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FIRST INTERNATIONAL SCHOOL ON COMPUTER NETWORK ANALYSIS AND MANAGEMENT

(3 - 14 December 1990)

S N A AND N J E
Concepts and Products

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Pisa

S N A and N J E

Concepts and products

System Network Architecture
and
Telecommunication Products
Course Guide

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Pisa - IT

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Preface

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This presentation guide has been prepared for didactic purpose only.

The content of this outline is mostly a selection of items from different sources ordered according a conceptual criteria, that shows first some of the basic elements of the System Network Architecture and than the products which it's implemented with.
Notes will help to better clarify some of the fails
References to etherogenus environment shows some connectivity solutions through use of products implemented according standard "de facto" or international standards.

NJE protocols and products complete this presentation in the perspective of the EARN and EASINET international networks.

It cannot anyway be considered an exhaustive document about SNA concepts and capabilities, as well as it cannot cover all the IBM telecommunication products
Any reference to an IBM product in this document is not intended to state or imply that only IBM's product may be used.

The content of this document has not been submitted to any formal IBM revision, and is distributed on "As Is" basis without any warranty either express or implied.

The reported definition files must be considered as pure didactic samples

Any suggestion that would help to improve this guide is welcome and may be addressed to the author:

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For more detailed information on specific topics references are listed in Appendix.

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PART A

Computer Networks Overview

- **Computer processing evolution**

- Off-Line Processing
  - Batch Processing = = Remote Job Entry

- On-Line Processing
  - Interactive and RJE Processing

    → Terminal network : tree structured

Introduction ...

IBM

- **... Computer processing evolution**
- Interconnected and distributed systems
  - Interactive and NJE processing
    - → Computer network: mesh structured
- Needs for Communication Architecture
  - Proprietary Architectures
  - Open Architectures

Introduction /Notes

IB

- *Short summary of computer processing evolution*

1. *Computer processing evolved from the local batch processing, located within a computer room, toward the interactive and Networking Job Processing where the end user could even don't Know where his Job will be processed*
2. *With the Batch and RJE processing there was no relationship between the user and the computer. The user had to provide the input to the computer and later on collect the output with great wasting of time.*
3. *With the development of Time-Sharing systems the end user gains the contact with the computer via the terminal network (teleprocessing)*
4. *The network has a tree stucture*
5. *Most of terminal handling is provided by the central processor within the application program.*

   No common Teleprocessing Access Method
6. *A change of a line configuration or a terminal model requires modification to the application program*
7. *Handling of teleprocessing software requires high level programmers*
8. *Sharing of lines and applications not allowed*
9. *Specialized resorces cannot reside all toghether on the same system.*

All these limitations originated the needs for sharing resources via a distributed computer network.

But to handle sharing of resources (lines, applications, terminals ....) and reduces costs and complexity of terminal or remote resource management as well as to protect investments a network architecture is needed.

So IBM designed its SNA (System Network Architecture) since the far 1974, to address data processing and communication needs in a flexible, unified design for growth. As an Architecture, SNA specifies how products connect and communicate with one another. During all these years SNA is grown to face the evolution of network requirements, but the original basic concepts are still valid and all the line of products developed according to the SNA specifications are still supported

To respond to market requirements, SNA was developed first with a hierarchical structure but in the last years it's evolving also toward a peer-to-peer structure as required from par

of the market.

- *Computer Architectures are commonly classified as*
  - *Proprietary*

    where the first to be developed according to market requirements
  - *Open*

    public specifications: allow connectivity with OEM equipments
  - *ISO / OSI conforming*

    implemented according to the standard protocols and services defined by OSI: allow interconnection between different computer vendors

    IBM states the SNA is a OPEN Architecture. In fact since the beginning the SNA Formats and Protocols are published as well as the access interfaces to allow third parties to develop their products compatible with SNA specifications.

    IBM supports also OSI protocols and services
    As we'll see during this presentation, IBM is doing a progressive integration between SNA and OSI because this is the trend the market requires.

Networks of the 90'

- Carrier Network Evolution
  - Customized services
  - Intelligent Networks
  - High Speed
    - Reduced Cost
    - Improved Quality
- Tecnology
  - Digital
  - High Bandwidth/Fiber
  - FAX
  - Image/Voice/Graphics
- Standards
  - OSI, TCP/IP, SNA, EDI ...
  - X.25, ISDN, 802.x, FDDI
  - Standards Profiles (GOSIP, ...)
- Global Networks
  - PTT Relations/Deregulation
  - VAN Expansion/Enhancement

Environmental Factors

IBM

Multiple choices are available; technologies, products and services, vendors and standards.

Technologies are relentlessly rolling out - extremely powerful processors, sophisticated desk top workstations and very high speed network capabilities for local and wide area networks with an continuous improvement of the price/performance ratio

Carrier/transmission capabilities are expanding and public network are becoming more and more intelligent, enabling the offering of customized services (Value Added Networks, ...), and the cost of high speed transmission is dropping quite rapidly enabling new opportunities and users.

Standards - OSI (Open System Interconnect) holds the promise of a common worldwide standards for multivendor communications, but today only few application are available, so TCP/IP is mainly used for multivendor communication for a limited number of applications, while the Open proprietary communication architectures, like SNA, will still have a fundamental role. Even with standards available, it will take a number of years before they are implemented by vendors and widely available.

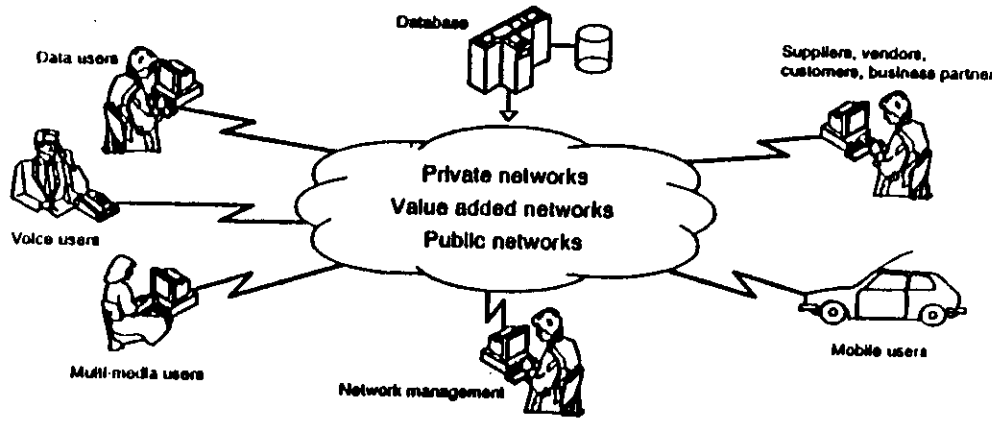
SNA and TCP/IP are today used for multivendor communications.

Some OSI products are also available from IBM and others will come with the standards available.

The users must however remind that the options available today make multivendor communication very much an art, not the science we would all like to see.

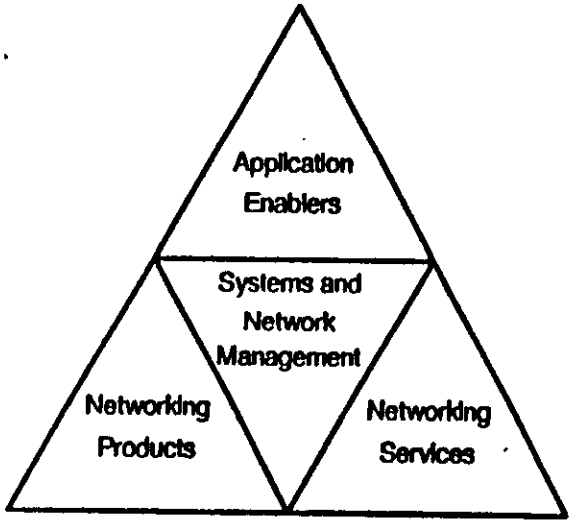
Customer requirements

IBM



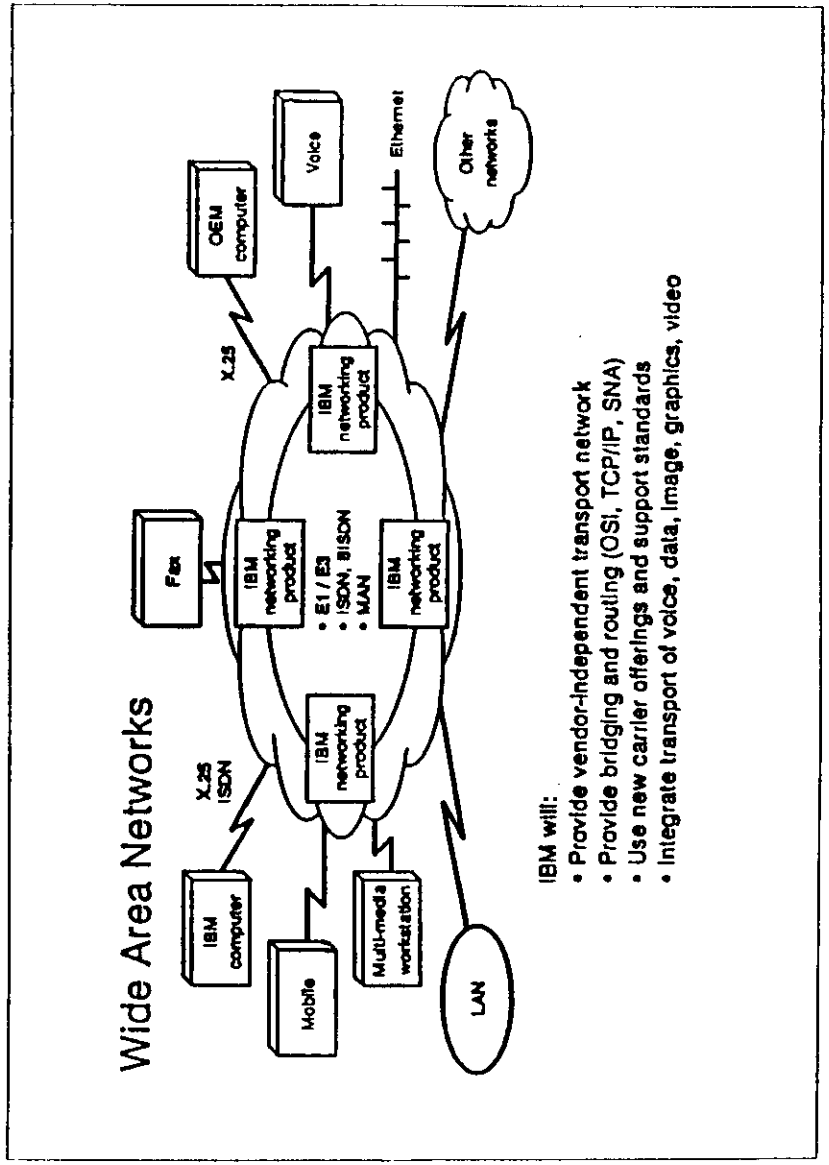
- Information Sharing
- Openess (multi-vendor communication).
- System and Network management interface
- Robust and complete solutions
- Easy-to-use, cost effective
- Investments protection

IBM Total Networking Solutions

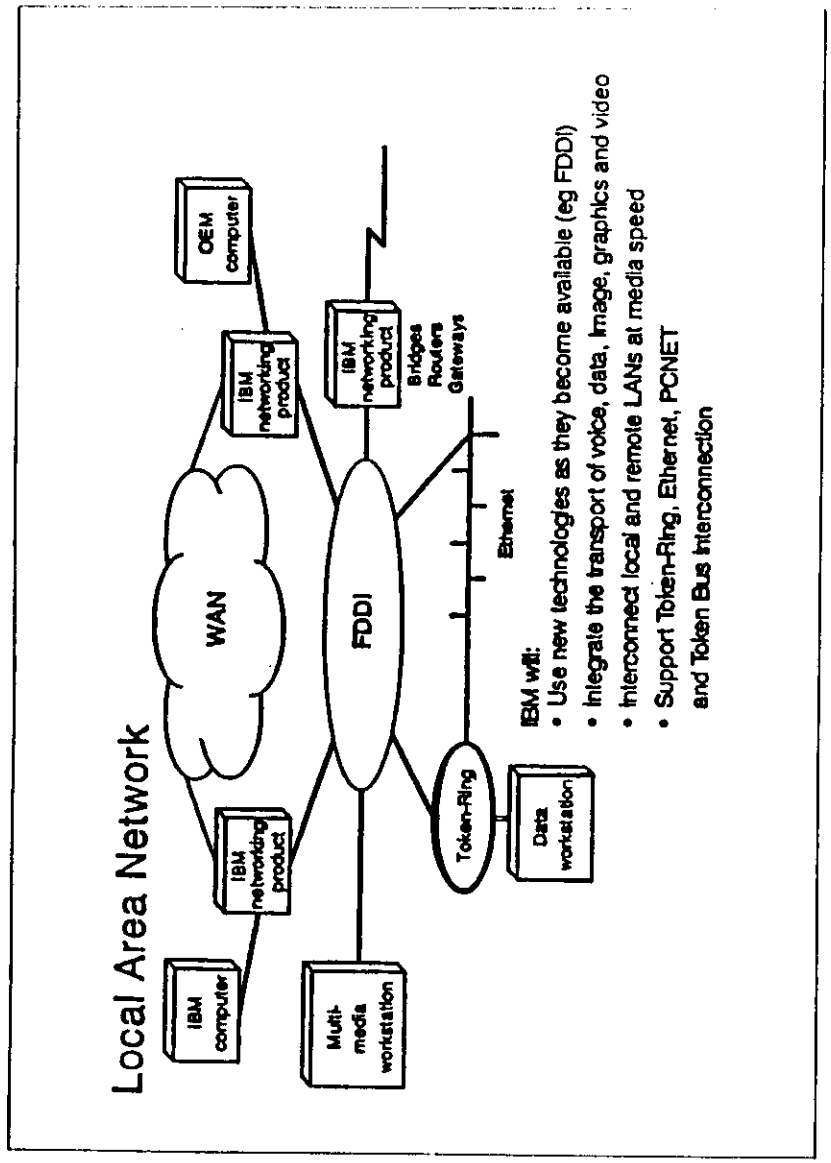


Communication System Platform for Multi-media Application

WAN Networking Direction



LAN Networking Direction



SNA/OSI and OEM connectivity

Connection/Communication

IBM

- **System Network Architecture (SNA)**

- Global description of logical structures
  - Message Formats
  - Protocol Sequences
  - Operative Procedures

  to transmit messages and data through a communication system

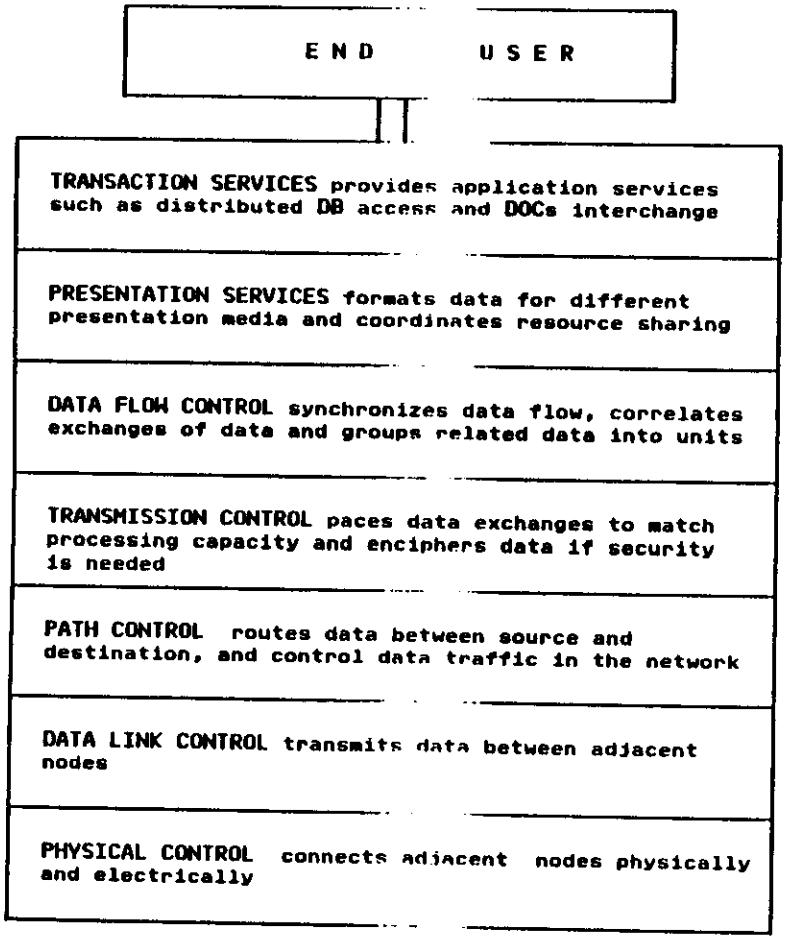
- Two aspects
  - connection
  - communication

SNA products

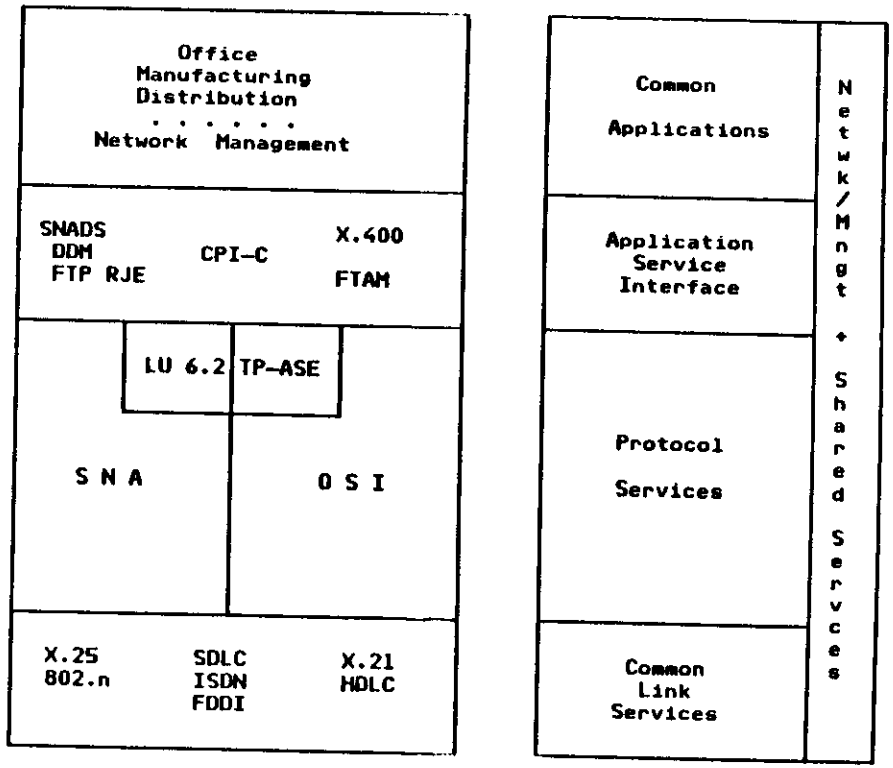
IBM

- SNA is a set of Hardware and Software products architected according the specifications to provide:
  - global solution
  - resource sharing
  - reliability and performances
  - network management
  - network interconnection
  - OEM openings
  - investments protection

- The SNA architectural model

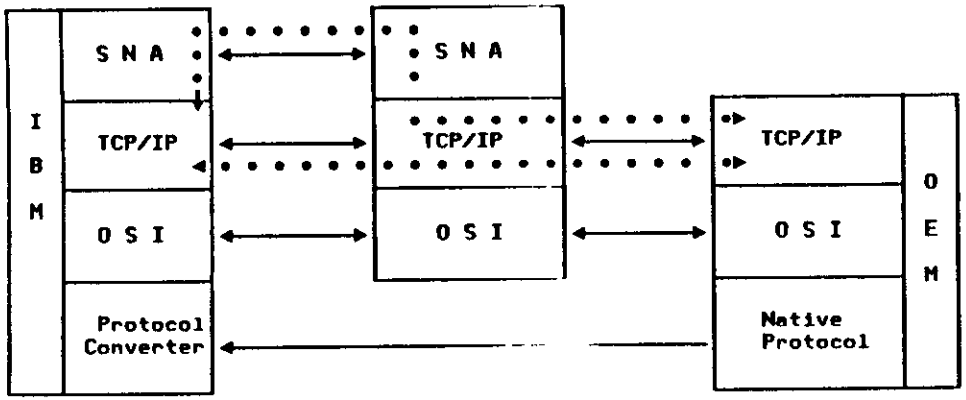


IBM Networking Architecture Direction



- SNA as common platform for SNA and OSI apllications
  - Last PSI products adhere to SAA specifications

- **OEM Connectivity**
  - Standard de facto and International Standards
    - TCP/IP is provided by most of vendors (about 130 implementations)



  - Migration strategy from TCP/IP to OSI

PART B.

SNA Concepts

Network Structure

- Host Processors
- Distributed Processors
- Communication Controllers
- Cluster controllers
- Workstations
- SNA access method
- Application Subsystems
- Application Programs
- Network management programs
- Network control programs

- **Host Processor**: control all or part of the network as well as program execution and computation, Data Base access, file services and network management
- **Distributed processors**: provide functions similar to the Host processors except for the network management.
- **Communication controllers**: manage the physical network, control the communication links and route data through the network.
- **Cluster controllers**: control the I/O operations and the devices connected to them (video, printers, workstations ....).
- **Workstationsprovide user access to the network**
  Workstations usually have I/O devices that enable network users to send and receive information.
- **SNA Access Methods**:
  1. logically control the flow of data through a network
  2. provide an interface between application subsystems and a network
  3. protect application subsystem from unauthorized access
  4. the access method resides in the host processor
     - The most common SNA access method is Advanced Communication Function/Virtual Telecommunication Access Method (ACF/VTAM)
- **Application Subsystems** support activities as
  1. developing programs interactively
     - TSO, VSCS ....
  2. retrieving and updating information
     - CICS, IMS, SQL .....
  3. processing batch jobs remotely

     - JESx, RSCS ...
  4. Application subsystems reside in processors
- **Application Programs perform the function** the user wants done, such as scientific computation, text editing, or user written programs
  - application programs reside in processors, intelligent cluster controllers and workstations.
- **Network management programs**:
  1. assist network operations
  2. detect and report errors
  3. maintain statistic about network performances
  4. assist for automatic network control
  5. ... optionally many other function to help network management
     - The IBM primary SNA management program is NetView
  6. each component of a SNA network perform functions that help the network management and is supported by NetView.
  7. NetView/PC allow application programs running on a PC to collect alert data from non-SNA devices and pass them to NetView
- **Network Control Programs** route data and control its flow between communication controllers and other network resources.
  - The primary IBM network control program is the ACF/NCP
  - NCPs reside in communication controllers

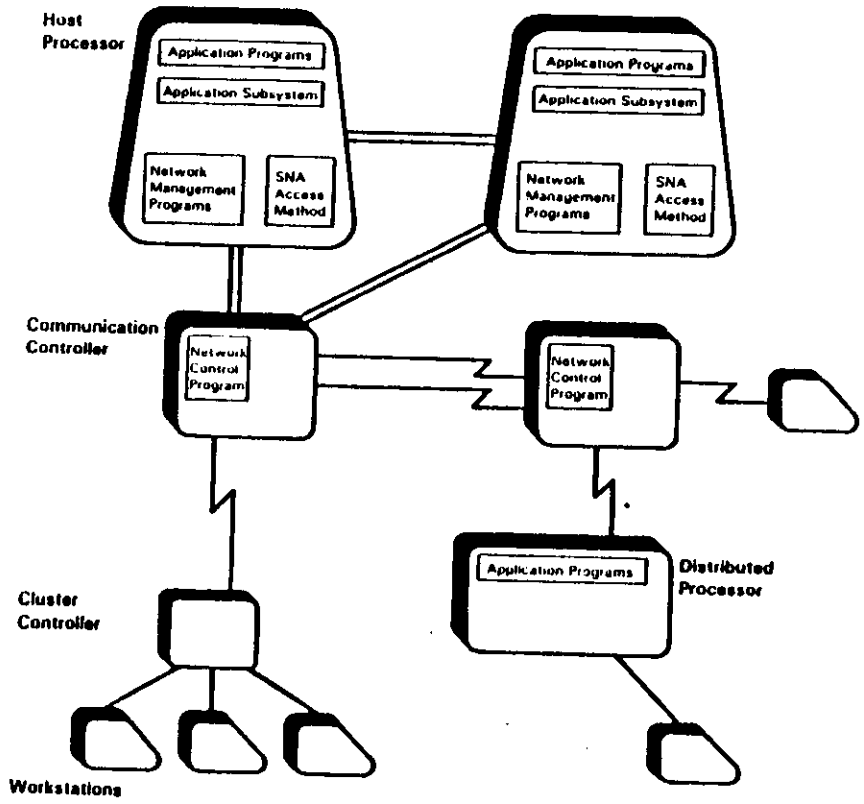


Figure 1. Network Components

Note: For descriptions of specific SNA products, refer to "Chapter 5. Selecting SNA Products."

◇ **Link definition:**

connection between adjacent Link Stations (nodes)

– trasmission media and data link control protocol

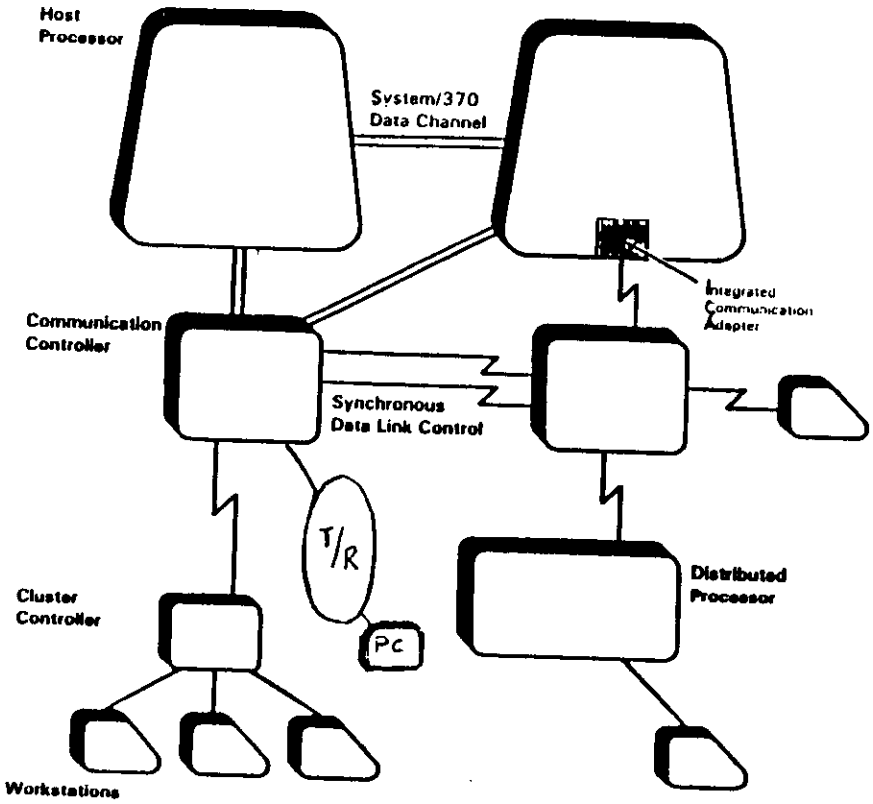


Figure 2. Links

- Links consist of a Link Connection represented by a transmission media and two or more Link Stations which use the data link control protocol to transmit data over a link connection.

1. Trasmission media can be telephone lines, microwave beams, fiber optic, and coaxial cables.

2. The Data Link Control Protocols specify how to interpret control data and transmit data across a link between adjacent nodes.

   SNA specifies the following data link control protocols:

   - **Synchronous Data Link Control (SDLC)** is the protocol that disciplines the interconnection of network components via telecommunication links.
     SDLC transmit data serially.

   - **Sys/370 data channel** connect locally various network components to host processors (Host subarea nodes to other subarea nodes and to locally attached peripheral nodes).

     - Data Channel trasmit bits in parallel

     - If the Host processor supports Integrated Communication Adapter (IC A) then a telecommunication link can connect network components to a host.

   - **Token-Ring Network** is a data link control that has two parts:

3. the Logical Link Control protocol (MAC)

   - the LLC sublayer provides sequential, connection-oriented data transfer.

     connetion-oriented data transfer provides error recovery, sequencing and flow control.

4. the Medium Access Control (MAC)

   - The MAC controls the routing of information between the physical layer and the LLC sublayer.

     The IBM Token Ring Network connects SNA components in a physical ring.

     - SNA products also supports:

   - Asynchronous (Start/Stop) and Binary Synchronous protocols (BSC).

   - HDLC and X.25 interface.

   - SHM (Short-hold mode) to support circuit switch networks (available only in some European countries)

     allow releasing of the switched connection during idle periods.

   - ISDN

   - ... see last announces

- **End User Definition**
  - ultimate source and destination of information flowing through a network
  - interacts with the network to obtain services supplied by the network
- End User Examples
  - workstation user
  - application program

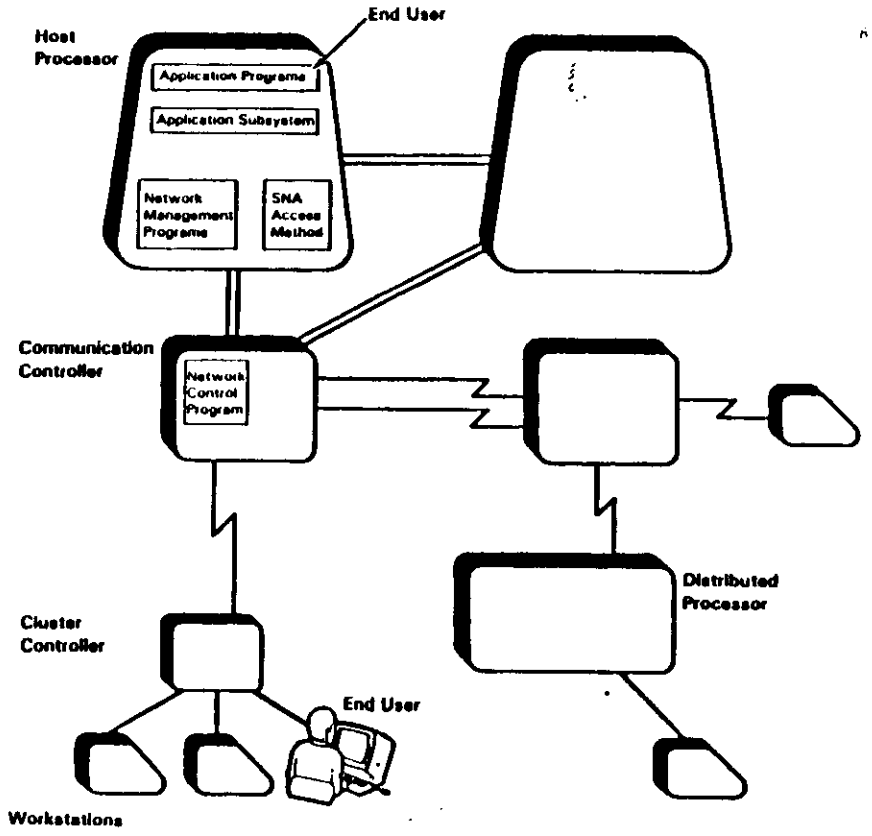


Figure 3. End Users

- The relationship between End-Users.

End User /Nodes

IBM

- *The End-Users are not part of the Network*
- *They interacts with the network to use the services it offers providing efficient exchange of data between two points.*
- *The End-User can be:*
  - *an application program*
    - *operating with another remote application program*
    - *interacting with a workstation operator*

Nodes

IBM

◇ **Node definition:**
a network component in which SNA functions are implemented

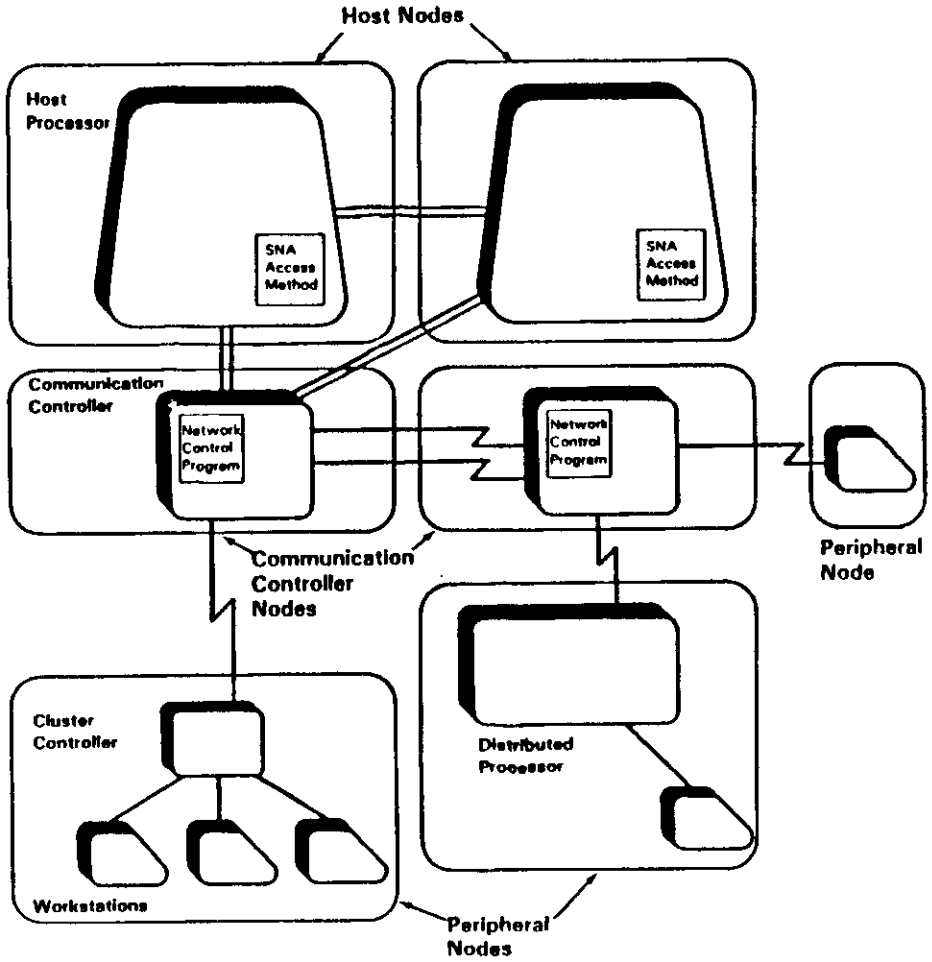


Figure 4. Nodes

- *Nodes provide SNA functions tha enable end users to be independent of a network's characteristics and operation. The network resources in the nodes that provide these function fall into two categories:*

  1. *Network addressable Units*

  2. *Path control network*

  → *see Node Structure later-on*

- *SNA nodes are interconnected by links.*
- ***Host Node** is a host processor that contains the ACF/VTAM*
- ***Communication Controller Node** is a controller that runs ACF/NCP. This node, under direction of the host node, controls the links*

  and the attached peripheral nodes (clusters and workstations).
- ***A Peripheral Node** are both source and destination of dat a.*
  - *They are associated with workstations, cluster controllers or distributed processor.*

◇ TG definition:

is a link or a group of links between adjacent subarea nodes

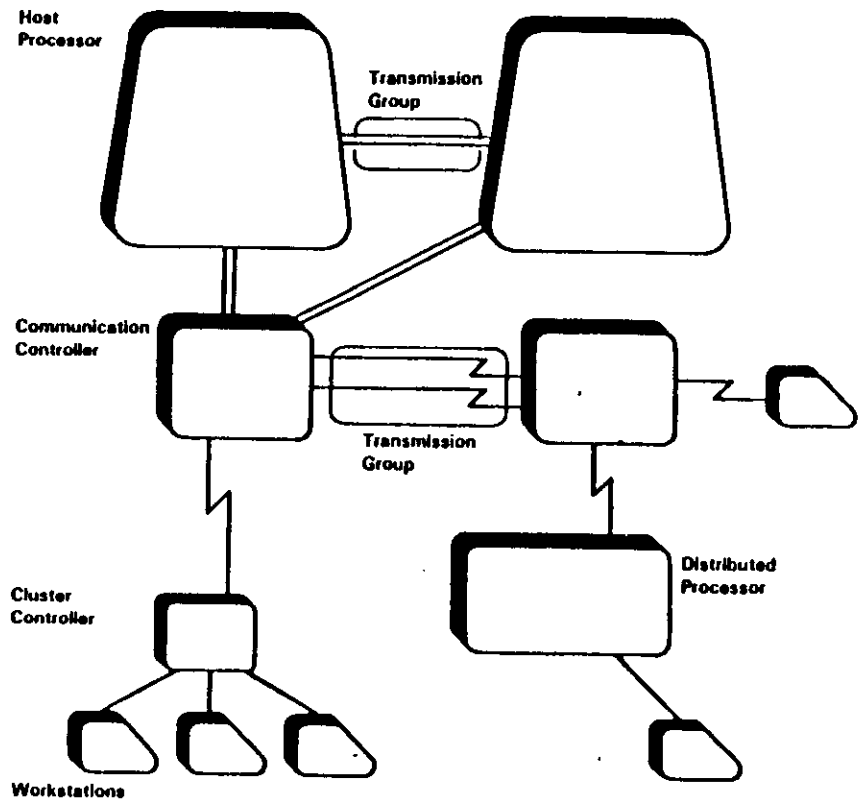


Figure 5. Transmission Groups

Trasmission Group /Notes

IBM

- *Regardless of the number of link in a trasmission group, subarea nodes treat the transmission group as a single link.*
- *Parallel links grant better performances.*
- *If one link in a trasmission group fails, the subarea node can automatically place data traffic on the remaining active link. This avoid loss of data and disruption to the end user.*
- *the PIU sequence is granted by the TG mechanism when parallel links are used.*

Subareas

IBM

◇ **Subarea definition**

a host or communication controller and its peripheral nodes.

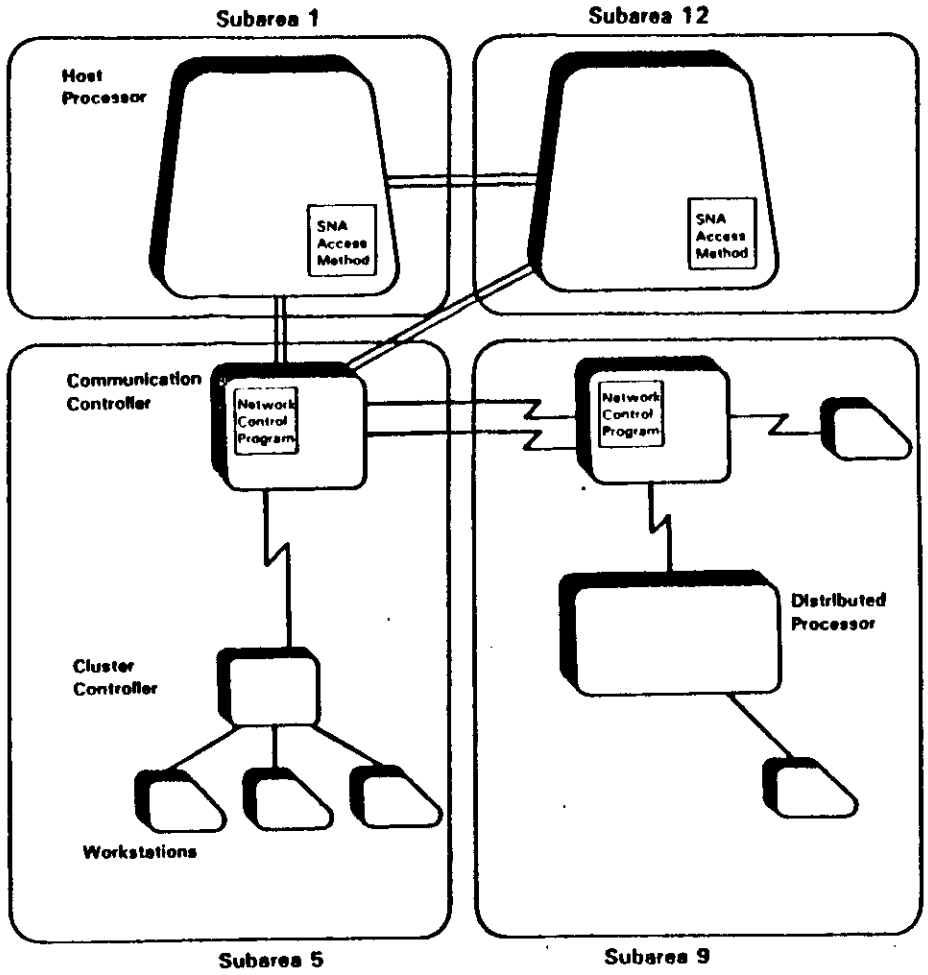


Figure 8. Subareas

Subareas /Notes

IBM

A Subarea consists of a host or communication controller node and its peripheral nodes.

The horst node or the communication controller node in a subarea is called a subarea node

- ***Each subarea has a unique number.***
- *Network administration personnel use the subarea number to identify network components.*

Network Addressable Units

IBM

◇ NAU definition

Network resources identified by an network address

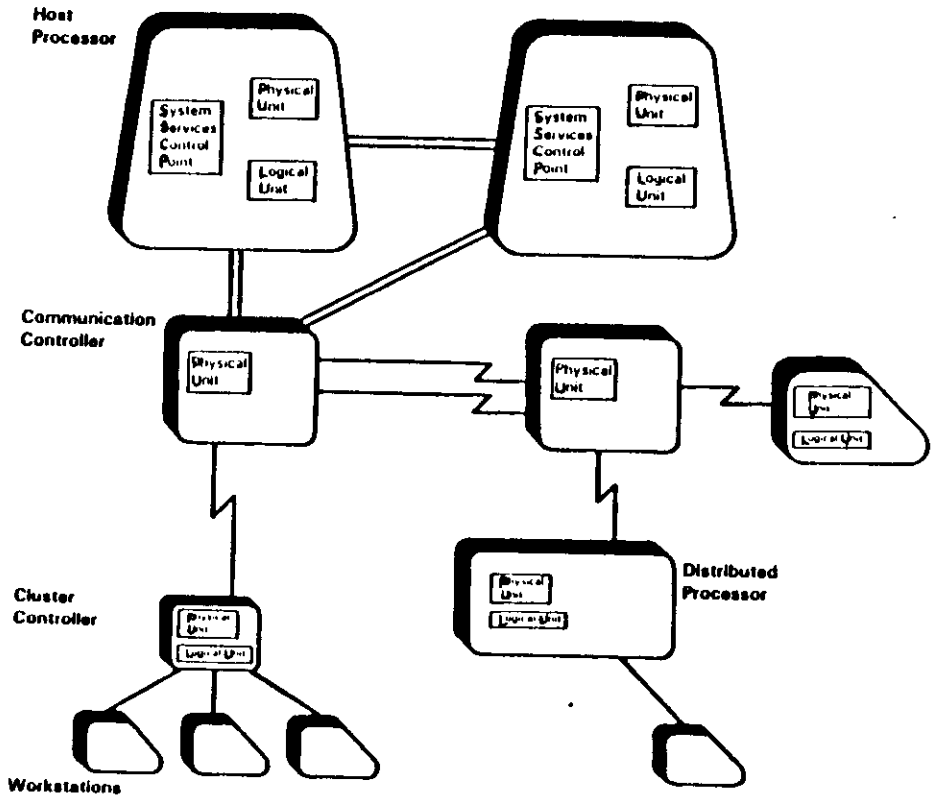


Figure 7. Network Addressable Units

Network Addressable Units

IBM

***Network Addressable Units** have addresses that identify their routing location, so that end user can transmit data to each other.*

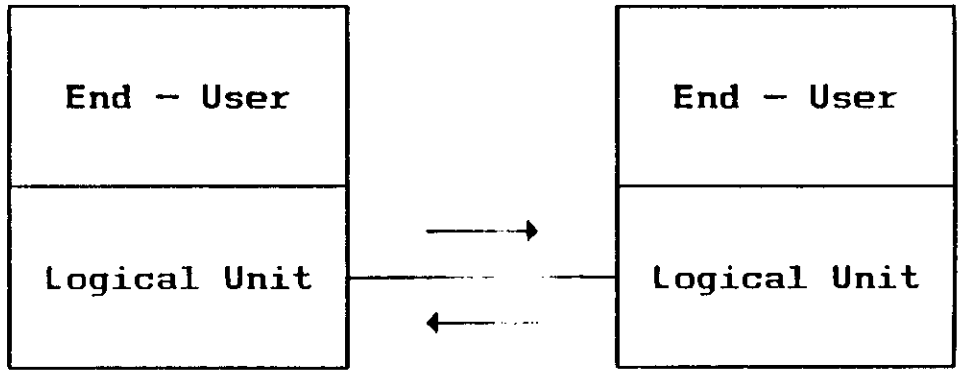
- *NAUs provide the following functions:*
  - *synchronize communication between end users*
  - *manage the resources in each node*
  - *control and manage teh network*

  Each NAU has an address that identifies it to other NAUs and to the path control network. The Path Control uses this address to route data between NAUs.
- *SNA defines three kinds of addressable units:*
  - ***Logical Unit (LU)** provides end user access to the network resources and manages the transmission of information between end users*
    - *Pheripheral and host nodes can have more than one logical unit.*
    - *Every end user has one or more logical units that enables it to communicate with other end users.*
    - *A single LU can serve one or more end users*
    - *Before end users can communicate each other, their respective LUs must be connected in a mutual relationship called a session (LU LU session).*
  - ***Physical Unit (PU)** resides in each node and provide services to manage and monitor that node's resources.*
    - *the ACF/VTAM manages the resouces for a host nodes.*
    - *the ACF/NCP manages the resources of a communication controller node*
  - ***System Services Control Point (SSCP)** is the control point of control for a domain.*
    - *An SSCP resides in a host node and provides services for monitoring and controlling network resources (activation, initialization, etc).*
    - *It is part of ACF/VTAM*
  - ***Boundary Function**provides services and control at a subarea node to enable peripheral nodes to easily connect to a network.*

Logical Units

IBM

- **Logical Unit (LU) definition**
  - point of access to the network for End Users
  - manages exchange of data between End Users
  - one LU may serve one or many End Users



LU Types

IBM

LU types identify the set of SNA functions that a product provides to support end user communications

- **Presentation services profiles:**
- LU type 0 uses non-architected presentation services
- LU type 1 uses SNA character strings (SCS)
- LU type 2 uses 3270 data streams
- LU type 3 uses printer 3270 data streams
- LU type 4 standard of first word processor
- LU type 6.1 standard for the first transactional applications (IMS)
- LU type 6.2 standard for SNA APPC (most recent)

→ LU-LU sessions can exist only between logical units of the same LU type.

Physical Unit

IBM

◆ **Physical Unit (PU) definition**

- combination of Hardware and Software to
  - manages the node
  - manages the Links to adjacent nodes
    - → p.e. VTAM or NCP manages PUs
- every node contains a PU

- **System Services Control Point definition**
  - manages the whole or a portion of the network
    - activates resources
    - controls "
    - deactivates "
    - initiates and terminates sessions

      SSCP - PU

      SSCP - LU

      LU - LU

      SSCP - SSCP

→ An SSCP is said to **own** a network resource which it has activated and not yet deactivated

- *Only Host subarea nodes contain an SSCP*
  - *The SSCP manages network resources in accordance with the commands issued by the network operator*
  - *It coordinates the activation of sessions between LUs*

    p.e. an SSCP provides directory services to assist a Logical Unit initiate a LU-LU session
  - *When necessary it acts on the physical network to activate sessions*

    p.e. an SSCP can cause a workstation to be dialed over a switched link when that is necessary to activate a session
- *Each SSCP manages a portion of a network and that portion is called a domain*
  - *When a network contains only one SSCP, that SSCP manages all the network resources*
  - *in this case the network is said to be a single-domain network*

  Two or more SSCP in a network can provide backup for failing SSCPs in other domains, cooperatively control network components and help establish sessions between Logical Units.

◇ Single and Multiple Domain

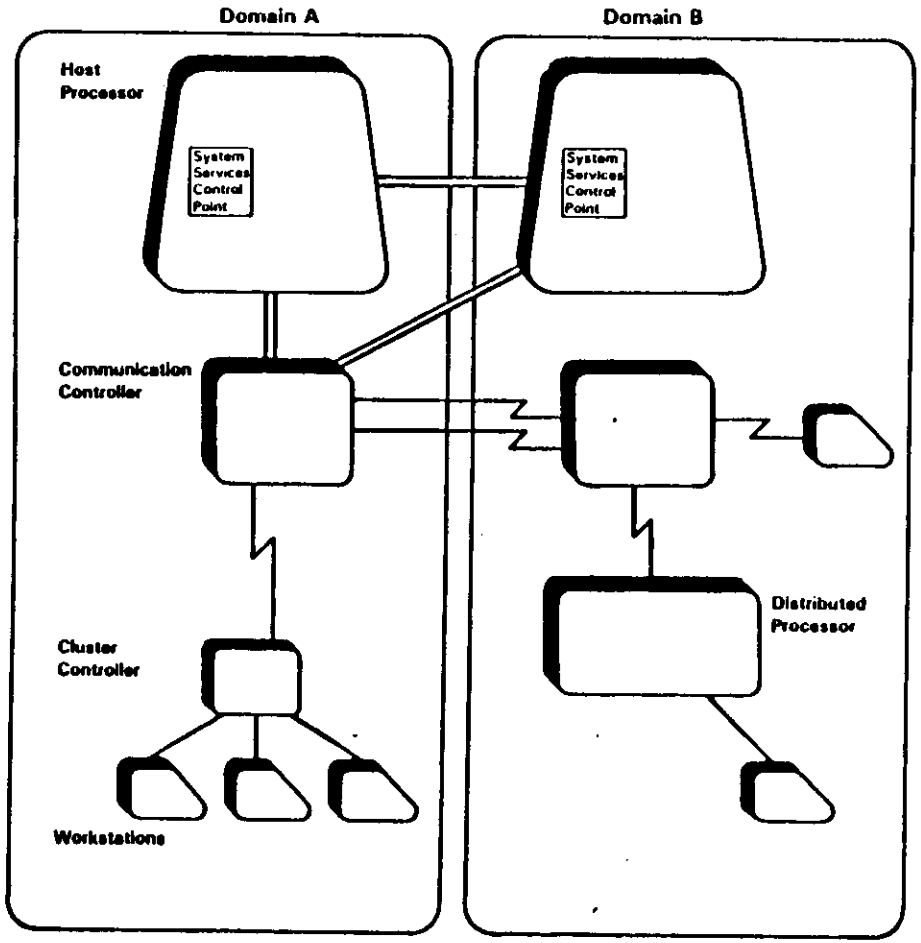


Figure 8. Domains

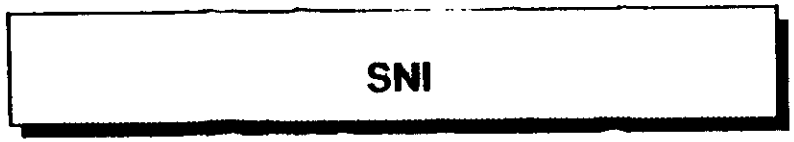
◆ Domain definition

an SSCP and the network resources activated by the SSC

- Network resources are:
  - PUs
  - LUs
  - links
  - Link stations

→ some types of resource may be owned by more than one SSCP

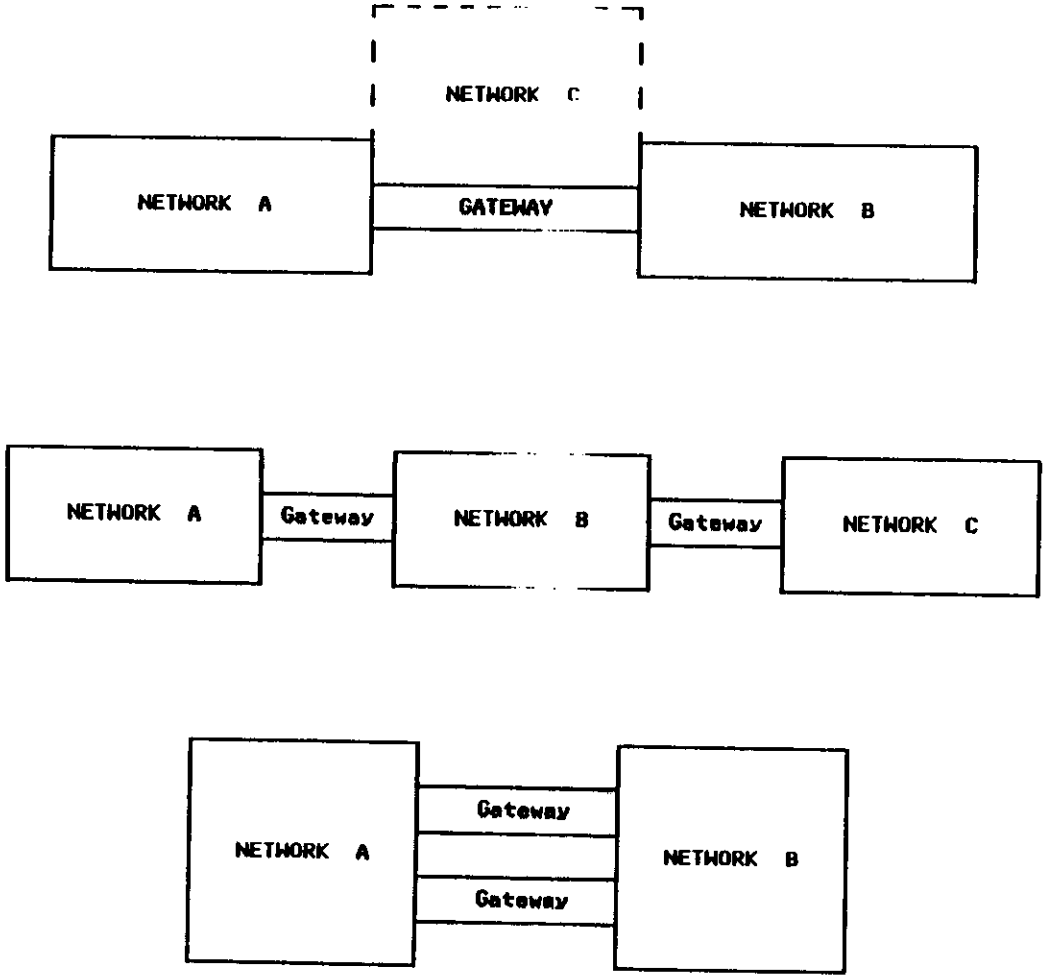
- provides backup in case of SSCP failure



- Why SNA Network Interconnection?
  - Growing need to exchange data between separate SNA neworks
  - Growth of existing networks impacts on resource naming management

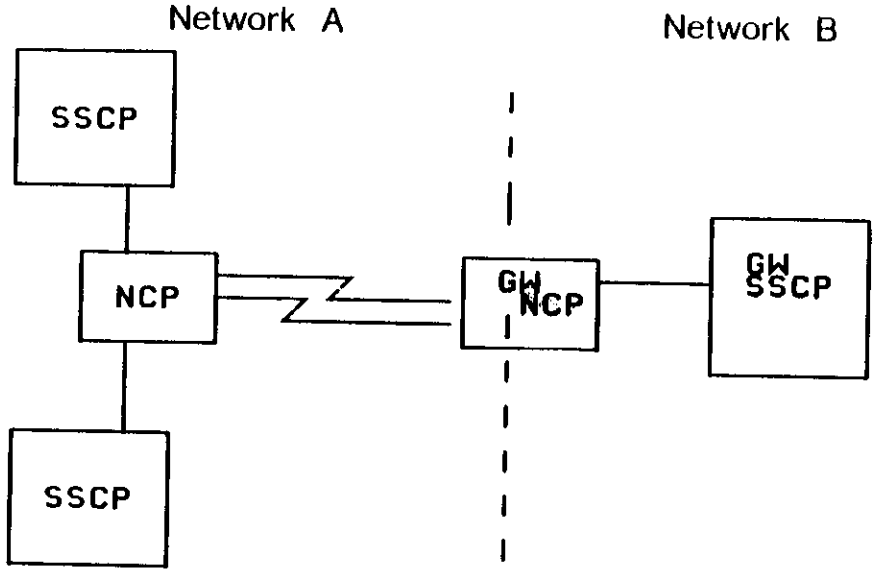
- S N I Facilities
  - Interconnect indipendent SNA networks
  - Divide an existing SNA network
  - Allows communication between end-user in separate SNA network
  - Indipendence of connected networks
    - Nework address structure
    - Resource names
    - Network configuration
    - Network management
  - Different ACF versions/releases

Inteconnected Networks Configurations



Adjacent Network Gateway

- Single SSCP and NCP Gateway



- \+ simple configuration
- \- if GWNCP faults also SNI sessions drop
- \- if GWSSCP faults new SNI sessions cannot be activated

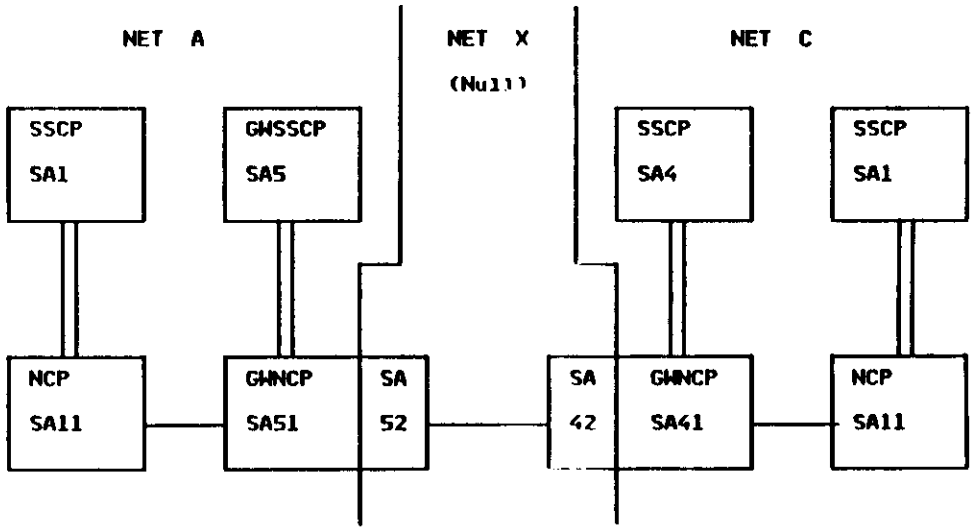
Adjacent Network Gateway

IBM

- *To open End-User sessions between two interconnected networks, at least a service session must be opened between two SSCP, where one of them must be a GWSSCP*
- *Two networks are adjacent if only one GWSSCP is involved in a service session.*
- *The GWSSCP is identified as a normal NAU*
- *The only sessions allowed between cross networks are the CDRM-CDRM sessions.*
  - *SSCP-PU and SSCP-LU are not allowed between different networks*
- *ALIAS functions*
  - *Allow LU names in different networks to have the same names.*

SNI Back-to-Back Configuation

IBM



Back-to-Back Networks

- The Null network contains cross-network links only and part of NCPs containing Alias addresses of network partners.

The figure on the previous foil is an example of configuration called Back-to-Back

- *This configuration makes use of a Null Network separating the production networks.*
- *The Null Network consists of only portion of two GWNCP's containing Alias addresses of the cross-network partners.*
- *The production networks each contain a GWSSCP controlling a GWNCP*
- *The Back-to-Back configuration provides a significant degree of network configuration isolation, in fact the most of all the types of configuration.*
- *The two production networks do not have to exchange much information about themselves. Most of the cross-network definitions will pertain to the null network.*
- *This type of configuration has particular appeal to two independent organizations who wish to interconnect to share information, but are not interested in revealing too much about their operation to other company.*

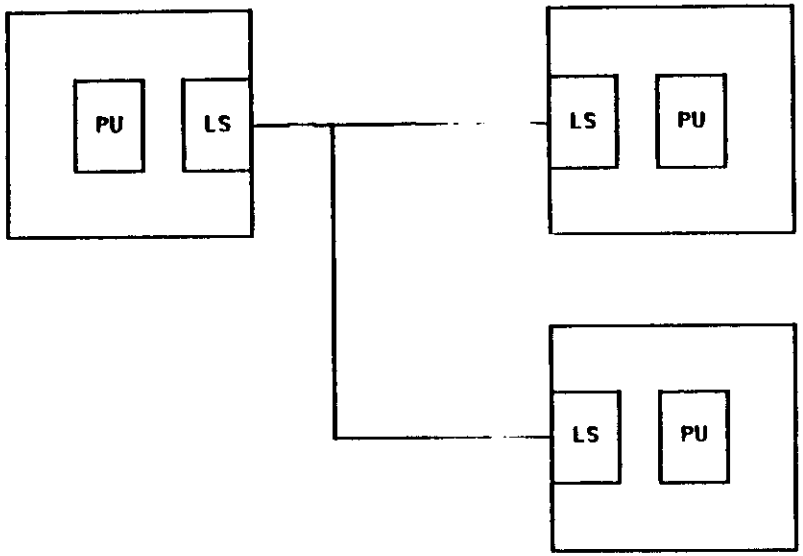
- **Configuration Considerations**
- *Availability/Recovery*
  - *cross-network alternate routes*
  - *GWSSCP and GWNCP backup facilities*
- *Performance*
  - *GWSSCP's and GWNCP's involved in session setup path*
  - *Alias Application (how many GWSSCP have to install?)*
  - *Number of cross-network sessions*
- *Network Management*
  - *Network organization autonomy*
  - *Cross-Network Configuration Data and Routes*
  - *Security*

PART C.

SNA Components and Functions

Data Link Control - Link Stations

IBM



→ LS = link station - data link control element

- ◆ to control link activation and deactivation
  - L'SSCP refers to Links in a node containing an owned PU
  - L'SSCP refers to Link Stations in a node adjacent to a node containing an owned PU

→ Once a Link Station has been "contacted", Path Control in the node containing the owned PU can route data to resources in the adjacent node

- LS is also responsible for error recovery

Data Link Control - Link Stations Notes

IBM

- *Data Link Control provides services for Path Control*
  - *trasmit message units (PIUs) across links*
  - *manages link-level flow*
  - *manages link-level error recovery*
- *Data Link Control is served by Physical Control which includes*
  - *SDLC links*
  - *Channels*

Node Types and PU Types

IBM

- Host Node (type 5)
  - represents a subarea (a subarea node)
  - contains an SSCP
  - contains a PU Type 5
    → example: an ACF/VTAM in a VM system

- Communication Controller Node (Type 4)
  - represents a subarea (a subarea node)
  - does not contain an SSCP
  - contains a PU Type 4
    → example: an NCP in a 37xx

- Peripheral Node (type 2 or 2.1)
  - does not represent a subarea
  - attaches to a subarea node
  - contains a PU Type 2 or 2.1
    → example: a 3174

Node Types and PU Types

IBM

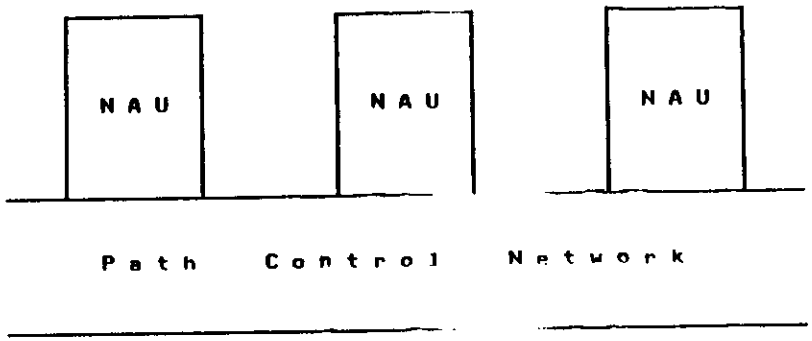
- *Node description Nodes are hardware and software components that implements SNA functions. The network resources providing these functions fall into two categories:*

  1. *Network Addressable Units (NAU)*
     - *SSCP, PUs and LUs are network addressable units*
     - *they enable end users to send data through a network and help network operators perform network control and management functions.*
  2. *The Path Control Network*
     - *Link Stations (data link control element), subarea path control elements, and peripheral path control elements are part of the Path Control Network*
     - *they route and trasmit data between NAUs*

- *SSCP manage the configuration of a network, control other network resources, coordinates network operator and problem determination requests and provides directory support and other session services for end users.*
- *PUs manage and monitor each node's attached links and adjacent link stations.*
- *LUs provide end user interface to the network and manage data execange between end users.*
  - *before end users can communicate each other their respective LUs must be connected, that is a LU-LU session must be established*
- *Link stations are data link control elements that trasmit data over the physical connection between adjacent nodes.*
- *Path control elements route data between NAUs*
  - *Subarea path control elements route data to and from NAUs in subarea nodes and between subareas*
  - *Peripheral path control elements route data to and from NAUs in peripheral nodes.*
- *The architecture defines 4 type of nodes to identify the SNA function that each node support.*
  - *see previous foil.*

Node structure

IBM



- Data is routed by the path Control Network between NAUs based on the Network Address of the origin and destination NAUs
- SSCP, PU and LU are types of NAUs
- Each NAU has a Network address composed by:

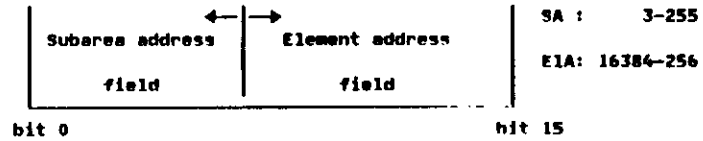
  → Subarea Address + Element Address

Node structure /Notes

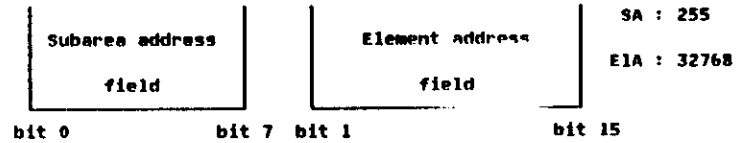
IBM

- *Addresses*
- *Subarea Address*
  - *a number (address) which uniquely identifies a subarea used for routing between subareas*
- *Element Address*
  - *a number (address) which uniquely identifies a network resource within a subarea*
- *Network Address*
  - *the combination of subarea adrress and Element address which uniquely identifies a network resource within the network*

- **16-bit Network Address**



- **ENA: Extended 23-bit Netork Address**



With 16 bits addressing is necessary that hosts within the same network have same SA field dimension.

Than the parameter MAXSUBA=n where n is the same in each domain.

→ *while SA number is unique within the whole network, the Element address must be unique within the subarea only.*

- *The Element Address is assigned by VTAM or by NCP*
  - *during the generation*
  - *during a network reconfiguration*
  - *during the activation of resources connected in switched mode*
  - *when parallel LU-LU sessions are activated*

SNA provides fixed element addresses for some resources:

		Resource	Element Address
Node	5	PU SSCP LUs	0 1 > = 2
Type	4	PU	0

Path Control Network

- **Functions**
  - Trasmits data across links between nodes
  - Routes data from a subarea node to another subarea node
  - routes data from a subarea node to attached periphera nodes
- **Path Control Network Layers**
  - Path Control
  - Data Link Control
  - Physical Control

Path Control Network /Notes

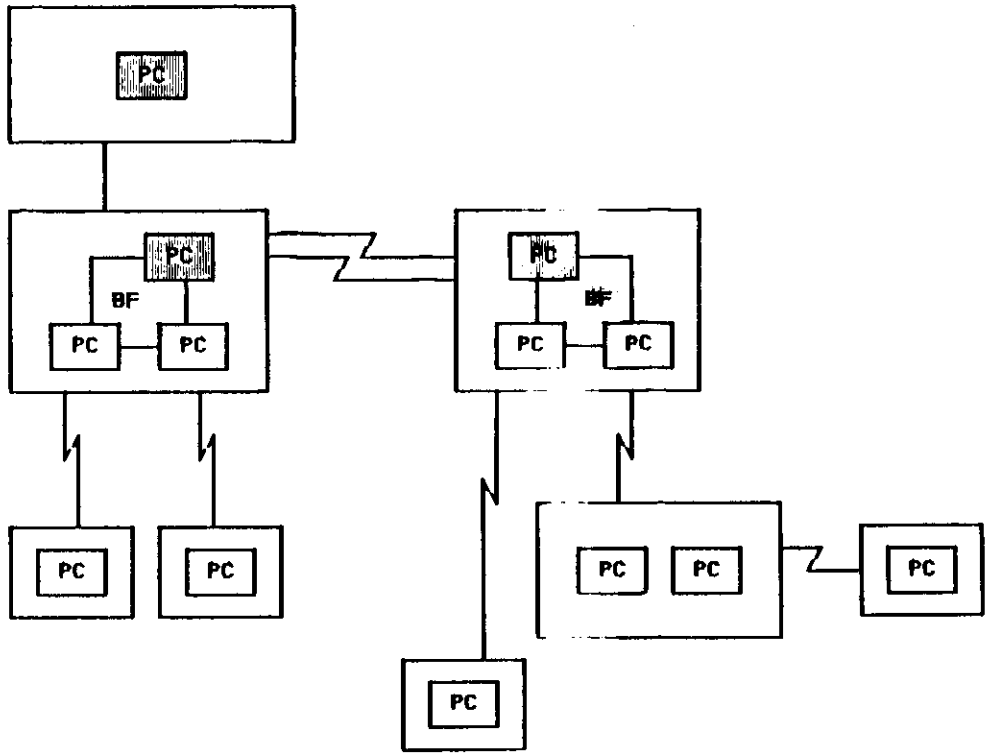
IBM

- *Functions The Path Control is a SNA function that creates a logical channel through the network using the available physical links.*
  - *Messages units are routed between NAUs*
  - *Messages units contain the address of the destination NAU, and the PC uses this address to select a path for the data through the network*
  - *There are two kinds of path control elements*
    1. *Subarea Path Control elementes:*
       - *route data between subarea nodes*
       - *route data between NAUs belonging to the same subarea*
       - *use the network address to route message units*
    2. *Peripheral Path Control elements:*
       - *route data between subarea nodes and peripheral nodes*
       - *route data between NAUs in peripheral node*
       - *route data between Type 2.1 peripheral node*
       - *use local address to route message units*

Note that whereas a network address is unique within a network, a local address is unique only within a peripheral node.

Path Control Elements

IBM



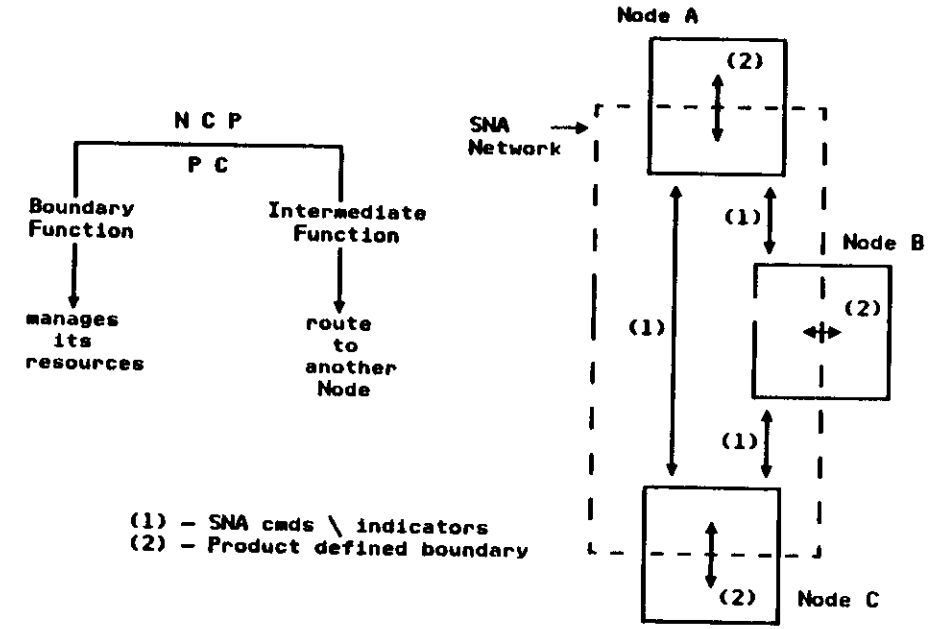
Legend:
Subarea Path Control Element
Peripheral Path Control Element
Boundary Function Component

- One SPC element for each subarea node
- Subarea nodes contain one PPC element for each adjacent peripheral node

Boundary Function

IBM

- Interconnects subarea and peripheral path control elements
  - enables Peripheral Nodes to have fixed "local" addresses
    - simplifies the implementation
    - simplifies attachement to network
- The SA-node converts the Network Address to Local Address



Boundary Function /Notes

IBM

- *L'element Address is automatically assigned by VTAM or NCP*
  - *during the generation*
  - *during a network riconfiguration*
  - *durirng the activation of switched resources*
  - *when LU-LU parallel sessions are initiated*

SNA requires for some resources constant element addresses

		Resource	Element Address
Node	5	PU SSCP LUs	0 1 > = 2
Type	4	PU	0

- *Local address*

The resources of a peripheral node have both the network address as th e local address. Whereas the network address identifies a PU, a LU or a Link station within the network, the Local address identifies one of these resources within a peripheral node.

Local addresses are not the same as the network element addresses and are unique only within the peripheral node.

Peripheral nodes are the origin and the destination of End-User data. But they have no role in the global routing based on the network address.

They are supported by the BOUNDARY Function in the subarea nodes for the association

of their local address with the network address used by subarea path control elements.

The boundary function make the peripheral nodes independent from changes of address due to the network reconfigurations.

- *Boundary Function*

Association of network address used by the subarea path control element with their local address used by the peripheral path control element

The subarea nodes perform two kind of "routing

- *Intermediate routing function*

  message routing between NAUs in different SA

- *boundary function*

  message routing between a SA-node and a peripheral node.

  Boundary function supports also the Extended Recovery Facility (XRF) to manage the backup sessions when an active LU_LU session faults.

  Ref. 2-12 SNA Technical Overview

- **Virtual Route Control**
  - creates logical channels between SA-nodes where messages of different sessions are multiplexed
  - the Flow Control mechanism prevents network congestion
  - each VR is mapped over one ER
- **Explicit Route Control**
  - defines the physical paths in the network through the SA-nodes and TGs sequence
- **Trasmission Group Control**
  - distribute the data traffic over parallel links like a single connection
- **Messages sequencing, bloking and segmenting**

- *PC Trasmission protocols The Path Control Network uses three protocols when transmitting data between NAUs.*

  1. *Sequencing*

     message units are numbered when queued to be trasmitted
     the sequence number is used at the receiving side to reorder out-of-sequence messages received over a Transmission Group

     → *Links in multiple link TGs should use the same speed*

  2. *Bloking*

     is the combination of multiple Path Information Units (PIUs) into one Basic Transmission Unit (BTU) to be given to Data Link Control for transmission

     → *implementation - channel links only*

  3. *Segmenting*

     Path Control can split one PIU into multiple segments to be given to the Data Link Control to be transmitted over a link. the segment sent to the link is called a Basic Transmission Unit (BTU).

     → *implementation - peripheral nodes only*

  4.

  Ref. SNA Technical Overview pg 8-3/8-5

  Higher layers protocol are related to the LU LU sessions an are specified within the BIND at session initiation time.
  Because during this lectures there is no space to cover the Session protocols, only a summary list is given here:

  - *Response Protocols*
  - *Chaining Protocols*
  - *Bracket Protocols*
  - *Sequencing Protocols*
  - *Request and Response Mode Protocols*
  - *Send and receive Mode Protocols*

  - *Data Security Protocols*
  - *Function Management Headers*
  - *Extended Recovery Facility Protocols*

For further details refer to Chapter 8 of SNA Technical Overview

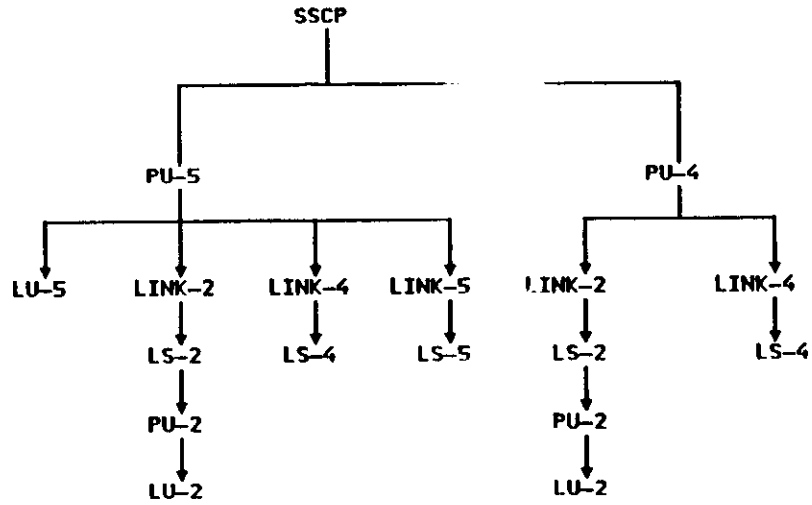
Resource sharing

IBM

- **Concurrent sharing**
  - → more tha one SSCP can simultaneously control the same resource
  - → shared limit Í 1
  - PUs in type 4 nodes
  - Non-switched SDLC links in type 4 nodes to
    - other type 4 nodes (subarea nodes)
    - Peripheral nodes
  - Link stations for the non-switched SDLC links between subarea nodes
- **Serial sharing**
  - → only one SSCP at a time can control a resource
  - → shared limit = 1
  - LUs and PUs in peripheral nodes
  - Switched links between subarea nodes
  - Links and Links Stations that connect peripheral nodes to subarea nodes

Resource Activation Sequence

IBM



Legend:

PU-X	->	PU in a type X node
LU-X	->	LU in a type X node
Link-X	->	Link towards a type X node
LS-X	->	Link station in a adjacent type X node

Resource Naming

IBM

- End Users interface with the network services using
  - → Names
    - Network Addressable Units
    - Set of session protocols (BIND)
    - Route selection (COS)
- SSCPs provide a Directory Service to translate NAU names to network addresses used by Path Control
  - If the resource is owned by the SSCP it performs the translation
  - If the resource is not owned by the SSCP it routes the request containing the name to another (or more) SSCPs.
  - → Use of Names provides independence from knowledge of configuration
  - → An LU may have another name known only to the owning SSCP - the "uninterpreted name".

Resource Naming /Notes

IBM

During system generation, access methods build directories that relate the network names of resources in each domain to their network address.

The SSCP uses this directory to translate names to network addresses for resources within its domain.

In addition, the access method builds a cooperative directory that allows SSCPs to translate names to addresses across domain; if the named resource does is not in a SSCP's domain, the SSCP uses the cooperative directory to identify which SSCP can provide the name to address translation.

The network names should be unique within a network.

Its very important to define a consistent naming convention to ensure that duplicated names are not assigned.

Sessions

- **Logical connection between two NAUs.**
- SSCP-PU
  - control of the physical resource which PU represents and associated link and link stations
    → same domain
- SSCP-LU
  - servicing of end user requests
    → same domain
- LU-LU
  - end user communication
- SSCP-SSCP
  - servicing end user requests
    → cross-domain
- While a session is active, resources are committed in both NAUs which constitute a half-session in each.

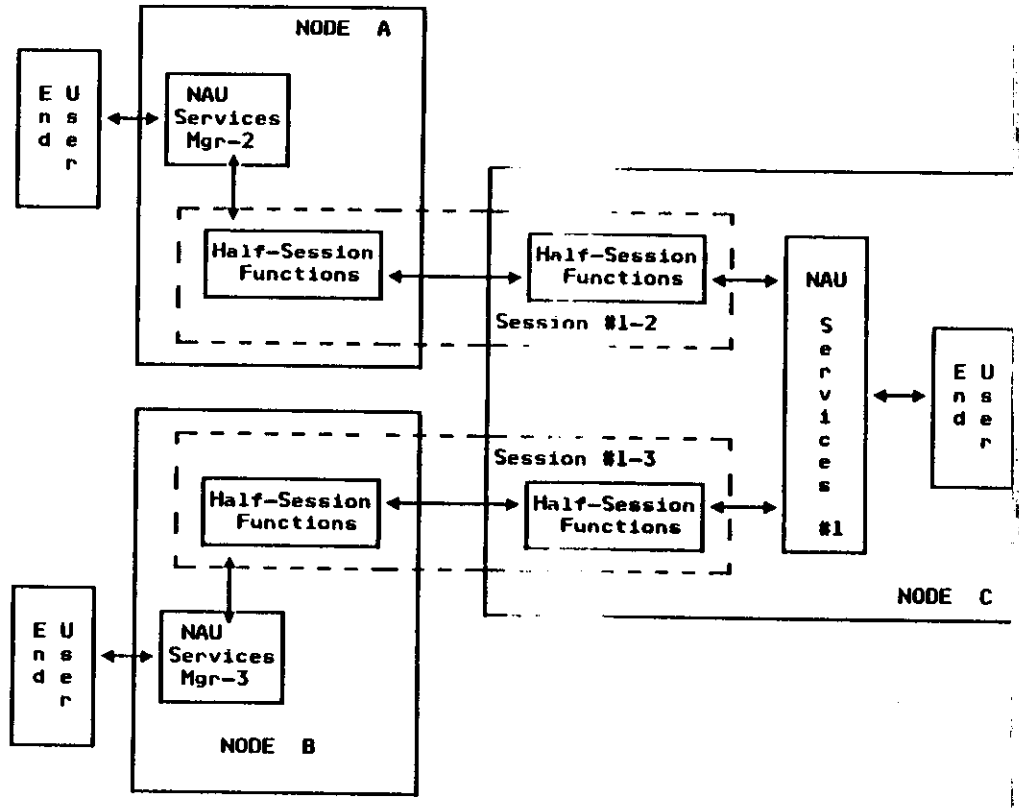
The session is the SNA base concept to establish a logical relationship between NAUs.

Because of different type of NAUs there are also different type of sessions

- *SSCP-PU*
  - *These sessions must exist between the SSCP and all the PUs owned by the SSCP itself.*
  - *They must be activated before any other activity can take place with the LUs controlled by the PU nodes.*
  - *they are used to control and manages network informations.*
- *SSCP-LU*
  - *The must be activated before LUs can initiate any activity.*
- *SSCP-SSCP*
  - *These sessions are used for communications between control points of different domains in a multi-domain network.*
  - *The must be activate to allow "cross-domain" activities.*
- *LU-LU*
  - *Are the so called work-sessions because allow data execange between End-Users.*
- *PU-PU*
  - *Although they are not explicitly defined, it's possible to exchange informations between adjacent PUs.*
    They are used to manage "Explicit Routes"

    The initialization sequence depends on the session type.

- **Half-Sessions**



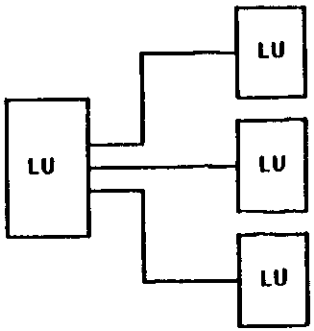
- A Session is univocally identified by the pairs of engaged NAUs
  - The pair is called SID (Session ID)

LU-LU Sessions

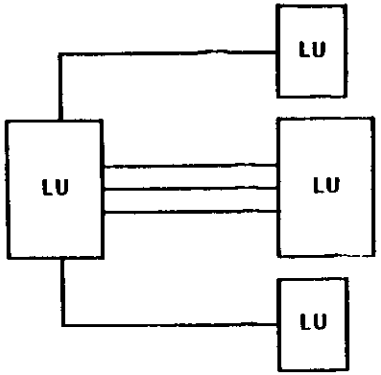
IBM

- Single session (one at a time)

- Multiple session at a time with different LUs

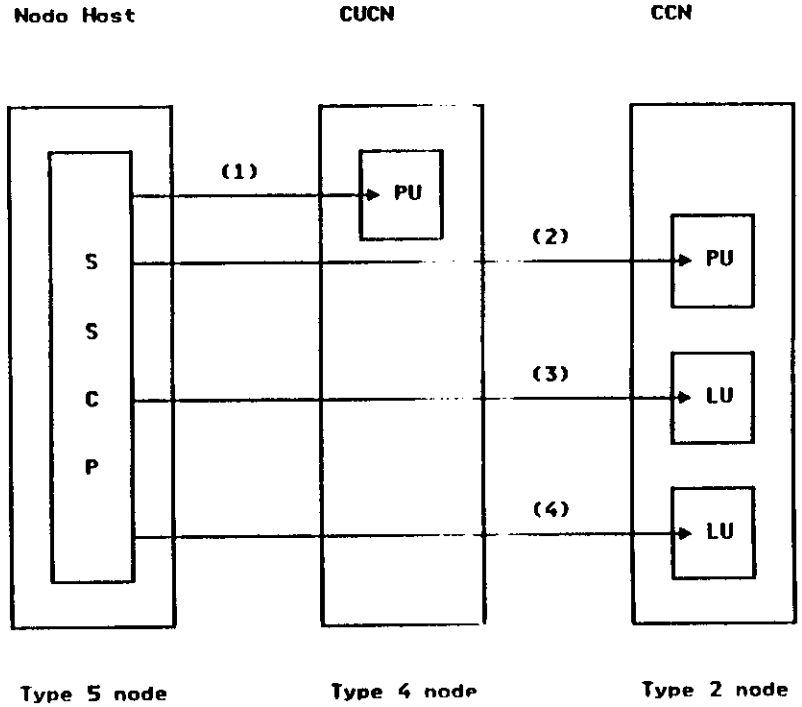


- Multiple sessions at a time with the same LU as well as different LUs



Session activation Hierarchy

IBM



When the activation sequence is completed the LUs in the CCN are ready to communicate with the LUs in the host.

LU-LU Session Initialization

IBM

- **An LU-LU session is started if:**
  - Both LUs are active
  - A suitable path is available from the origing to the destination
  - Both LUs agree on the session protocols
  - The SSCP(s) autorize(s) the session

LU-LU Session Initialization

IBM

LU-LU sessions can be initiated in several ways

1. *either of the partecipating LUs can initiate an LU LU session*
2. *a network operator can initiate an LU-LU session*
3. *in some cases, a third LU can initiate an LU LU session between two other LUs*
4. *System definition can specify that an LU-LU session be initiated automatically when certain resources become active*

   The process of activating an LU-LU session begins when a logical unit submits a Session-Initiation Request to its SSCP. LUs must have an active session with their SSCP before they can request a LU-LU session.

   The LU that is responsible for activating the LU LU session is called **Primary** *and the LU that receive the activation request is called* **Secondary**

   - *Commands for initiation and termination*
     - ***CINIT*** *(Control Initiate) request contains the set of session parameters that the requesting LU can support.*
     - ***BIND*** *request contains the Bind image, that is the selected set of session parameters, that the primary LU proposes to use during the LU-LU session. These parameters represent the protocols that both the LUs are to observe when communicating with each other.*

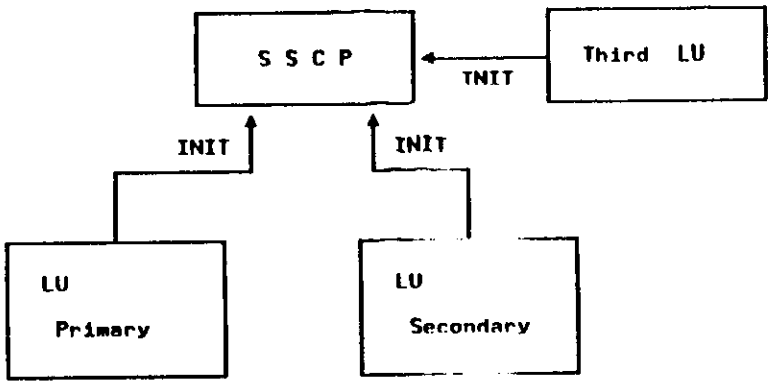
       There are two kinds of Bind requests:

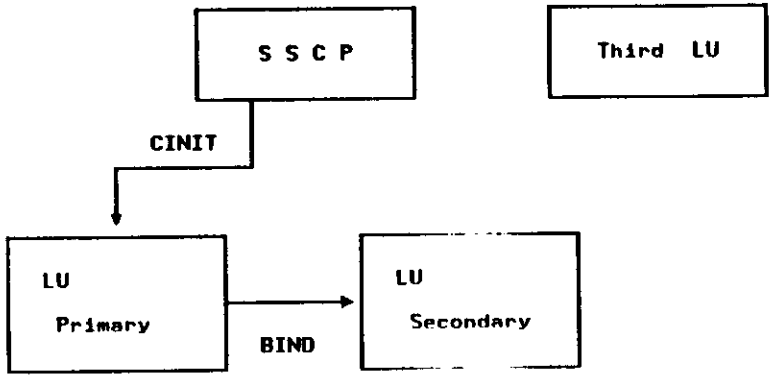
5. *Non-negotiale BIND: positive or negative ACK from the secondary LU*
6. *Negotiable BIND: if the proposed session parms are unacceptable, the secondary LU returns a positive ACK with an alternate set of parms to the primary.*
   If this alternate set is acceptable from the primary LU the session is activated and both the LUs will adhere to the alternate set of parameters

   - ***SESSST*** *(Session Started) sent by the primary LU to SSCP to notify the session become active.*
   - ***BINDF*** *(Bind Session Failure) indicate the reason the session cannot be activated.*
     - *Half Session*
   - *Some LUs can partecipate in more than one LU LU session at the same time. A LU allocates a portion of its resources to support each LU-LU session. The half session identifies that portion of resources.*

LU-LU Session Initiation

IBM

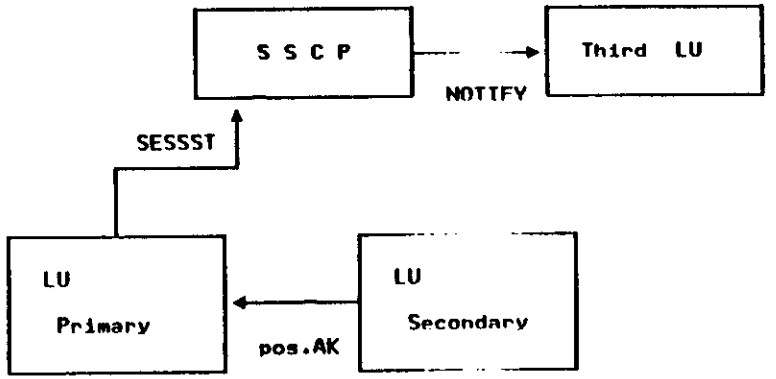


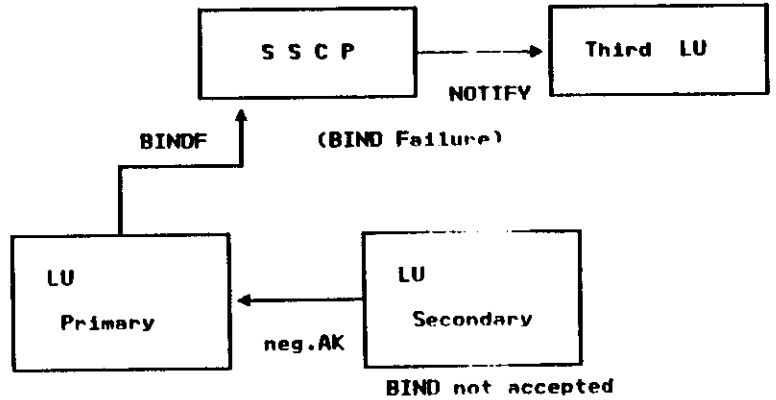


→ INIT may be INIT-SELF o INIT-OTHER

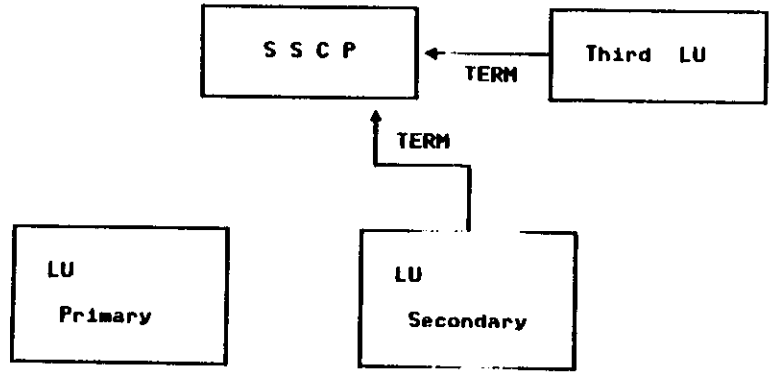
LU-LU Session Initiation ...

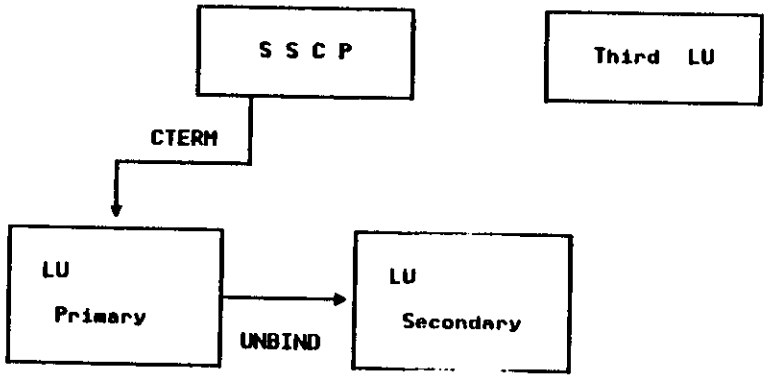
IBM





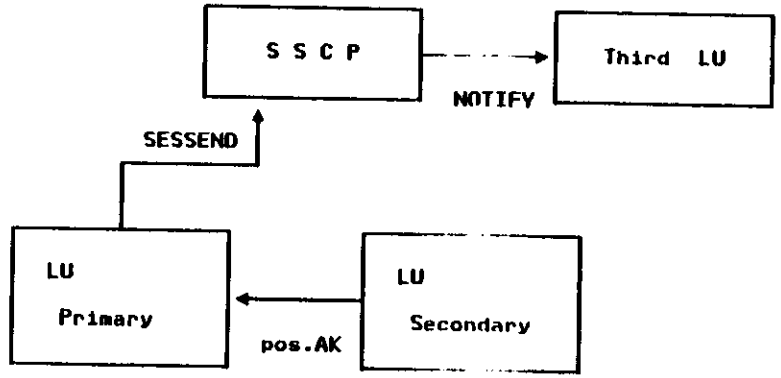
LU-LU Session Termination





→ TERM may be TERM-SELF o TERM-OTHER

LU-LU Session Termination



SSCP Request Format

IBM

- **Formatted**
  - INIT e TERM as architected (defined within SNA)
    → Formatted System Services of SSCP (used by applications)
- **Unformatted**
  - Character strings to be converted to formatted requests by the SSCP
  - implies
    - provision of routines or conversion tables
    - provision of response messages
      → Unformatted System Services (USS)

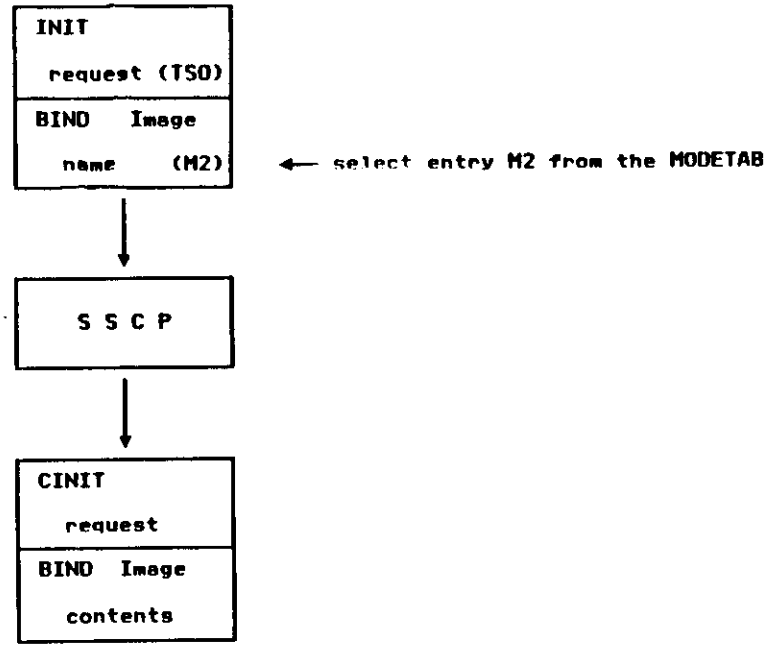
      LOGON —> USS —> INIT
  - USSTAB : simplifies commands for the end user

BIND Image

IBM

- **Single Domain**

  → p.e. LOGON APPLID(TSO) LOGMODE(M2)

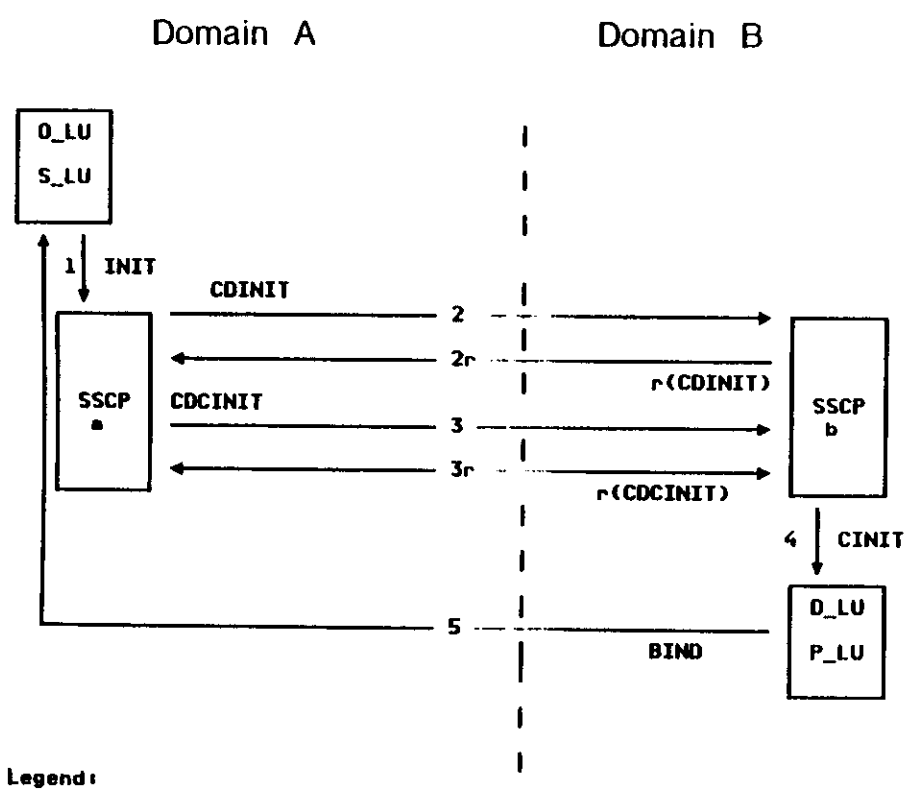


- Note: with parm LOGMODE selects an entry into the MODETAB. M2 is the entry name (Image name) that contains the set of protocols.

Cross-Domain Session Initiation

IBM

- Originating request from a terminal



Legend:

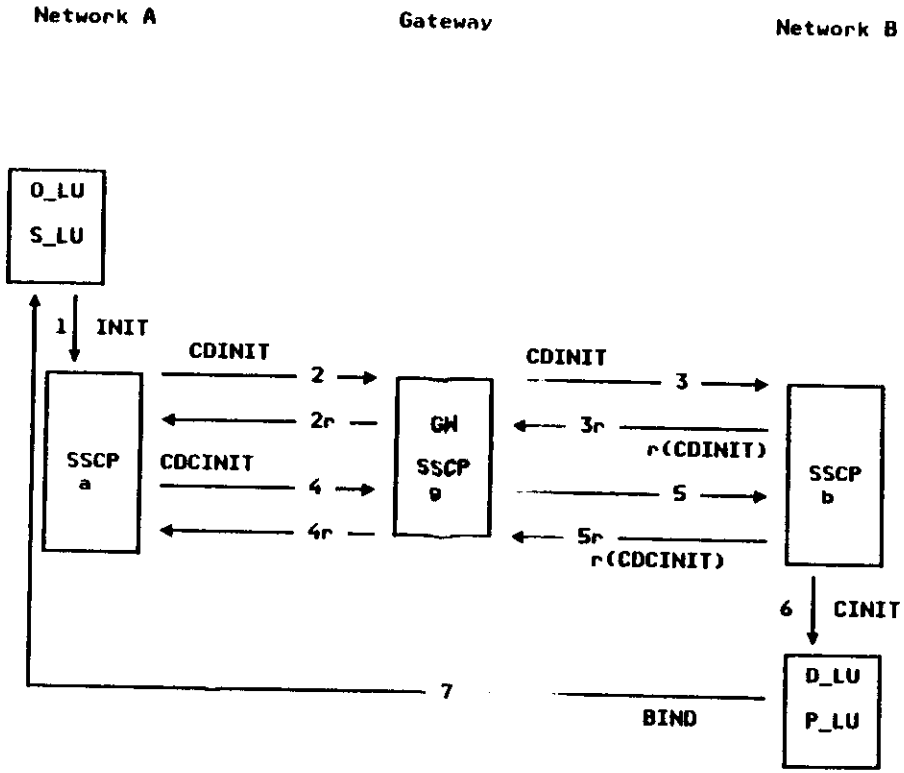
O_LU = Originating LU
D_LU = Destination LU

P_LU = Primary LU
S_LU = Secondary LU

Cross-Network Session Initiation

IBM

- Originating request from a terminal

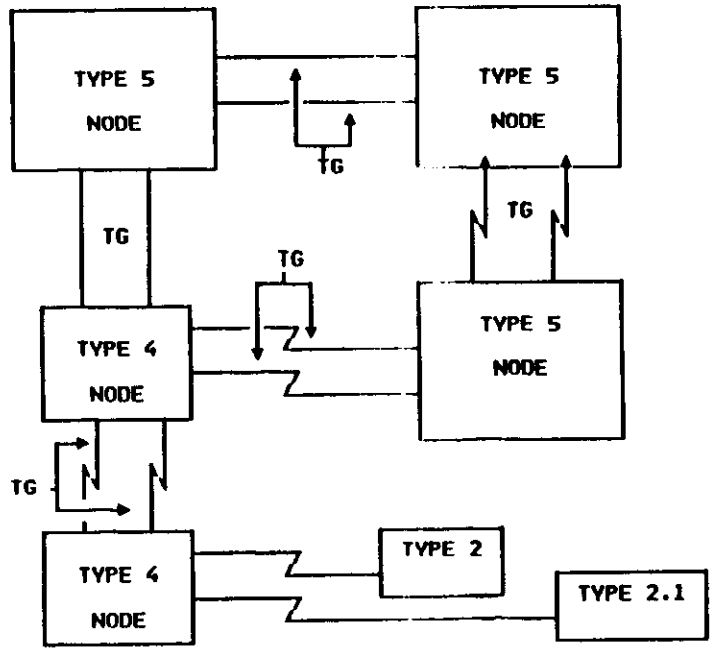


Legend:

O_LU = Originating LU
D_LU = Destination LU

P_LU = Primary LU
S_LU = Secondary LU

Routing



- Multiple connections
  - HOST - HOST (Channel to Channel)
  - NCP - HOST (Channel Adapter)
  - ICA - ICA (SDLC, TR, X.25)
  - NCP - NCP (Type 4 to Type 4 Nodes) (1)
- Each connection represents a Trasmission Group
  - 1-16 TGs between two subarea nodes
    - → increase trasmission capacity
    - → improve connection reliability

(1) unique until VTAM V3.4

Parallel links and Trasmission Groups /Notes

IBM

SNA requires the assignment of each link between subarea nodes to a Transmission Group (TG).

- *TG is a link or a group of links that connect adjacent SA-nodes.*
  - *TGs appears as a single link to the Path Control Network.*
  - *TGs are identified with a number assigned to each link (1-255)*
  - *TGs with parallel links grant higher availability than a single link TG as well as better performances.*
    - *if one link fails, data traffic continue on the remaining link in the group without session disruption.*
  - *Raccomandation: To optimize data trasmission sequencing, place links with similar characteristics in the same transmission group*

Path control sequencing: (FIFO)

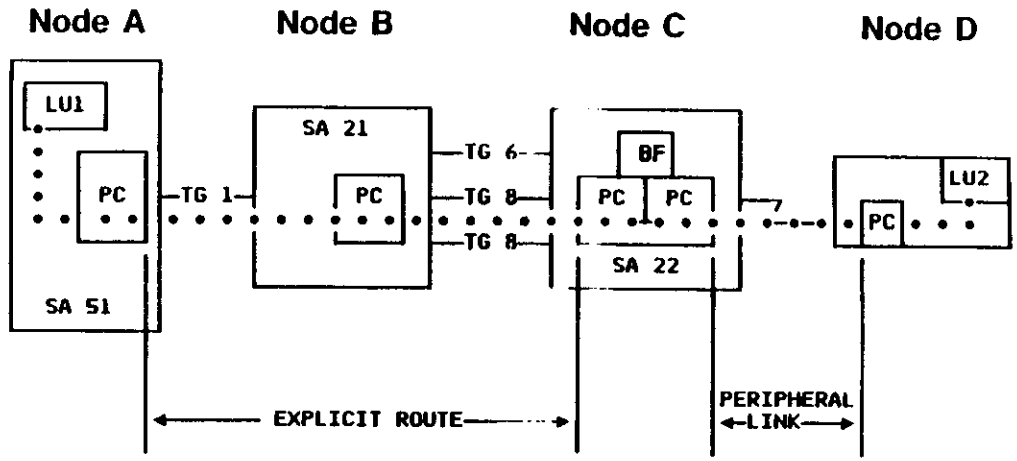
- *The PIUs to trasmit are set in a queue*
- *When a PIU is pulled-out from the queue to be trasmitted is assigned a sequence number*
- *When the PIU is received on the other side of the link, the sequence number is compared with the expected one.*
  - *If OK --> the PIU is sent to the end user*
  - *If the received PIU number > expected --> PIU is queued to be reordered*
  - *If the received PIU number < expected --> PIU is discarded because duplicated.*

P.E.

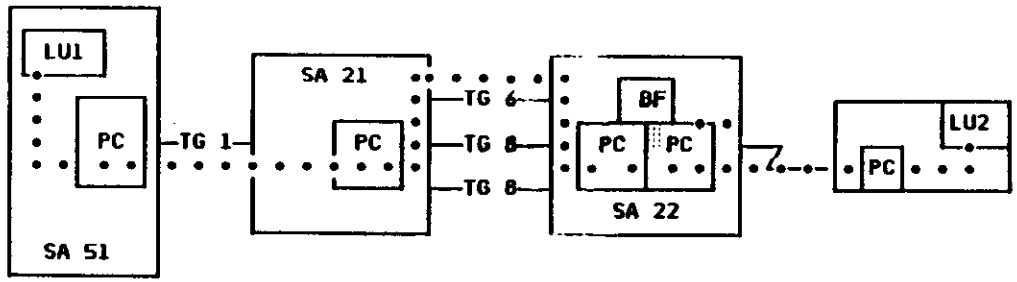
	Expected	Received	Action
	2	2	→ end user
x	3	5	queued
	3	3	→ end user
x	4	6	queued
	4	4	→ end user + deque 5 and 6
	7	7	→ end user
	...	...	

Defining Paths

IBM



- ER = ordered set of TGs and Subarea
  - → ER0: SA51 > TG1 > SA21 > TG8 > SA22
  - → ER1: SA51 < TG1 < SA21 < TG8 < SA22 (RER)
  - → ER1: SA51 > TG1 > SA21 > TG6 > SA22
  - → ER2: SA51 < TG1 < SA21 < TG6 < SA22 (RER)



Defining Paths /Notes

IBM

The process of designing routes involves defining one or more paths between each pair of NAUs that need to communicate with one another. A path consists of a series of Path Control elements, Data Link Control elements (the link Stations) and link connections.

Referring to the previous figures the one of the path is:

1. *proceed from LU1 in node A (SA 51)*
2. *over the link b (TG 1)*
3. *through node B (SA 21)*
4. *over the links c1 and c2 (TG 8)*
5. *through node C (SA 22)*
6. *over link b to Node D*
7. *to LU2 in node D.*

To define a path in SNA, you specify an Explicit Route and, if required a peripheral link.

- *An explicit route is the portion of path between two subarea nodes.*
- *It is an ordered set of subarea nodes and trasmission groups along the path.*
- *Defining more than one explicit route between subarea nodes it is increased the probability that a path will be available between the two nodes.*
- *Explicit routes allow definition of meshed network*
- *Explicit routes are bidirectional, but it is allowed to assign different explicit route numbers to the forward and reverse directions.*

Routing Table

IBM

◆ ER Rules

- Up to 16 between two subareas in the forward direction numbered 0 to 16
- Up to 16 between two subareas in the reverse direction numbered 0 to 16
- A valid route traverses the same subarea in both directions

A routing table in each subarea node identifies

- the ER number
- the destination subarea
- the next (adjacent) subarea on the route
- the TG to use to the next subarea

→ The origin subarea is not identified

→ The reverse ER (RER) is dynamically determined on ER activation

- **Paths**
  - ER0: SA51 > TG1 > SA21 > TG8 > SA22
  - ER1: SA51 < TG1 < SA21 < TG8 < SA22 (RER)
  - ER1: SA51 > TG1 > SA21 > TG6 > SA22
  - ER2: SA51 < TG1 < SA21 < TG6 < SA22 (RER)

Node	Destination Subarea	ER	Adjacent Subarea	TG
51	22	0	21	1
	22	1	21	1
21	51	0	51	1
	51	2	51	1
	22	0	22	8
	22	1	22	6
22	51	0	21	8
	51	2	21	6

Routing Table Segments for Two Explicit Routes

The Path Control Network routes data on a node by node basis.

- *Each node contains only the information needed to route data to the next subarea node along the path.*
- *The path definition is then distributed among all the nodes along the path.*
- *This simplifies network definition and saves storage space in the individual nodes.*
- *This information are defined in form of routing table as shown in the previous foil.*
- *When the network becames complex the path definitions can automatically produced by an utility program called RTG (Routing Table Generation)*

- **VR Characteristics**
  - In each subareawhere a route starts and selected, a VR is assigned to each ER
  - Many VRs can be assigned to one ER
  - VRs have the same number in both direction
  - Route flow control operates in conjunction with VRs
  - → One VR number can be used to map to ER with different numbers but with similar characteristics
    e.g. High band-width

- The path between a subarea node and a peripheral node is the **route extension** of a virtual route

*Whereas an explicit route is a physical connection between two subarea nodes, a **virtual route** is a logical connection.*

- *each virtual route maps to an explicit route.*
- *the portion of path between a subarea node and a peripheral node is called a **route extension***
- *You define one or more virtual routes to each explicit route and assign a **trasmission priority** for data traffic that uses each virtual route.*
- *Max 16 virtual route*
  each with 3 different trasmission priorities
- *that means that 48 virtual routes can be defined between two subareas.*

Transmission Priority

IBM

- Within a VR a trasmission priority is assigned
  - 3 priority levels
    - 2 - highest *(SSCP sessions)*
    - 1 - medium *(interactive)*
    - 0 - lowest *(batch)*

→ at each PC stage in subarea nodes, higher priority is sent before lower

Transmission Priority /Notes

IBM

The Transmission Priority identifies the priority of message units flowing over an explicit route.

- *Three level of priority for each virtual route:*
  - *0 = lowest,generally used for trasmission of batch processing*
  - *1 = medium, used for interactive processing*
  - *2 = highest, specially for SSCP sessions*
- *The Path Control is responsable to to queue and trasmit message units according to the assigned priority.*
- *An aging algorithm in the subarea nodes periodically reorders the transmission priority of message units in queue to avoid the low priority message units remain in the queue for an extended period of time.*

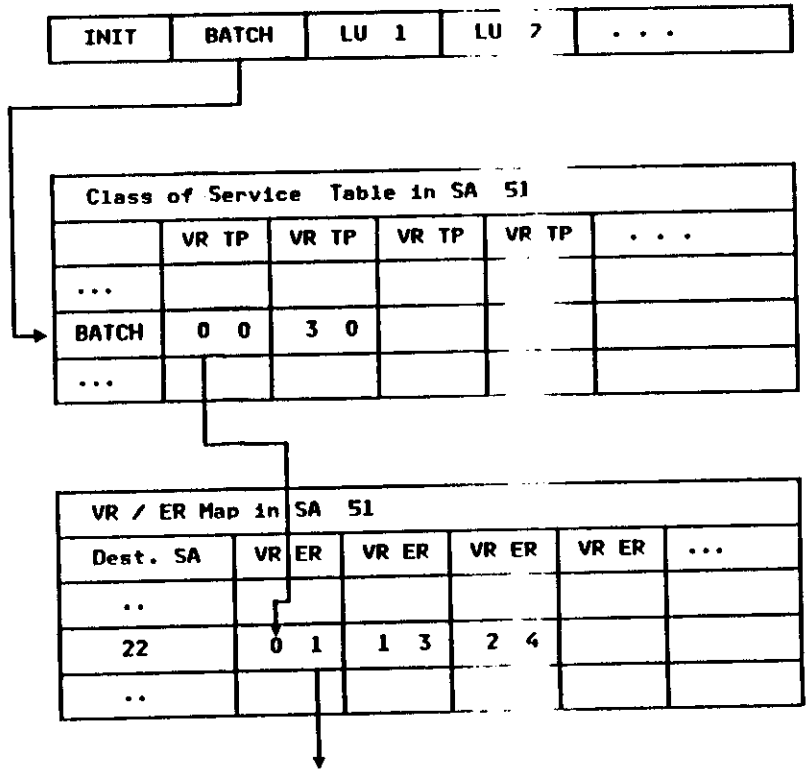
- Session initiation request includes **Class of Service** (COS) name
  - COS name correspond to a list of VRs and TPs
  - The first VR which can be activated is assigned to the session

- Examples
  - INTERACT
    - VR2 TP2 *first try to use it*
    - VR3 TP2 *first alternate if the first failed*
  - BATCH
    - VR0 TP0
    - VR3 TP0

  → VR2 is lightly loaded but limited band-width

  → VR0 is heavily loaded but with large band-width

  → VR3 is a less desiderable alternative



Route selection - Class of Service /Notes

IBM

- *Assigning session traffic to a Virtual Route*

  When an end-user initiates an LU-LU session a Class of Service is also requested.

  e.g. LOGON APPLID(applx) LOGMODE(Mx)

  during SSCP-SLU session initiation the entry Mx is found into the MODETAB; M2 specifies a set of protocols and a COS name

  - *A COS specifies a set of performances characteristics for routing data between two subareas.*
  - *The class of services are defined in a COS Table*
  - *A COS Table is a list of virtual route/trasmission priority pairs.*
  - *COS is used by the SSCP to identify a particular virtual route to the Path Control*
  - *All data of a given session use the same virtual route and then the same transmission priority.*

  Samples of class of services in a network:

  - *Best response time for high priority interactive sessions*
  - *Suitable response time for low priority interactive sessions*
  - *Best availability routes*
  - *Batch parocessing*
  - *High security trasmissions*

  Each class is named and the name is used to select the entry into the COS table to select the pairs of virtual routes/transmission priority that can be assigned to the class of service.

  In selecting the virtual route both the physical characteristics of the explicit route and the transmission priority have to be considered.
  Some explicit routes, and therefore the virtual routes that use them, may be better than others.

- *Summary of benefits of the SNA Routing Tecnique*

  - *Routing information distributed among al the nodes along the path*
    - *simplifies definitions and save storage spaces in the nodes*
    - *simplifies network riconfiguration*

Route selection - Class of Service /Notes

IBM

- *SNA avoids the rigidity of always assigning sessions to the same route. The route is assigned during session activation in accordance with the session requirements*
- *Better performances through the use of parallel links, multiple explicit routes and transmission priorities for virtual routes.*
- *Parallel links and and multiple explicit routes increase the network availability.*

Route Activation/Deactivation

IBM

- Route activation is automatic within the Path Control layer
- ERs
  - Activated whenever a two adjacent subareas make contact
  - Deactivated whenever a two adjacent subareas lose contact
- VRs
  - Activated whenever a session requires a new VR
  - Deactivated whenever no more sessions are using a VR

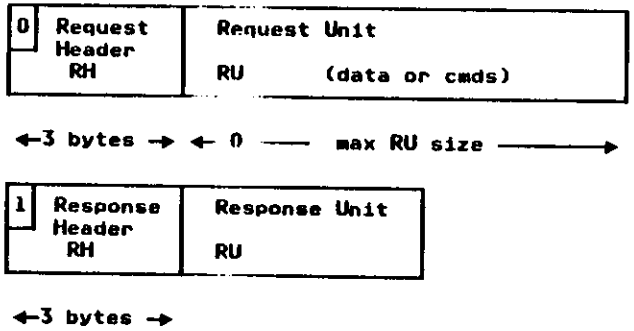
Virtual Routing Pacing

IBM

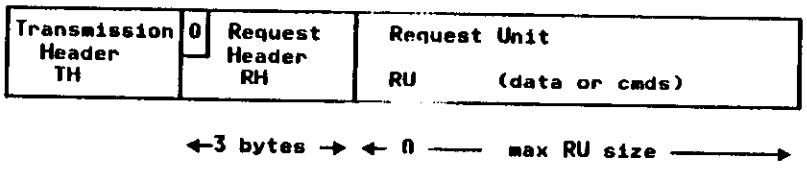
→ Protects storage buffers in routing nodes

- When VR activated
  → minimum and maximum window size are set
- No congestion
  → pacing window increases by 1 to maximum
- Mild congestion
  → pacing window decreases by 1 to minimum
- Severe congestion
  → pacing window decreases to minimum
  - Congestion is evaluated in any subarea on the route

- Basic Information Unit (BIU)
  - Data exchange between NAUs
  - Request Unit (RU)
    - data or commands originated by the End-user



- Path Information Unit (PIU)
  - Data exchange between Path Control Elements



- Transmission Header contains information required to route data and maintain correct sequence of message units

  → TH contains indicator to permit selected architected RUs to be given higher priority in Path Control
  - **normal flow** - lower priority
  - **expedited flow** - higher priority

- Basic Information Unit (BIU)
  - is the SNA frame that goes across the link

- Data Link Control adds al LH and a LT to the PIU
  - LH and LT contains information related to the SDLC protocol

Data formats /Notes

IBM

Message units flowing through the network can be either a request or a response.

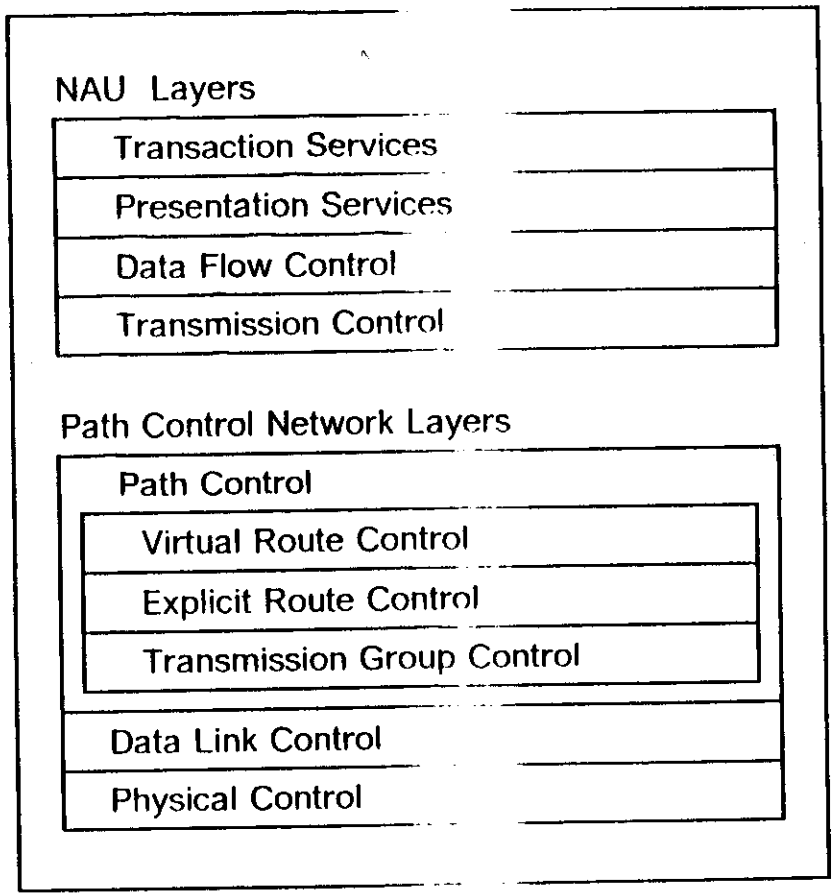
- *Request contains*
  1. *end user data* -> ***data reuests***
  2. *network commands* -> ***command requests***
- *Responses contains acknowledge for received requests.*
  - ***positive or negative responses***

SNA defines the following message-unit formats for NAUs:

- *NAUs use basic information units (BIU)*
- *Path Control elements use path information units (PIU)*
- *Data Link Control elements use basic link units (BLU)*

Summary of SNA Layers

IBM



PART D.

SNA Products

SNA and OEM Connectivity Scenarios

SNA products

IBM

SNA network is a set of hardware and software products that operate according the network architecture specifications.

◆ **Hardware Products**

- Host Processor:
  - Enable network users to access applications and data bases
  - Provide directory services across the network(s)
  - Provide computation functions for problem solving applications
  - Provide network management functions
- Distributed Processors:
  - Provide a set of processing functions for a network
  - Department services or specialized services
- Communication Control Devices (37xx)
  - Reduce the load of the host processor by assuming some network control responsibilities
  - Data flow control between hosts and workstations
  - Routing functions between network resources
- Peripheral Cluster Controllers
  - Handle workstations and terminals activities
  - LAN gateway functions
  - .....

SNA products ...

IBM

◆ **Sofware Products**

The library of network products enable users to access application programs, share the network resources and transmit information through a network.

- SNA Access Method: ACF/VTAM
  - Provides the interface between application programs and other resources in a SNA network
  - Manages and monitors the resources and the performances of the networks and helps network recovery in case of failures
  - Runs under operating system control (VM, MVS, VSE ...)
- Application Subsystems:
  - Provide application services to the end-users.
  - Interactive Services (TSO, VSCS, VSPC, ...)
  - Information Management System
  - Transactional Programs
  - Distributed Offices system
- Remote Job Entry Subsystems
  - JESn, RJE, NJE ...
- Control Programs
  - Network Control Programs (ACF/NCP, ...)

Interfaces for Non-SNA devices

IBM

Connect non-SNA devices to an SNA Network

- 7171 ASCII DACU
  - protocol converter for up to 64 ASCII devices through /370 data channel
- IBM 3708
  - protocol converter for up to 8 ASCII devices over a SDLC link
  - Selection Menu and Pass-Through facility to Host ASCII
- Non-SNA Interconnection
  - NSI allows selected RJE devices to send BSC data over a SDLC link
- Network Terminal Operator
  - NTO provides an interface for asychronous terminals throgh the enveloping of non-SNA data streams.
- NCP Packet Switching Interface
  - NPSI allow attachement of Communication controllers 37xx to an X.25 network.

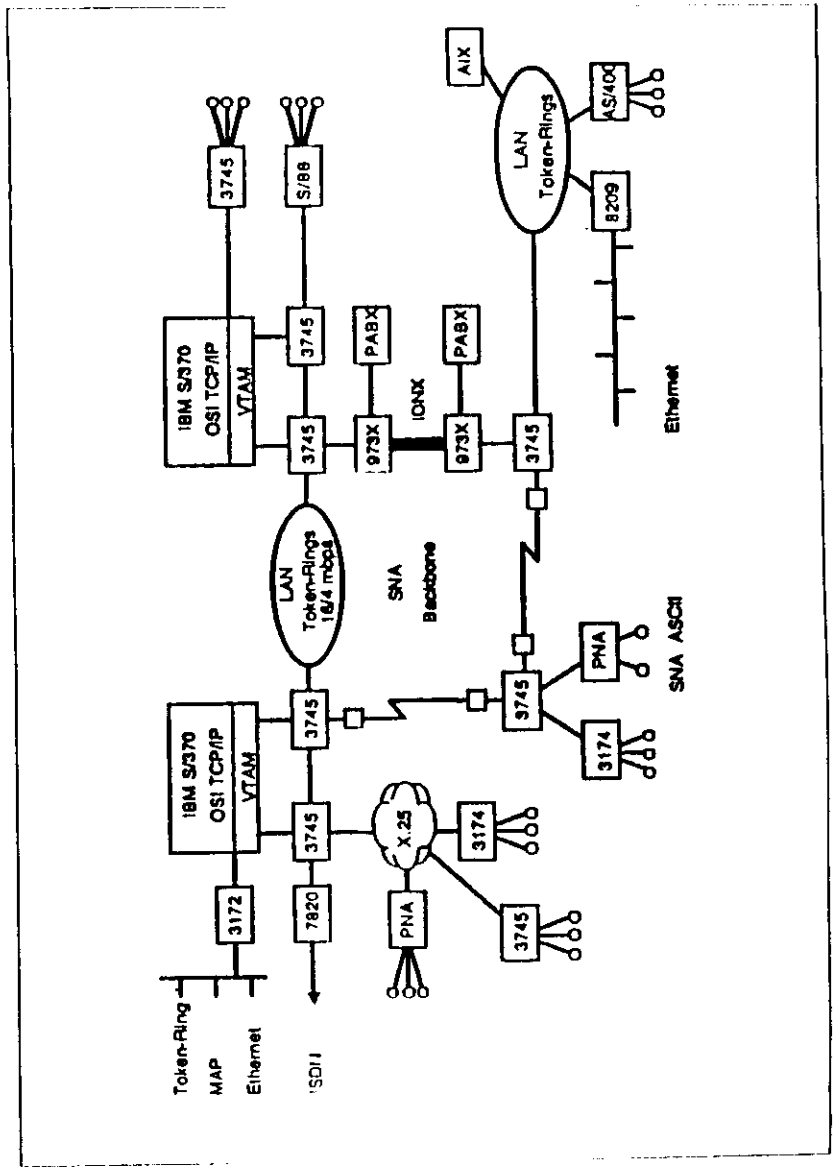
OEM Connectivity

IBM

- **Protocol converters / Emulators**
- **Standard de facto (TCP/IP)**
- **International standards (OSI)**

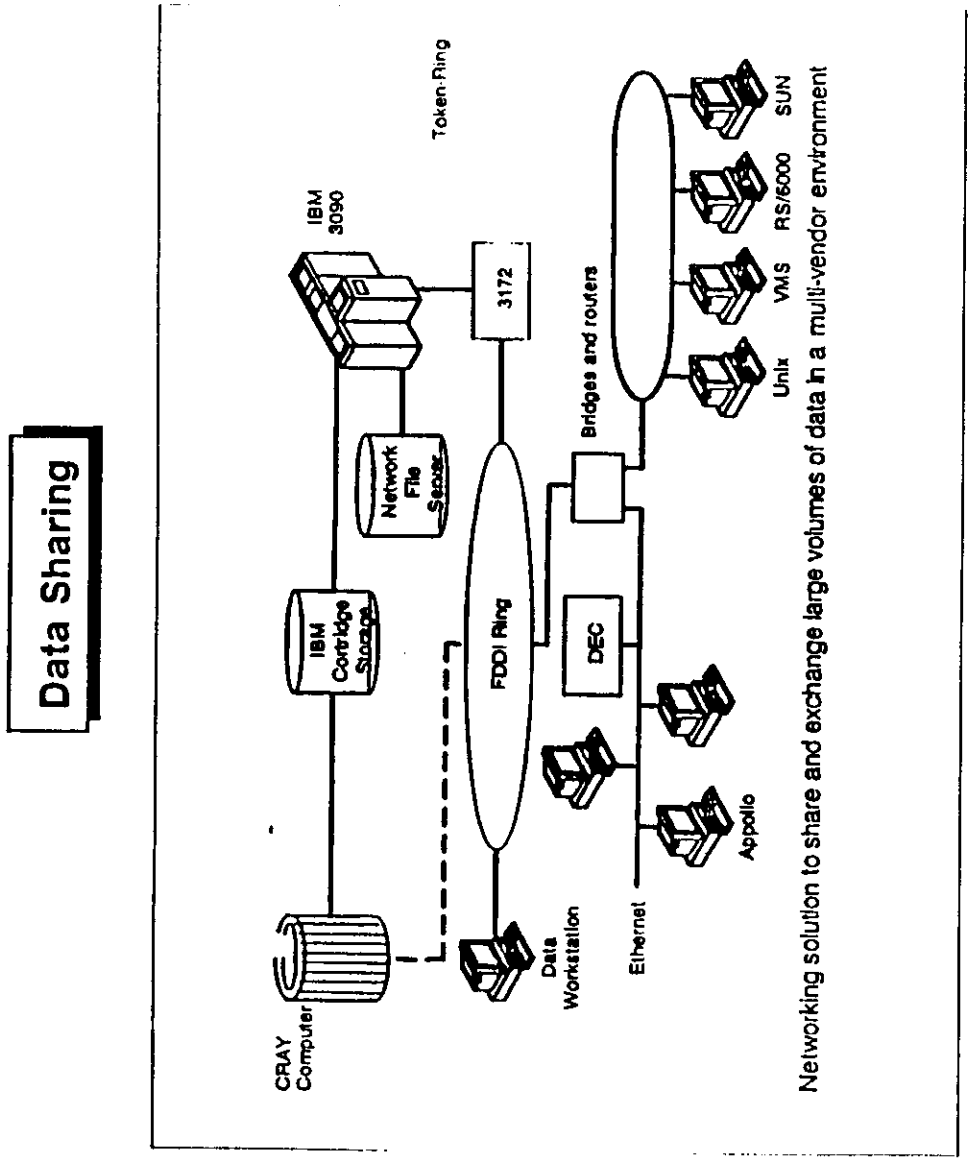
- International Standards
  - NCP Packet Swithing Interface for attachement to X.25
  - OSI/Communication Subsystem
    - levels 3-6 and ACSE of OSI Model
    - MVS, VM, VSE, OS/2, OS/400 (SOD)
  - OSIFS (FTAM)
  - OSDS (X.400)
  - OSIMF/6000 (X.400 and FTAM)
    - RISC/6000 AIX implementation
    - Gateway to TCP/IP (SMTP and FTP)
    - Connection to X.25, Ethernet, Token-Ring
    - OSI and TCP/IP share the same driver

Networking Products



Multi-Vendor Scenario

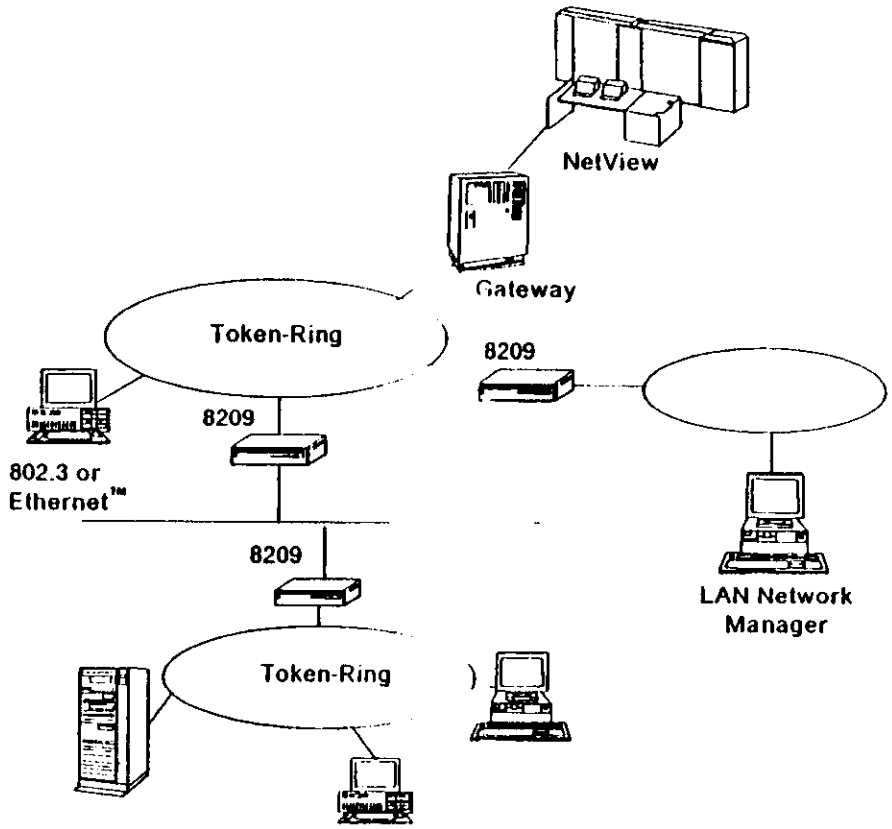
IBM



LAN Interconnection

IBM

- **IBM 8209 LAN Bridge**



- High Performance local bridge
- 'PLUG and PLAY' installation
- LAN network management support

The IBM 8209 avoids the use of a PS/2 to act as a Token Ring bridge.

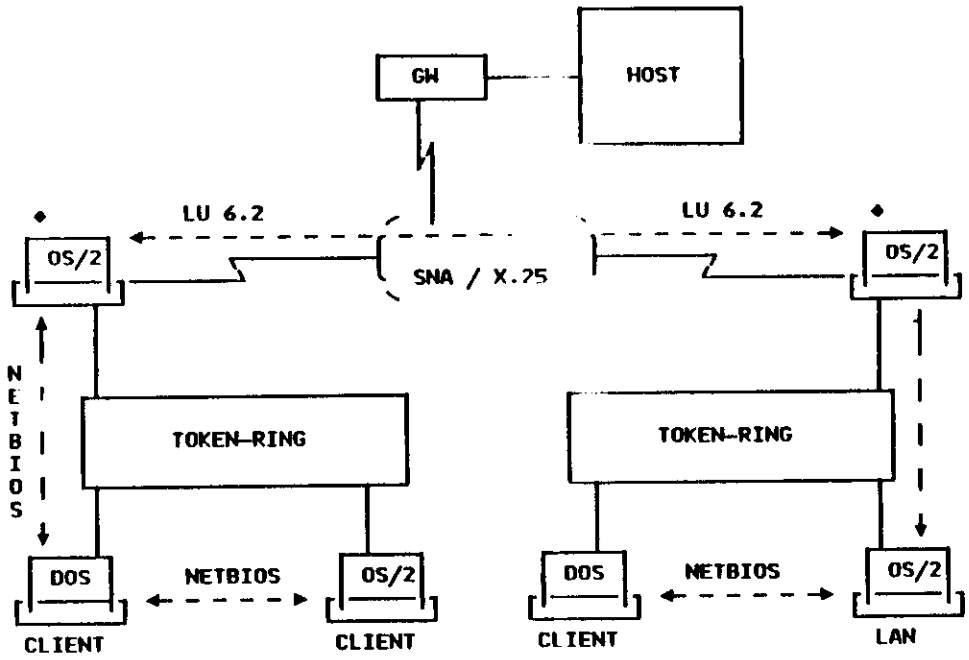
This devices combines the functions and network management capabilities of the IBM Token Ring network bridege program with the easy-to-install features of the 8209 for locally bridged T/R networks.

The IBM 8209 provides also connection in a multivendor environment from IEEE 802.3 (Ethernet) to IBM Token-Ring LANs.
Token-Ring workstation users may communicate to Ethernet users via Netbios, TCP/IP or SNA protocols.

- *Enhancement the Ethernet features*

  1. *T/R network management info is now supported across an Ethernet LAN segment*

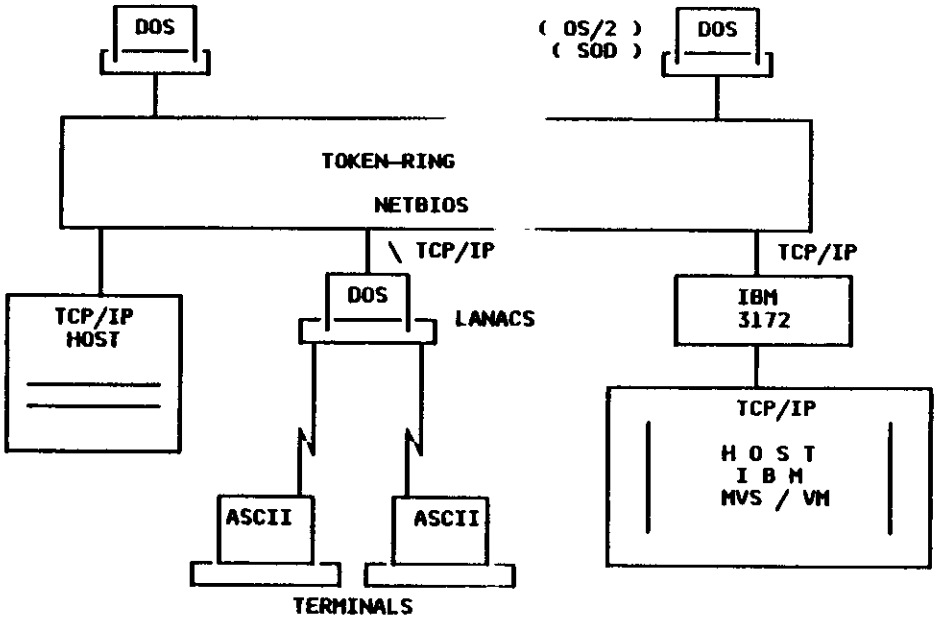
  2. *New filters allow you to minimize the traffic on the LAN backbone for increased performance.*
  This means that now it's possible support of remote T/R LAN segments through an IEEE 802.3 or Ethernet LAN



- Utilize existing SNA backbone networks for LAN data
- Extend LAN Server access to multiple establishment
- Manage sessions across the network

◆ Contain IBM LAN-LAN Wide Area Network Program

◆ LAN Asynchronous Connection Server



- 3270 Emulation to IBM TCP/IP Host
- Access non-IBM TCP/IP hosts
- Support Token-Ring and Ethernet LANs
- New Management functions

- *Open Network Management Structure*

  The Open Network Management, first articulated in 1986 as an extension to the SNA architecture, today provides users the ability to manage mixed SNA and non-SNA networks using a single, consistent network management structure and a proven set of network management products.
  Netview provides a central focal point to manage IBM and non-IBM communication components connected to the IBM network at defined IBM supported entry and service points or through OSI or TCP/IP directly to Netview

  Three conceptual "points" defined:

  1. *The "focal point" - the place for consolidation of network management data from all resources managed by that focal point*

  2. *The "entry point" - the logical location at which network management data fron SNA NAUs and their owned resources is collected*

  3. *The "service point" - the distributed point for control of non-SNA network resources.*

  All management data collected from all points is forwarded to the central focal point where it's combined to form a true end-to-end picture of networks.

- **NetView Version 2**
  - SAA Graphics
  - Expanded Automation Capabilities
  - Improved Performances
  - Integration with:
    - Info/Management
    - Network Problem Management
    - NetView Performance Monitor
    - NetView Access Service
    - LAN Network Manager
  - LU 6.2 Transport

- *Graphics Monitor Facility the GMF of Netview V 2 provides the capability to monitor the physical network using a dynamic, real-time, color coded display of the status of resources in the network.*
  - *GMF runs on a PS/2 and uses presentation manager of OS/2 EE 1.2*

OSI

	MVS	VM	OS/400	OS/2 EE	AIX	Layers
Virt. Term.	SOD	SOD	SOD	SOD	SOD	
X.400	Y	Y	SOD	SOD	Y	7
X.500	Y *	Y *	SOD	SOD	SOD	
FTAM	Y	Y	SOD	SOD	Y	
OSI Layers 3 to 6	Y	Y	SOD	SOD	Y	3 to 6
WAN X.25	Y	Y	SOD	SOD	Y	3 to 1
ISDN	SOD	SOD	SOD	SOD	SOD	
LAN 802.N	SOD	SOD	SOD	SOD	Y	
FDDI	SOD	SOD	SOD	SOD	SOD	
CMIS/CMIP	Y	Y	SOD	SOD	SOD	1 to 7

(Y) IBM Program Product available
(*) Limited Subset
(SOD) IBM Statement of Direction

TCP/IP

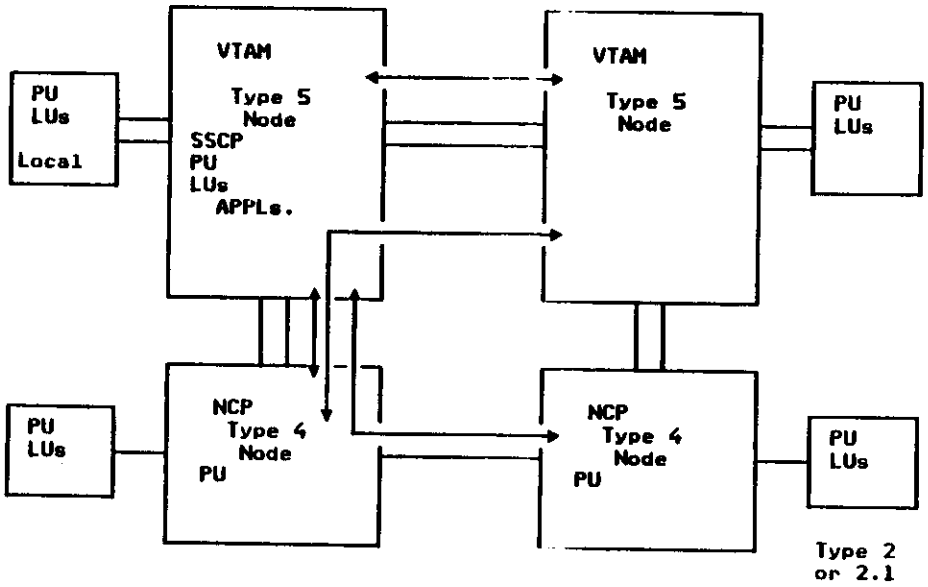
	MVS	VM	OS/400	OS/2 EE	AIX	Layers
TELNET	Y	Y	Y	SOD	Y	Apps
SMTP	Y	Y	Y	Y	Y	
FTP	Y	Y	Y	Y	Y	
TCP / UDP	Y	Y	Y	Y	Y	3 to 1
IP	Y	Y	Y	Y	Y	
X.25	Y	Y	*	Y	Y	
LAN 802.N	Y	Y	Y	Y	Y	
SNMP/NetView	SOD	Y	Y	*	Y	

SMTP Gateway to X.400
FTP Gateway to FTAM

(Y) IBM Program Product available
(*) Support based on IBM Technical and business judgement
(SOD) Statement Of Direction

- ACF/VTAM and ACF/NCP

◆ ACF/VTAM and ACF/NCP



→ *VTAM implements*

- *A type 5 Node (Subarea Node)*
  - *SSCP*
  - *PU Type 5*
  - *LUs*
    - *Applications*

      primary - any LU type

      secondary - any LU type
    - *local Non-SNA display and printers*

      secondary - LU Type 0 (3270 Data Stream)
  - *Routing to attached*
    - *Type 5 Nodes (VTAMs)*
    - *Type 4 Nodes (NCPs)*
    - *Type 2.1 Nodes (APPNn)*
  - *Attachement of Peripheral Nodes*
    - *Type 2 Nodes 3x74 A Models*
    - *Type 2.1 Nodes (AS/400,...)*

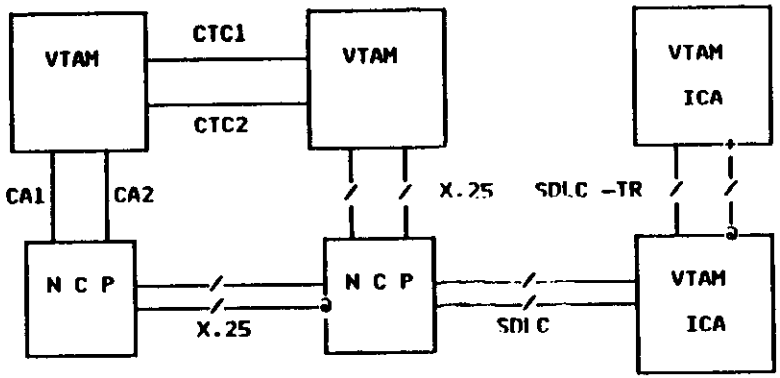
▸ *NCP implements*

- *A Type 4 Node (Subarea Node)*
  - *PU Type 4*
  - *Routing to attached*
    - *Type 5 Nodes (VTAMs)*
    - *Type 4 Nodes (NCPs)*
    - *Type 2.1 Nodes (APPNs)*
  - *Attachement of Peripheral Nodes*
    - *Type 2 Nodes*

◆ *ACF/VTAM Program products are Operating System dependent*

◆ *ACF/NCP Program product is operating system dependent for the Installation Procedures only.*
Same Product but different packages according to Operating System environment.

◆ Parallel Trasmission Groups

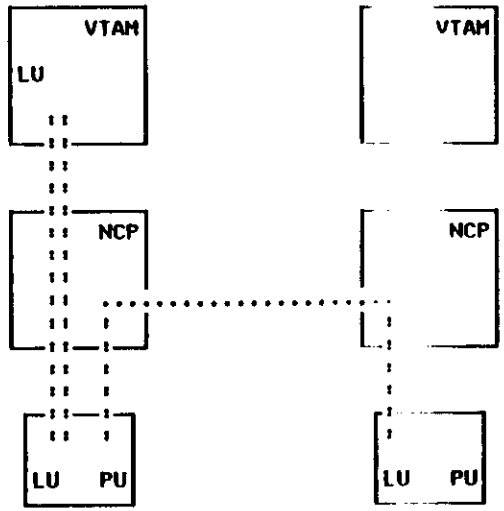


- Host - Host (CTC)
- NCP - Host (CA)
- ICA - ICA (SDLC, TR, X.25)
- Each link can be seen as a TG

  → Tasmission capacity improvement

  → Connection availability

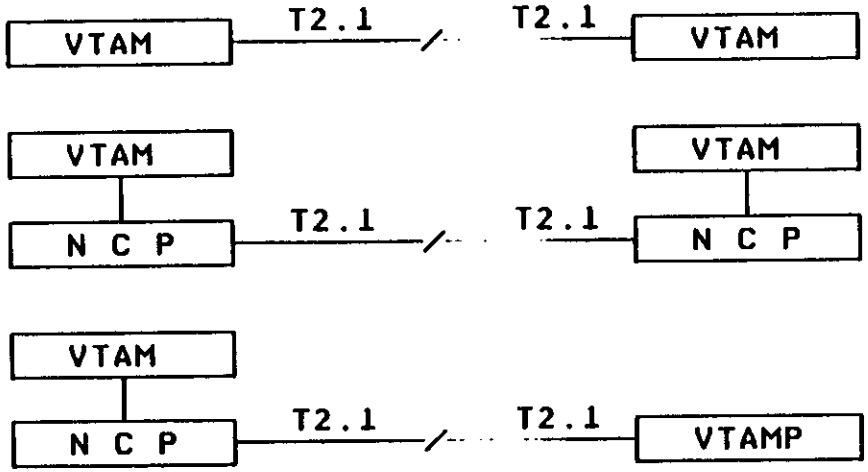
◆ Type 2.1 node support



- Hierarchical communication with host applications
- Peer-to-Peer between T2.1 nodes
- Multiple/parallel sessions
- Routing through subarea network

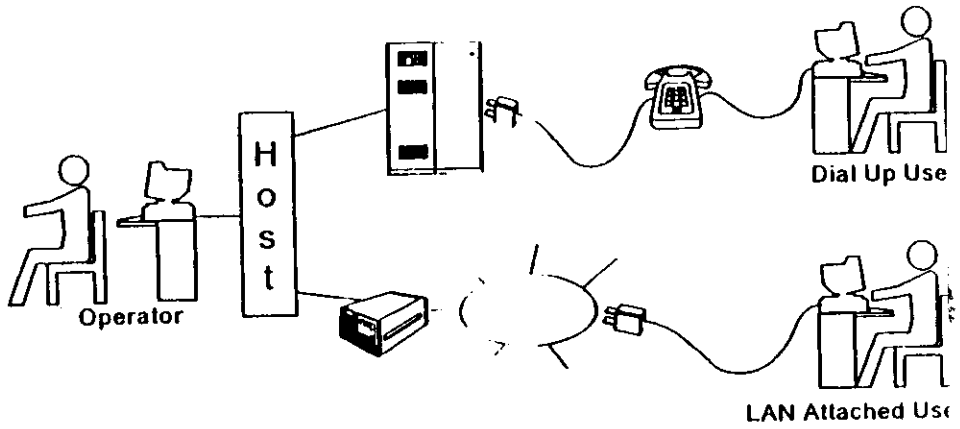
  → Link sharing and cost reduction

- **Casual Connection**



- SA links defined as connections between nodes T2.1
  - Switched, leased, X.25, Token Ring
  - Alternative for SNI connections
  - Reduced definitions
    - no Cross Domain (CDRM, PATH ...)
  - Flexible connections

- **Dynamic access to the network**



- For switched or token-ring connections
  - Devices autoidentification
- Dynamic Network ID
  - Multiple connections between APPN and SA networks
  - Dynamic application access

    → simpler definitions - more flexibility

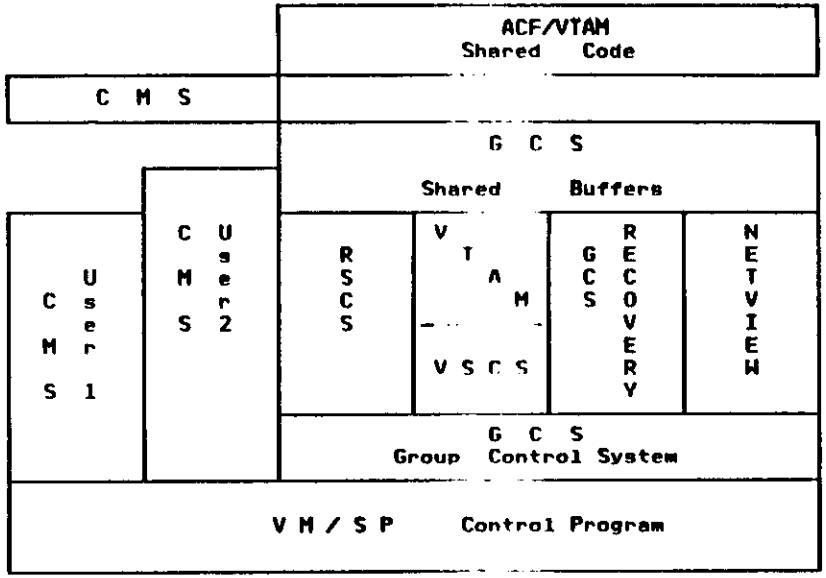
TLC SW Program Products

IBM

Program Product	Code PP	P.Lett.
VTAM V3 3 x VM/SP	5664-280	ZP89-490
VTAM V3 4 x VM/SP	5664-280	ZP90-469
VTAM V3 4 x VM/ESA	5684-095	ZP90-469
VTAM V3 4 x MVS/ESA	5685-085	ZP90-469
VTAM V3 4 x VM/SP	5664-280	ZP90-469
VTAM V3 for OSI RPI	5666-363	ZP90-0468
NCP V5 3	5668-738	ZP90-0495
NCP V5 3 1	5668-738	ZP90-0410
NCP V5 4	5668-738	ZP90-0410
SSP V3 5 x VM	5664-289	ZP89-0494
SSP V3 5 1	5665-338	ZP90-0434
SSP V3 6	5665-338	ZP90-0434
NPSI X 25 V3 3	5688-035	ZP89-0486
NPSI X 25 V3 4	5688-035	ZP90-0414
EP R7	5735-XXB	ZP89-0488
EP R8	5735-XXB	ZP90-0416
EP R9	5735-XXB	ZP90-0416
NTO R6	5735-XX7	ZP89-0487
NTO R7	5735-XX7	ZP90-0417
NRF R5	5768-963	ZP89-0489
NRF R6	5768-963	ZP90-0399
Netview V2 2 x VM	5686-111	ZP90-0444
Netview P M. R 4	5665-333	ZP90-0427
Netview A.S. R.3	5684-028	ZP90-0372
Netview FTP V.1 x VM	5684-048	ZP90-0343
TCP/IP V 2 x MVS	5735-HAL	ZP90-0439
TCP/IP V 2 x VM	5735-FAL	ZP90-0280
TCP/IP V 1 1 x OS/2 EE	5798-RXW	ZP90-0238
TCP/IP x AS/400	5728-TC1	ZP90-0370
OSI/CS R1 1 x VM	5684-013	ZP90-0528
OSI/CS R1 1 x MVS	5685-014	ZP90-0528
OSI/CS R1 x OS/2 EE	5601 124	ZP90-0429
OSI FTAM R 1 x VM	5684-038	ZP88 0441
OSI FTAM R 1 x MVS	5685-046	ZP89-0441
OSI FTAM R 1 x OS/2	5601 124	ZP90-0457
OSIMF/6000 AIX	5756-085	ZP900283
ONDS X 400 x VM	5684-139	ZP900435
ONDS X 400 x MVS	5695 043	ZP900435
X 400 DISOSS Bridge R	5785-GCF	ZP90-0440
X 400 PROFS Bridge R 2	5785-GCG	ZP90-0440

SNA in a VM Environment

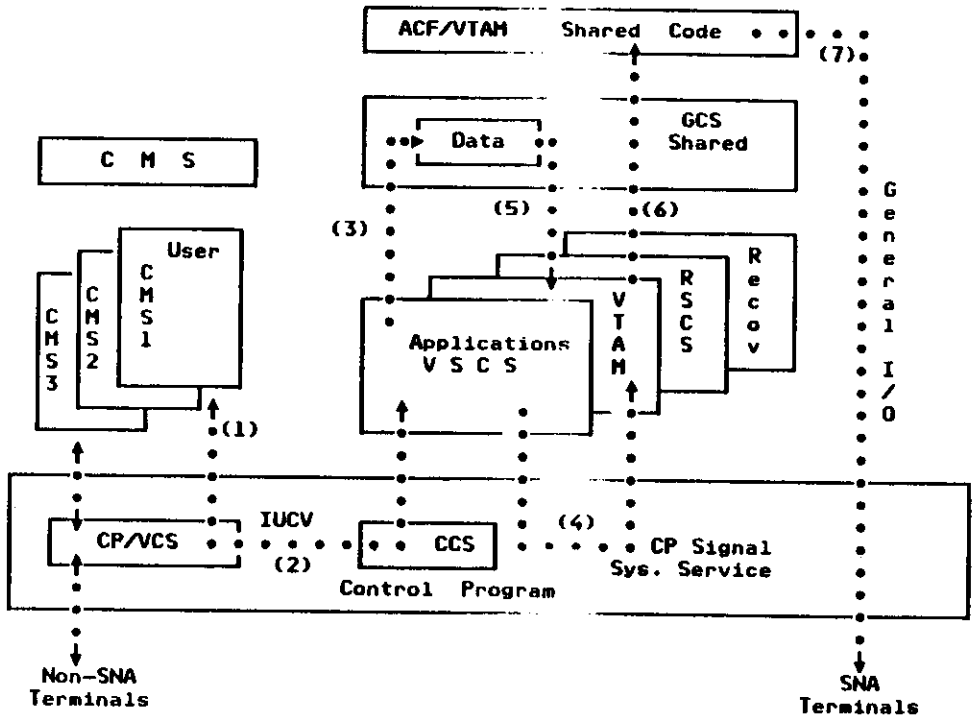
IBM



- G C S: Group Control System
- ACF/VTAM: SNA Access Method
- VSCS : VM SNA Console Support
- RSCS : Networking Remote Spool Communication System
- NETVIEW: Network Management

- *G C S: Group Control System*
  - *Multitasking Operating System (MVS subset)*
  - *R/W Shared segment for data buffers allocations*
- *ACF/VTAM: SNA Access Method*
  - *Executable Code in Shared segment*
- *VSCS : VM SNA Console Support*
  - *Interactive processing*
- → *VTAM and VSCS run within the same virtual machine*
- *RSCS : Networking Remote Spool Communication System*
  - *Multistreaming over SNA links (NJE)*
  - *Multistreaming over BSC links (RJE)*
  - *Remote Printer Support (SNA and non-SNA)*
  - *Sharing of networking SNA printers*
  - *Graphic SNA Printer Support*

Virtual Console Data Flow



CCS – SNA Console Communication Service
VCS – CP Virtual Console Service

The previous figure shows the data flow between a virtual machine and its console.

Let's assume a CMS V.M. issues SIO to the virtual address of the console:

- *CP itercepts the SIO privileged operation, decodes virtual CCW and process data to send to the console.*

  a) if the terminal is non-SNA:

  CP builds a real CCW and issues a real SIOF to send data to the terminal, using the CP Virtual Console Service

  b) if the terminal belongs to the SNA network (1)

  2. *SNA Console Communication Services (CCS) sends data to the VSCS virtual machine using the Inter User Communication Vehicle (IUCV);*
  3. *The VSCS processes the data received via IUCV and write them in a buffer located in GCS Common Storage;*
  4. *VSCS uses the CP Signal System Service to notify VTAM of data ready in Common Storage;*
  5. *VTAM receives and process data*
  6. *VTAM uses VM/GCS General I/O Service to send data through the SNA network to the terminal.*

SNA Network Definition

Defining a VTAM Domain

IBM

- VTAM to the Operating System
- Local I/O to the operating system
- In a Stand-Alone (single domain) configuration:
  - Applications
  - Links(dedicated and/or switched)
  - Local non-sna devices
- In a Multi Domain configuration need to define also:
  - Path tables
  - Cross-Domain link
  - Cross domain resource manager
  - Cross domain resources owned by other VTAM
  - Customization tables
    - Start options and Configuration list

Type of definition files

IBM

- In MVS environment definitions are contained in the SYS1.VTAMLST data set
- In VM environment they are in CMS files
  - filename VTAMLST
- A Major Node is a VTAM definition file
  - contains definition of a subset of SNA resources
- A Minor Node is a named statement in a Major node identifying an SNA resource
  - examples
    - PU
    - LU
    - Link

→ Do **not** confuse with SNA nodes

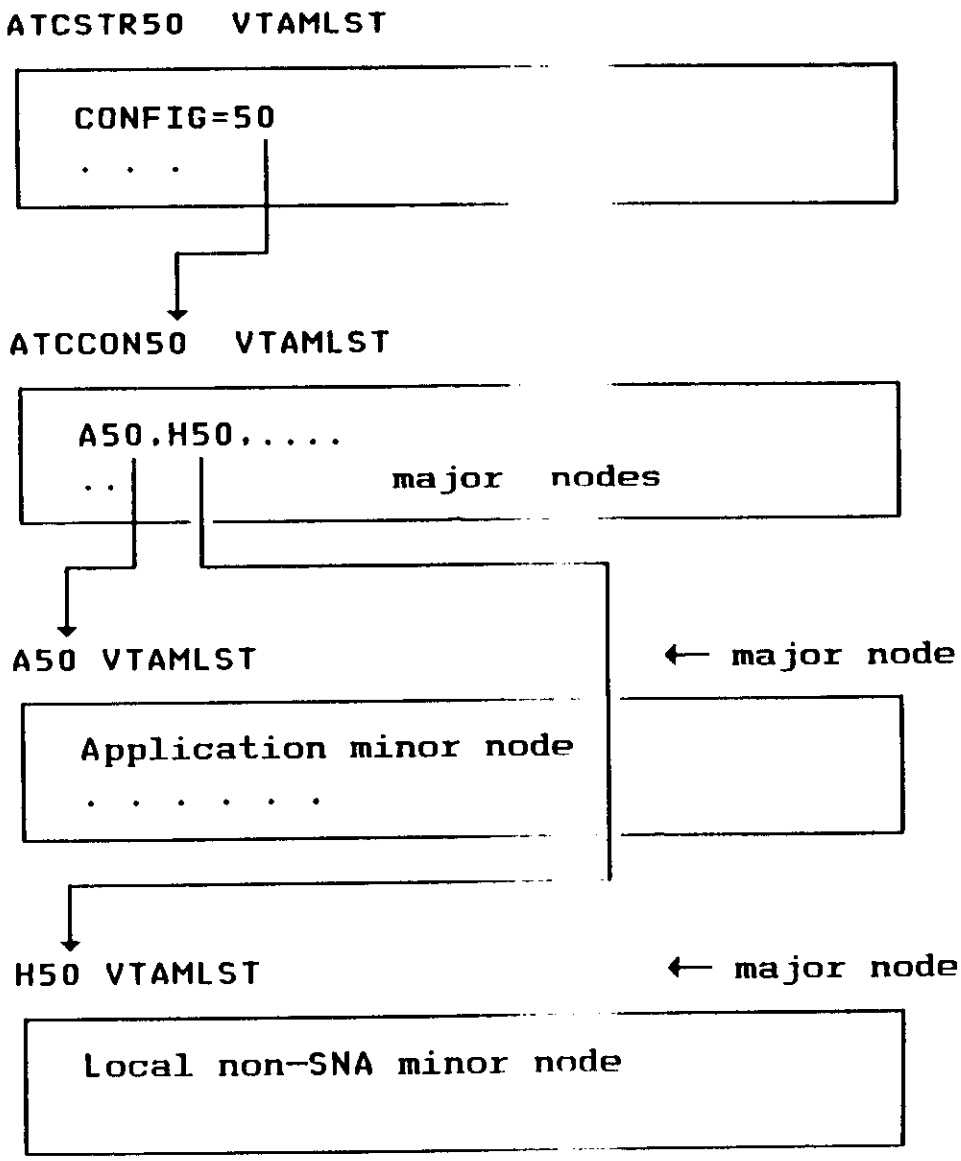
Node Naming Rules

IBM

- Minor node names
  - statement names: 1-8 characters
    - → **unique** within **domain**
      - – if not involved with cross-domain sessions
    - → **unique** within **network**
      - – if involved with cross-domain sessions
- VTAM definition file names: 1-8 characters
  - → including major node names
    - **unique** within **domain**

Configuration List

IBM



Naming Convention Rules

IBM

- Major node names
  - unique within domain
- Minor node names (SNA resource ID):
  - unique within domain or within the network

    When involved in cross-domain sessions
- Subarea Nodes
  - Unique within the network
- SNI unique definitions:
  - NETID : network name identifier (see note)
  - LU_names : resource names involved in cross-network sessions
  - SSCPID : SSCP identifier number
  - GW-NCP_SA : Subarea number of the Gateway NCP

Naming Convention Rules ...

IBM

- **IBM SNA network registration service**
  - Network Identifier (NETID) registered and reserved

    ISO standard 3166 for country code
  - NETID structure (8 bytes CS 1134)

CCEEEENN

CC = Country Code
EEEE = Enterprise ID
NN = Network suffix

example:

ITINFNPI

IT = Italia (ISO Standard)
INFN = Enterprise
PI = Pisa network

- *The network suffix allows definition of more networks within the same enterprise (alphanumeric value).*
- *Once the Enterprise code has been astablished, 1296 netids (all the suffix combinations) will be registered for the requesting customer.*

- *Lett. N¢. ZA89-0270*

  - ***Registration Process for SNA Network Identifiers***

  IBM is establishing a worldwide registry for SNA networks. In connection with this registry, IBM is providing a service that allows customers to register their Network Identifiers (netids). Customers may submit requests to have a netid registered by contacting their IBM branch office representative.
  The initial products supported for which netids can be registered are:

  a) Advanced Communications Function/VTAM

  b) Operating System/400

- *GENERAL AVAILABILITY: January 2, 1990.*
- *HIGHLIGHTS*
  - *Registration facility to assist customers in establishing a unique SNA netid*
  - *Newly architected structure for SNA netid is part of IBM's direction toward OSI/SNA interoperability.*
  - *No charge service.*
- *DESCRIPTION*
  In SNA, a network is an interconnected group of nodes that are logically associated by a common identifier called a netid. Communication between any given SNA networks require that the netids involved must be unique, one from another. Previously, the responsibility for the uniqueness of this netid was solely in the hands of the network owner. Now, IBM is offering the SNA Network Registry to assist network owners in establishing and maintaining the uniqueness of their netids.
  The registration of SNA netids into the SNA Network Registry is recommended to all customers with an existing SNA network or that have near-term plans to establish an SNA network. The registration services provided for the SNA Network Registry offer customers assistance in establishing a unique, structured netid for use in communicating with other SNA networks. The structured netid and the registry are expected to play an important part in any efforts toward OSI/SNA interoperability. IBM is working towards the inclusion of this registry in the OSI registration process. The purpose is to provide a registration vehicle that will allow the SNA addressing token to be used as part of a Network Service Access Point (NSAP) in the OSI environment.
- *SNA NETID STRUCTURE*
  The following new architectural structure has been defined for SNA netids. This structure retains the existing length (8 bytes) and character set (CS 1134), and adds a hierarchical structure to allow identification of the country in which the network is managed, the owning enterprise, and network suffix. This structure consists of a 2-byte country code (using ISO Standard 3166 to represent specific countries) 4-byte enterprise code, and 2-byte network suffix. For example, the netid USABCD01 would signify a country code of US, an enterprise code of ABCD, and a network suffix of 01.

- *REGISTRATION REQUESTS*
  Access to the SNA Network Registry is available worldwide, at no charge, to customers who are licensed for selected IBM networking products. Customers wishing to submit requests to register a structured netid should contact their branch office representative. Requests to register a structured netid are validated based on the uniqueness of the enterprise code within the specified country code. Once an enterprise code has been established, 1296 netids (using all of the network suffix combinations) will be registered for the requesting customer. Requests for multiple enterprise codes per country code by the same customer involve additional validation based on the eligible products owned by that customer. In cases where there are situations in which customers need to continue using an existing netid, requests to register an unstructured netid may also be submitted through the branch office representative.
- *ELIGIBILITY*
  Customers who are licensed for the following IBM networking products are eligible to submit requests for netid registration:

  a) Advanced Communications Function/VTAM

  b) Operating System/400

- *MIGRATION*
  Upon availability of the SNA Network Registry, IBM Information Networks (IIN) will use the new registration service. Customers currently registered with IIN will automatically be added to the new registry.
- *PUBLICATIONS*
  An SNA brochure entitled "SNA Network Registry" G325-6025-0, describes the registry, its purpose, and how it is used, is now available.

***** *END OF DOCUMENT* *****

European SNI naming convention

IBM

- **Sample of resource name structure**
- NETID = **ITyyxxxx**

  CC = Country code
  yy = prefix of network
  xxxx = resource name within the network

- **SSCPID** Structure: 5 positional digits

  p1-2 : a value = < 64 *(generally = VTAM Subarea number)*

  p3 : digit = < 4 that identifies the domain within the network

  p4-5 : the telephon country code reversed

  examples:

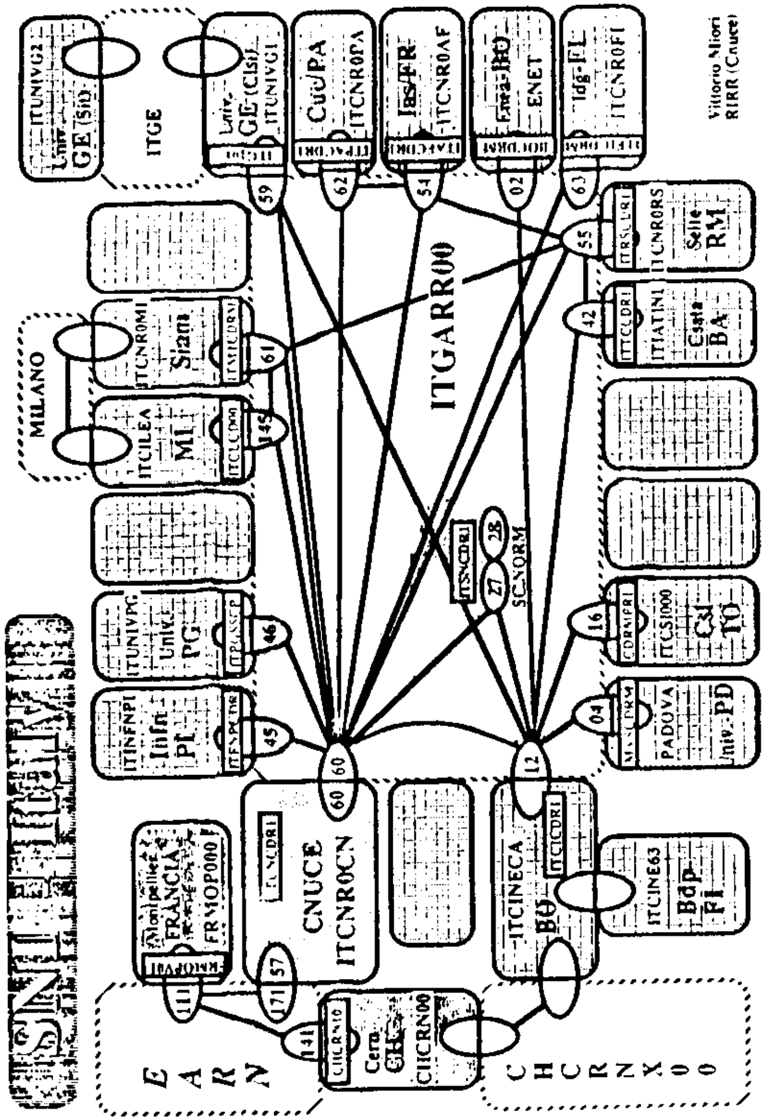
  - CINECA's SSCPIDs: 61093 61193 61493

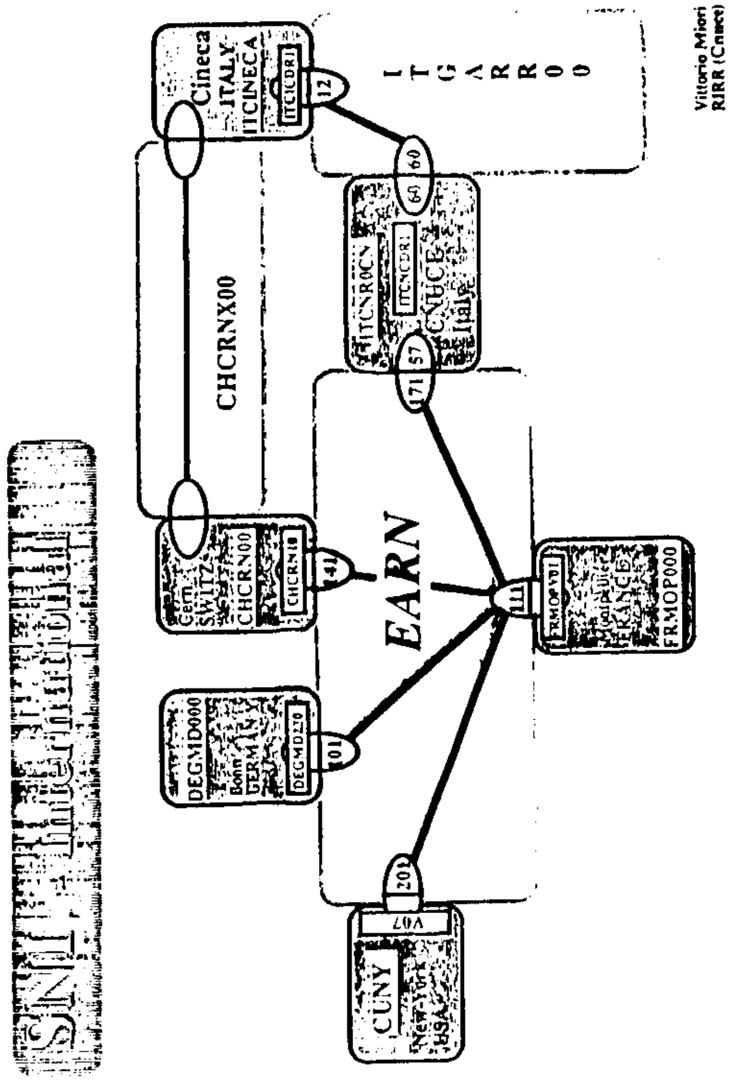
- **GW-NCP_SA**: is the subarea number of the Gateway SSCP
  - must be unique within the interconnected networks

European SNI naming convention (Notes)

IBM

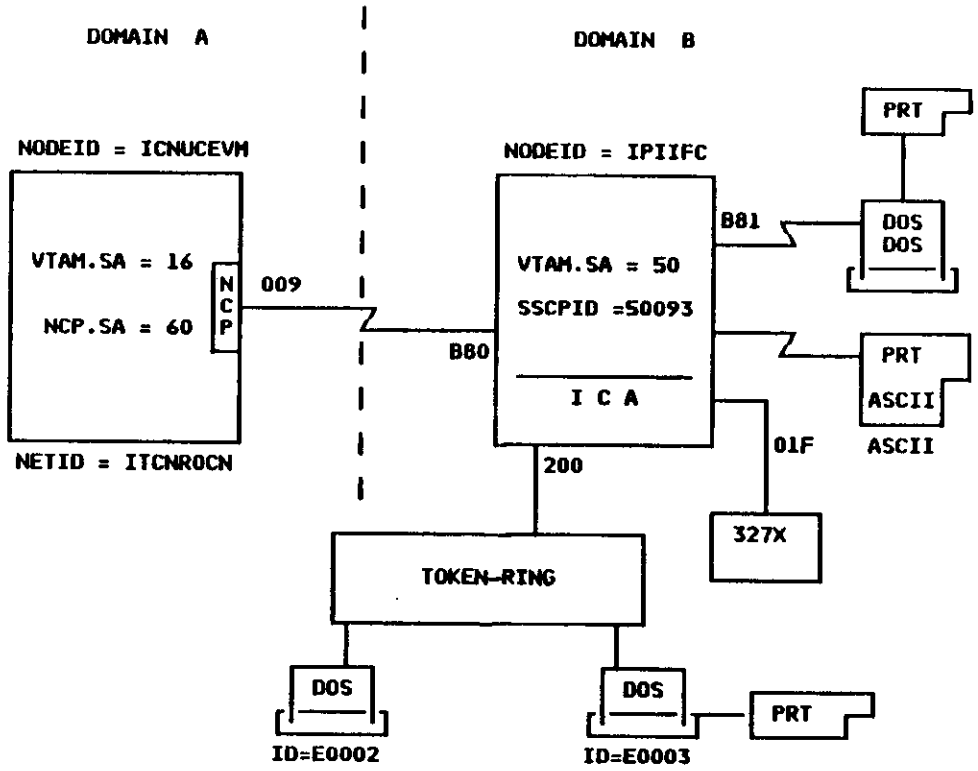
inserire note di Sommani sulle reti SNI.
per la generazione automatica delle VTAMLSTs


ITGARR00
CNUCE
ITCNR0CN
MILANO
ITGE
SC.NORM
CHCRNX00
EARN
Vittorio Miori
RIRR (Cnuce)


ITGARR00
CHCRNX00
EARN
CUNY
Vittorio Miori
RIRR (Cnuce)

Sample of SNA network definitions

- Defining an IBM 9370 domain within a multidomain network



IBM 9370 TCSS definition

IBM

- ICA - Link definition to Tele Communication Sub-System

```
Configuration                          6031

Next I/O          Rack A     Unit 01A     Card 12     Page 1/2

Port   - 01     Protocol  -  SDLC    Physical Interface  - V.24


Clocking (0-DTE, 1-DCE)  . .  . . . . . .    1
Line speed . . . . . . . . . . . . . . . .   9600
 Switched line  . . . . . . . . . . . . . .   N
 Select standby . . . . . . . . . . . . . .   N
 Modem procedure (0-DTR, 1-CDSTL) . . . . .   0
 Permanent Request to Send  . . . . . . . .   0
 Data rate select (0-Full, 1-Half)  . . . .   0
 Line utilization buffer length . . . . . .   24
 Line utilization threshold percentage  . .   60
 Non return to zero inverted (NRZI) . . . .   N
 Non productive receive timeout . . . . . .   0


        Command:  QFIB80
```

Note: The line address is B80, as reported in NET5000

```
Configuration                          6031

Next I/O          Rack A     Unit 01A     Card 12     Page 2/2

Port   - 01     Protocol  -  SDLC    Physical Interface  - V.24


Fill character timeout . . . . . . . . . .    30


        Command:  QFIB80
```

Note: NRZI must be setup the same value at both sides of the link.

VTAM start lists

IBM

- **Start options Configuration List**

```
ATCSTR50  VTAMLST

IOINT=0,                                                          X
CONFIG=50,                unique within the network               X
HOSTSA=50,                                                        X
IOBUF=(96,286,47,,96,48), option values                           X
HOSTPU=ITIFHOST,                                                  X
NETID=ITCNROCN,           netID                                   X
SSCPORD=DEFINED,                                                  X
SSCPNAME=ITIFCDRM,                                                X
SSCPDYN=NO,                                                       X
SSCPID=50093              unique within the network
```

- **Resource activation list**

```
ATCCON50  VTAMLST

ITIFAPPL,     application major node (VSCS , RSCS)     X
ITIFLOCO,     Local non-SNA displays                   X
NET5000,      SDLC Links                               X
TR5000,       Token-Ring major node                    X
SW5000,       Switched major node                      X
PATH5000,     Path tables within the network           X
CDRM,         CDRMs within the network                 X
CDRSC,        SNI resources                            X
ADJSSCP       Adjacent SSCP
```

Application definition

IBM

- **Application Major Node**
  - specifies application program to VTAM
  - major node - ITIFAPPL
  - minor nodes
    - VM (VSCS)
    - NJE (RSCS)

ITIFAPPL VTAMLSI

```
ITIFAPPL VBUILD TYPE=APPL
*
ITIFVM   APPL  AUTH=(BLOCK,PASS,ACQ),PARSESS=YES,ACBNAME=VM,          X
               PRTCT=VM,AUTHEXIT=YES
*
ITIFNJE  APPL  AUTH=(ACQ,VPACE),ACBNAME=IPIIFC,DLOGMOD=RSCSNJE3,      X
               AUTHEXIT=YES,MODETAB=RSCSTAB,VPACING=2
```


Local Non-SNA Major Node

IBM

- Specifies 3x74/D displays and printers to VTAM
  - Major Node - ITIFLOC0
  - Minor nodes - ITIFL020 027

ITIFLOC0 VTAMLSI

```
ITIFLOC0 LBUILD
*
ITIFL020 LOCAL CUADDR=020,TERM=3277,USSTAB=USSIFBSC,DLOGMOD=D4B32782
   .  .  .
ITIFL02n  0 ◄ n ► 7  ......................................
   .  .  .
ITIFL027 LOCAL CUADDR=027,TERM=3277,USSTAB=USSIFBSC,DLOGMOD=D4B32782
```

Remote SNA links

IBM

- Specifies any SNA resource connected via SDLC links
  - Major node - NET5000
  - Minor Nodes -LN50B81, PU50B80, ITIFV002, ...

```
NET5000  VTAMLST

* LINK to SDLC Cluster Controller
*
IFNET50 VBUILD TYPE=CA
*
IFGRSDLC GROUP LNCTL=SDLC,                                          X
               DIAL=NO
LN50B81  LINE  ADDRESS=B81,              physical line address      X
               ISTATUS=ACTIVE
PU50B80  PU    PUTYPE=2,                                            X
               ADDR=C1,                  poll address               X
               MODETAB=ISTINCLM          VTAM default               X
               DLOGMOD=D4C32782,         D/T 3278-2                 X
               SSCPFM=USSSCS,            unformatted cmds           X
               USSTAB=USSSNA             VTAM Logon Screen
ITIFV002 LU    LOCADDR=2,                Controller port addrèss    X
               ISTATUS=ACTIVE
ITIFP003 LU    LOCADDR=3,                Controller port address    X
               BATCH=YES,                D/T printer                X
               MODETAB=RSCSTAB,DLOGMOD=RSCSPRT3,                    X
               ISTATUS=ACTIVE
*
* Cross-Domain Link to ADJNCPSA=60
*
LN50B80  LINE  ADDRESS=B80,                                         X
               RETRIES=7
PU50B80  PU    PUTYPE=4,                   37xx  NCP node           X
               MAXOUT=7,                                            X
               SUBAREA=60                  adj NCP_SA
*
```


LAN Attachement definition

IBM

- Specifies a 9370/LAN attached to the ring as a peer processor
  - Major node - TR5000
  - Minor Nodes - PRT01, GR1TR,

```
IR5000  VTAMLST

*  9370 Token Ring Adapter definition
*
TR50     VBUILD TYPE=LAN
*
PRT01     PORT  CUADDR=200,              physical address VTAM/LAN   X
                LANCON=(5,5),                                       X
                MACADDR=400005001001,      9370 T/R ADAPT           X
                MAXDATA=2000             ( 1-65535)                 X
                MAXSTN=16,               ( 1-65535)                 X
                SAPADDR=4
*
GRTR01    GROUP DIAL=YES,                                           X
                LNCTL=SDLC,                                         X
                ISTATUS=ACTIVE
*
LNTR01    LINE  CALL=INOUT
PUTR01    PU    MAXLU=2           default 2, value=( 1 - 255 )
LNTRnn    ...   ..............    01 ◄ nn ◄ 24
PUTRnn    ...   ........  nn depends from the number of stations on T/R
LNTR16    LINE  CALL=INOUT
PUTR16    PU    MAXLU=2
*
```

LAN Attachement definition

Notes

IBM

Recommended structure for MACADDR

```
          4000ABBCCDDD   ove A = station type
                                 0 - not used
                                 1 - 37xx
                                 2 - 3174L
                                 3 - PC o PS/2
                                 4 - 3174R
                                 5 - Printer
                                 6 - ....
                                 7 - ....
                                 8 - 9  not allowed
                              BB = Sub-Area number
                              CC = ring number
                             DDD = station ID


LAN I/O device definition in DMKRIO

LANTR    DEVICE  ADDRESS=(200,12),DEVTYPE=3088
         ......
         RCTLUNIT ADDRESS=200,CUTYPE=3088,FEATURE=32-DEVICE
         ......
         RCHANNEL ADDRESS=2,CHTYPE=BLKMPXR
```

Note: Token-Ring and Ethernet Integrated adapter 937x have the same DMKIO definition.

Token-Ring Station definitions

IBM

- Stations on Token-Ring are defined as switched PUs
  - Major node - TRSW5000
  - Minor nodes

```
TRSW5000  VTAMLST

IFSWTR01 VBUILD TYPE=SWNET,MAXGRP=5,MAXNO=50
*-------------------------------------------------------------------
* Station  E0002 - MAC ADDRESS = 35001002
*-------------------------------------------------------------------
TR50PU2  PU     ADDR=02,                  not used but required
                IDBLK=017,                PC EMUL. 3270 x DOS     (1)
                IDNUM=E0002,              PC EMUL  PU ADDR
                DISCNT=NO,
                LANSW=YES,
                LANCON=(5,5),
                LANRESP=(5,5),
                LANSDWDW=(7,1),
                MACADDR=35001002,           PRIMA STAZIONE / PC
                MAXDATA=265,              MAX FOR PC EMUL
                MAXPATH=4,                Dial IN/OUT allowed
                PUTYPE=2,
                SAPADDR=4,                SNA SAP
                SSCPFM=USSSCS,
                USSTAB=USSSNA,
                VPACING=0
*
TR50PH   PATH   DIALNO=0004400005001001,     not used for  9370 LAN
                GRPNM=GTR01,
                GID=1,PID=1,
                USE=YES
ITIFP2L2 LU   LOCADDR=02,DLOGMOD=D4C32792
ITIFP2L3 LU   LOCADDR=03,BATCH=YES,USSTAB=USSIFSDL,
                MODETAB=RSCSTAB,DLOGMOD=RSCSPRT3
```

- *Define as many PUs as the stations on the ring*
- *(1) If OS/2 emulator is used on the station define IDBLK=05D*

Path Definition for cross-domain sessions

IBM

- Define routes to VTAM to communicate between subarea nodes
  - Major node - PATH5000
  - Minor node - PH50TO60

```
PATH5000  VTAMLST

PH50TO60 PATH  DESTSA=(60,16,. . . . . ),                          X
*
               ER0=(60,1),ER1=(60,1),ER2=(60,1),ER3=(60,1),        X
               ER4=(60,1),ER5=(60,1),ER6=(60,1),ER7=(60,1),        X
*
               VR0=0,VR1=1,VR2=2,VR3=3,VR4=4,VR5=5,VR6=6,VR7=7
```


Cross Domain Resouce Manager Definition

IBM

- Major node - CDRM
- Minor nodes - Network name and CDRMs names
  - Contain all CDRMs within ITCNR0CN network which 9370 belongs

```
CDRM VTAMLST

*
          VBUILD TYPE=CDRM
*
ITCNR0CN NETWORK NETID=ITCNR0CN
*
*               (VTAM d1 ICNUCEVM)
*
ITCNCDR1 CDRM  ISTATUS=ACTIVE,                                     X
               SUBAREA=16,                                         X
               ELEMENT=1,                                          X
               CDRDYN=YES,                                         X
               CDRSC=OPT
*
*
IPOCDRM  CDRM  ISTATUS=ACTIVE,                                     X
               SUBAREA=23,                                         X
               ELEMENT=1,                                          X
               CDRDYN=YES,                                         X
               CDRSC=OPT
*
*               (VTAM d1 . . . . . )
*
*               (VTAM d1 IPIIFC)
*
ITIFCDRM CDRM  ISTATUS=ACTIVE,                                     X
               SUBAREA=50,                                         X
               ELEMENT=1,                                          X
               CDRDYN=YES,                                         X
               CDRSC=OPT
```

Cross Domain resources definition

IBM

- Define cross-domain resources minor nodes with which an application or a LU within this domain can have a session
  - Major node - CDRSC
  - Minor node - PH50TO60

CDRSC VTAMLSI

```
*
CDRSC    VBUILD TYPE=CDRSC
*
ITCNROCN NETWORK NETID=ITCNROCN
*                (RSCSV2 di ICNUCEVM)
*
ITCNNJE1 CDRSC CDRM=ITCNCDR1
*
*                (JES2 DI ICNUCEVS)
*
ITCNNJE2 CDRSC CDRM=ITCNCDR2
*
*                (VM di ICNUCEVM)
*
ITCNVM1  CDRSC CDRM=ITCNCDR1
*
*                (NETVIEW di ICNUCEVM)
*
IT....   CDRSC . . . . .
*
*                (RSCSV2 DI IPIIFC)
*
ITIFNJE  CDRSC CDRM=ITIFCDRM
*
*                (VM di IPIIFC)
*
ITIFVM   CDRSC CDRM=ITIFCDRM
```


Side NCP_SA 60 Definitions

IBM

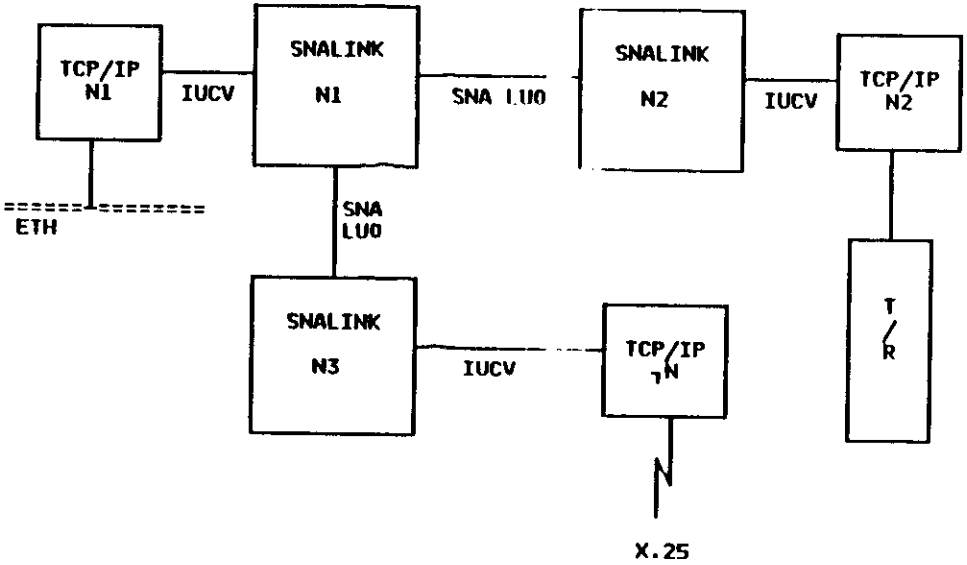
- Define the link between the NCP (SA = 60) and 9370
  - position after GROUP definition for Cross-System links in the NCP source.

```
*
* Cross Sub-Area Link  NCP_SA_60 to IFC 9370
*-------------------------------------------------------------------*
*
*
L60009   LINE  ADDRESS=(009,HALF),SPEED=9600,                      X
               NRZI=NO,                                            X
               SDLCST=(SL60STPR,SL60STSC)     selection table entries
*
P60009   PU    PUTYPE=4,                                           X
               TGN=1,                                              X
               NETID=ITCNROCN
*
```

SNA Backbone for TCP/IP

IBM

- SNALINK provide support to transport TCP/IP over SNA Links



- SNALINK runs as a VM/VTAM application
- Defining SNALINK Application to VTAM

```
SNALINK VTAMLST

SNALKB03  APPL ACBNAME=SNALKB03,AUTH=(ACQ,VPACE),AUTHEXIT=NO,          X
               EAS=12,PARSESS=YES,SONSCIP=YES,VPACING=0
```


NJE Protocols and Products

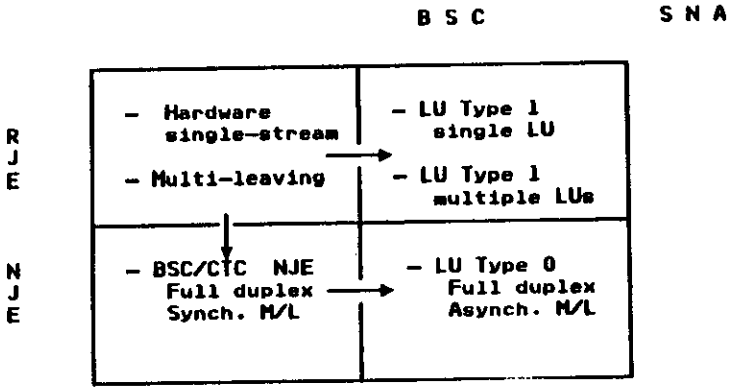
IBM

PART E.

NJE Protocols and Products

◆ Network Job Entry

- Protocol used for Host peer-to-peer communication
- Enables users to transfer jobs and data through a distributed network of computing facilities
- Operator commands and messager can also be transmitted
- NJE evolution



- RJE and NJE together create a distibuted job processing network

◆ *Protocol Types*

The RJE protocols permit remote work station source and sink devices to enter SYSYN jobs and receive SYSOUT jobs from the network of Host processors.

- *The RJE protocol has four form:*
  1. *BSC Hardware (non- multileaving)*
     - *HW station also called NPT (Non Programmable Terminal)*
  2. *BSC Multileaving*
  3. *SNA LU Type 1 Single LU*
  4. *SNA LU Type 1 Multiple LU's*
- *The non-multileaving and the single LU protocols allow only one stream to flow at a time in any direction, whereas the multileaving and multiple LU forms permit concurrent transfer of several SYSIN and SYSOUT streams*
- *RJE protocols (except for BSC Multileaving) are Half-Duplex*
- *NJE protocols are Full-Duplex*

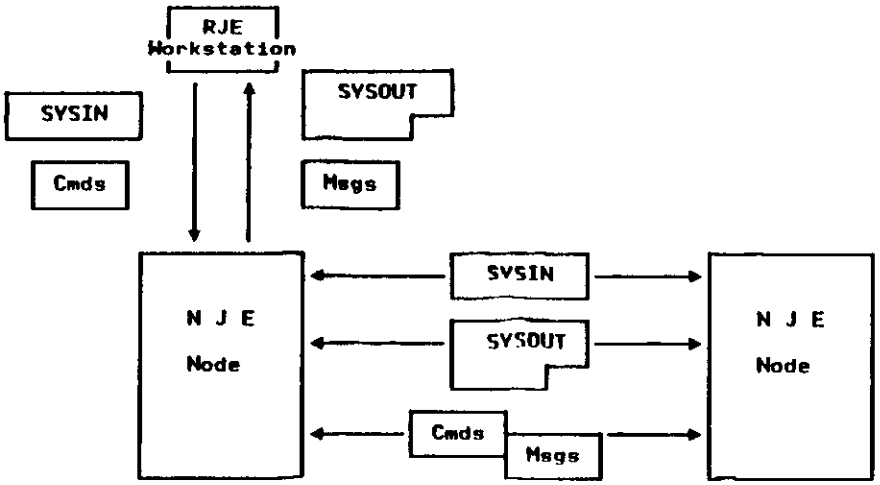
RJE protocols were designed for remote unit record devices (readers, printers and punches) and therefore device oriented protocols.
NJE, in contrast, is a sppol transfer protocol where a spool is considered to contain a SYSIN queue and a SYSOUT queue.

◆ *NJE Types of Links*

- *NJE supports multiple type of links*
  1. *the half-duplex BSC lines*
  2. *the Channel-to-Channel adapter - CTCA*
  3. *the the full-duplex SNA LU Type 0*

RJE and NJE

IBM

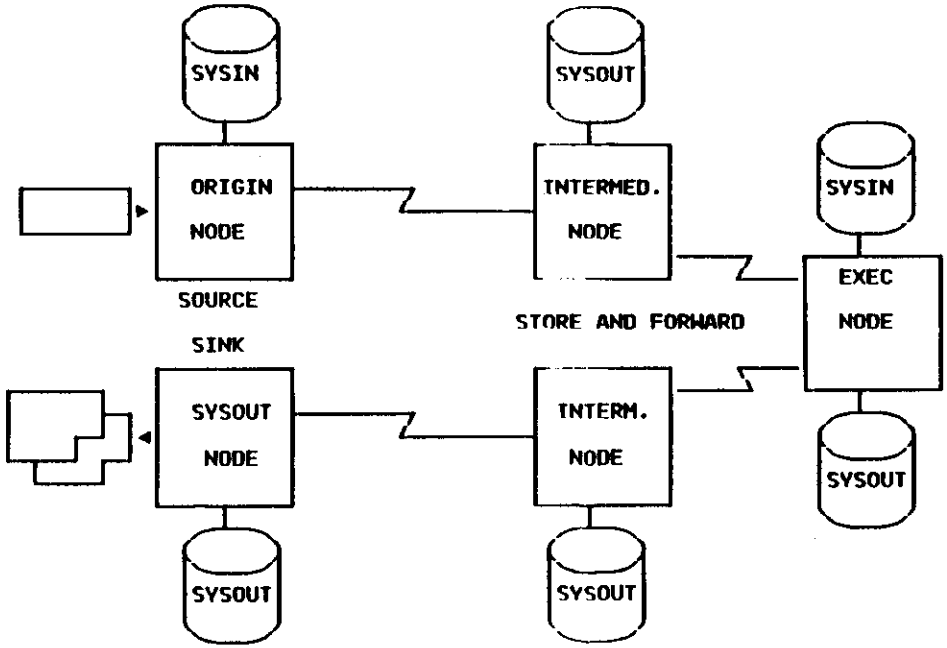


- RJE are non-Symmetric protocols
- NJE are Symmetric and peer-to-peer protocols
  - allow jobs, commands and messages flow in both direction

NJE Network

IBM

- NJE Job Transmission



- NJE Functions
  1. Transmit
  2. Receive
  3. Store and Forward

- *NJE Functions*

  1. *Transmit - packages SYSIN and SYSOUT jobs in NJE Control Records and inserts them into the network*

  2. *Receive - recognizes jobs packaged in NJE Control Records and processes them*

     SYSIN are executed - SYSOUT are printed

  3. *Store and Forward - receives NJE jobs, stores them on spool and forwards them to the next node*

- *NJE Addressing*

  - *Dest = NODE or (NODE . REMOTE) or (NODE USERID)*

    An RJE workstation can be considered a sub node, associated with one of the NJE nodes.

- *NJE addressing*

  NJE use a 2-level addressing scheme:

  1. *Nodename or NodeID - 1 to 8 characters*

  2. *UserID or Programor Remote workstation name*

     1 to 8 characters

  Do not change NodeID, otherwise the entire network will have to be synchronized and end-users will have to be notified to use the new names and change their JCL.
  In JES2 the default nodename is of the form "Nnnnn" but it's recomended to use more descriptive names.

  - *NJE is concerned with routing a file or work request to the NODE portion of the specified destination.*

  - *It is then the destination node to route the job to the REMOTE or USERID on the destination node, using RJE or some other mechanism*

- *NJE Data Type*

  - *Three data types supported*

    1. *JOBs - according to the NJE terminology, may be either SYSIN or SYSOUT*

    2. *COMMANDS and MESSAGES*

       Nodal Message Records (NMRs) to the receiving system

       - *Commands are intended to be executed*
       - *Messages are intended to be displayed*
       - *NMRs are not stored and forwarded*

    3. *NETWORK CONTROL RECORDS - include Signon, Signoff and NPM (Network Path Recors)*

- *Path Routing*

  The Network Path Routing in JES2 is designed for dynamic reconfiguration with other JES2 nodes. Multiple paths, alternate paths and path changes are managed automatically as connection are made or broken.

  - *Non-JES2 system do not hane a NPM, so cannot notify JES2 systems of connection changes.*
  - *Non-JES2 do not forward connection info records from NPM to others nodes in the network*
  - *Connection between JES2 and non-Jes2 nodes must be prdefined.*
  - *RSCS V2 do not have the Path Managers, but operator can dinamically add or change a path with an operator command*

    ROUTE nodeID to LinkID

    REROUTE nodeiD to nodeid

- *Job submission - JES2*

```
//abc    JOB   xxxx(used at the origin and execution node)
/*ROUTE  XEQ   nodename
//STEP1  EXEC  PGM= ..........
 . .
        OR

//abc    JOB   xxxx(used at the origin only)
/*XMIT   nodename  DLM=$$
//xyz    JOByyyyyy        (used at execution node only)
//STEP1  EXEC  PGM= ..........
 . .
```

- *Job submission - VM*

```
TAG  DEV PUN   nodeID  batch-VM
SPOOL PUN  rscsID
PUN  f-name  f-type  f-mode (NOH
```

- *Routing OUTPUT - is controlled via /*ROUTE PRINT or OUTPUT DD statements in JES2 or via TAG cmd in VM.*

- The capability to concurrently transfer multiple input and output streams on the same link or SNA session.
  - 7 SYSIN streams
  - 7 SYSOUT streams
  - 1 Command/Message stream *(both directions)*
  - 1 Control stream *(both directions)*
  - BSC permits concurrent use of 8 of the 14 possible streams
  - SNA permits concurrent use of all 14 streams in both direction

- *Multistreaming*

  The capability of intermixing input/output files on the same link improve traffic flow on the network.
  With multistreaming, small files are not kept waiting while a large file is being transmitted. Both large and small files are transmitted at the same time. Multistreaming makes use of up to seven "streams" over which files can be transferred

  RSCS, in turn, uses exit routines called transmission algorithms to assign files to the various streams.
  It's possible to specify one of sixteen different transmission algorithms, by using the TA parameter of the PARM configuration file statement. IBM supplies two transmission algorithms, 0 and 1, that are convenient for use by most installations.

  Criteria to write your own algorithms should take into consideration:

  File size, Class, Priority, Origin and Destination

Algorithm	Function provided
0	Assign files in order received by the algorithm to any inactive stream
1	Assign files to one of two streams based on the size of the file
2-F	None. Linkage code only. Function to be added by customer

1. *For details refer to "Customizing Exit Routines RSCS manual.*

- *Full Duplex*

  Full Duplex refers to the capability to send data in one direction while receiving unrelated data in the other direction.

  - *The BSC protocol is pseudo full duplex since each end must flip-flop between the send and the receive states.*

    Both ends are synchronized.

  - *The NJE in SNA is a true full duplex, with each end concurrently in both send and receive state.*

    the sessions ends are operating independently

    the flow control is managed by VTAM pacing at the session level.

    VTAM takes care of error recovery, if necessary

- *BSC protocol is responsable of flow control synchronization and retransmition in case of errors. (ACK and NACK cmds)*

- *SNA asyncronous NJE protocol is more efficient and less error-prone on full duplex links.*

Applications

IBM

- Application using NJE Networks
  - Jobs SYSIN / SYSOUT
  - File Transfer
  - Electronic Mail
  - Interactive Conversations
  - Office applications
  - ..... more .....

Applications /Notes

IBM

The data elements for these applications are not defined in the NJE protocols but use NJE for the transmission and distribution of data.

- *File transfer*

  When using NJE for bulk data transfer of user files an additional step is required both at the sending node as well as at the receiving.

  1. *at the sending node the source data set is reformatted and moved to SYSOUT with appropriate tags (files attributes and destination infos)*
  2. *at the receiving node the file must be unloaded from the sysin spool data set and recreated with the original format before directing to the target user (write the target data set or queue to the userid spool)*

- *Electronic mail*

  Uses the distribution and transfer facilitie of NJE to send note between NJE systems (e.g. CMS SENDFILE command)

- *Interactive Conersations*

  Send short messages between interactive users on NJE Connected systems (e.g. TELL or SMSG in VM/CMS)

Messages and commands are transferred only if the system are NJE-connected if not connected they are discarded.

NJE Implementations

IBM

- NJE products and Links

Oper.Sys.		Links Types
• MVS	JES2	BSC CTC SNA
• MVS	JES3	BSC CTC
• VM	RSCS	BSC CTC SNA
• VSE	POWER	BSC SNA
• other	HASP,ASP	BSC CTC
• other	NJE Driver	BSC CTC SNA

Dial Lines either BSC or SDLC can be used in NJE

1. **Dial-up (switched) lines are relatively slow**
2. **The connection must be made manually**

   NJE has no auto-dial facility

RSCS Networking V.2

IBM

- Is a VM networking application
  - Data transfer services between systems or to/from remote devices
    - Jobs, files, command and messages
- RSCS supports SNA and non-SNA links
  - Non-SNA protocols (BSC and CTC)
    - Communicates indirectly with non-adjacent nodes Store-and-Forward transmission
  - SNA Links - connection to a SNA node
    - Communicates directly with both adjacent and non-adjacent nodes
    - VTAM takes care of physicalli moving of data
    - RSCS identifies the destination and VTAM decides what path the data will follow.

- *Non-SNA Links*
  - *RSCS is responsable of **where** and **how** send data*
  - *Indirect communication:*
    - *RSCS send data to an adjacent system which communicates directly*
    - *This intermediate system stores data within its spool and then retransmit data to destination or to another intermediate system*
    - *This method of trasmission is called **Store and Forward***
- *SNA Links*
  - *RSCS is responsable only of **where** to send data*
    - *identifies Destination*
  - *VTAM is responsable of **how** to send data*
    - *identifies the Path*

    For VTAM to select the proper path, it must have an accurate view of the network's physical configuration.
    RSCS and VTAM have different physical and logical view of nodes connected by SNA links.
  - *All SNA nodes are **logically adjacent** to RSCS*

    For instance, node that appear physically non adjacent to VTAM seem adjacent to RSCS. Thus with VTAM's help, RSCS carries on direct communication with nodes that are both physically adjacent and physically non-adjacent
  - *RSCS knows the netwok configuration through a **Configuration File** (see later)*
  - *network configuration may be changed dynamically*

- RSCS transfers files using:
  - Line Drivers over non-SNA links
  - Session Driver over SNA links
    - VTAM LU-LU sessions
  - Types of Drivers and Associated Nodes

D/T	Driver Name	Associated node
l	ASCII	Remote or local ASCII printer
l	LISTPROC	Remote peer systems
l	MRJE	Remote multi-leaving work stations
l	NJE	Remote peer systems
l	RJE	Remote work stations
s	SNANJE	Remote peer systems using VTAM
s	SNARJE	Remote workstation using VTAM
s	SNA3270P	Remote or local 3270 printers using VTAM
s	3270P	Remote or local 3270 printers

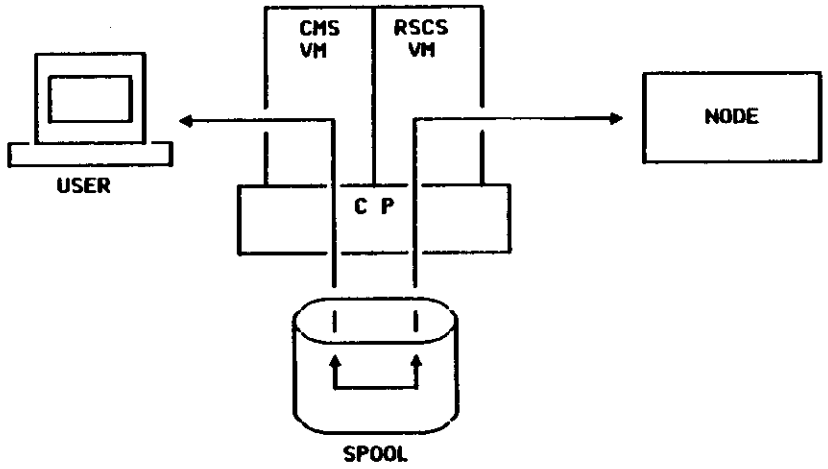
l = line driver

s = session driver

The two networking drivers NJE and SNANJE, use a special technique called multistreaming for transferring files.

- *Multistreaming allows more than one file to be transmitted concurrently over the sam link.*
  - *improve traffic flow on the network*
- *LISTPROC is a line driver used to process a spool file containing a list of destinations.*
  - *The target is to transmit the file to the destination listed in the distribution list using the minimum number of copies of the file.*

- Through use of VM system spool

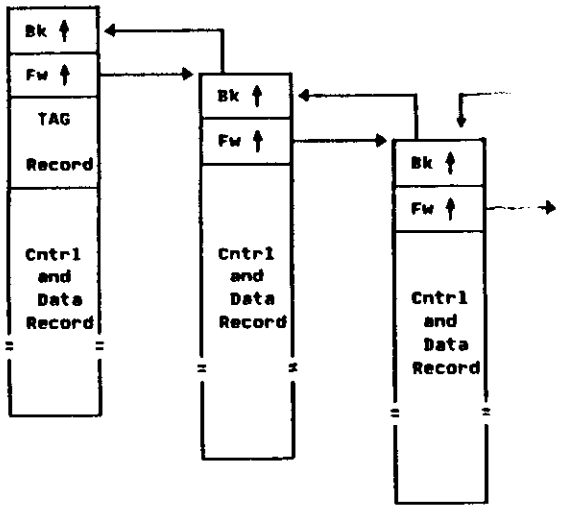


- RSCS relies on "Tag information" to manage files spooled to remote node
- The Tag becomes part of each data file spooled to RSCS
  - contains origin and destination address
  - " file's characteristics and attributes

How RSC Manages Files

IBM

RSCS uses the CP spool facilities of VM. The first spool buffer of each VM output spool files contains an info field called **spool tag record**
Tag record contains information as the file's destination etc.



CP spool File Format

Whenever a file that is received and spooled is to be processed by another line driver (forwarded), RSCS preface the Tag with "S&F" flag.

File handling example:
tag dev pun nodeid userid
spool pun to RSCSVM
pun f_name f_type

The cmd TAG places address information in the tag record. The last two cmds direct CP to punch the file and queue on the spool of the virtual punch output of RSCS virtual machine.

Planning a VM/RSCS node

IBM

- Installation and Customization
  - Define RSCS Virtual Machine
  - Identify RSCS to VM
    - **SYSTEM NETID** file

      e.g. **sernum nodeid rscsvmid**
  - Joining the GCS Group
    - RSCS works with GCS and VTAM *(if SNA-links required)*
  - Autologon of RSCS
    - include AUTOLOG command in PROFILE GCS of Recovery V.M.
  - Define non-SNA links to VM DMKRIO

- Define Networkink links, NJE and SNANJE
  - local and remote definitions at the end of the link to
    1. JES2 through a CONNECT statement
    2. RSCS via a LINK statement in Config file
- Preparing VTAM for SNA connections
  - Identify the RSCS application to VTAM

ITIFAPPL VTAMLST

```
ITIFAPPL VBUILD TYPE=APPL
*
ITIFNJE  APPL  ACBNAME=IPIIFC,                    *
               AUTH=(ACQ,VPACE),                  *
               AUTHEXIT=YES,                      *
               MODETAB=RSCSTAB,                   *
               DLOGMOD=RSCSNJE0,                  *
               VPACING=2
*
IT...    ....  .......
               .......
```


1. *ACBNAME will be used on the RSCS NETWORK command to start RSCS/VTAM communication interface*

   NETWORK START APPLID IPIIFC

   If APPLID not specified in the command, APPLID defaults to the local node ID as specified in the LOCAL statement of configuration file.
2. *RSCSTAB is the name of the table that contains logon mode entries*
3. *Log mode entry in RSCSTAB (default RSCSNJE0)*
4. *AUTHEXIT = YES is mandatory*
   authorizes RSCS to run in supervisor state.
5. *AUTH = (ACQ) is mandatory*
   authorizes RSCS to activate a session by simulating a logon request.
6. *VPACING value, controls the number of buffers VTAM allows to control the flow of sending and receiving. Select the value according to the link capacity.*

LOGMODE Tab for RSCS

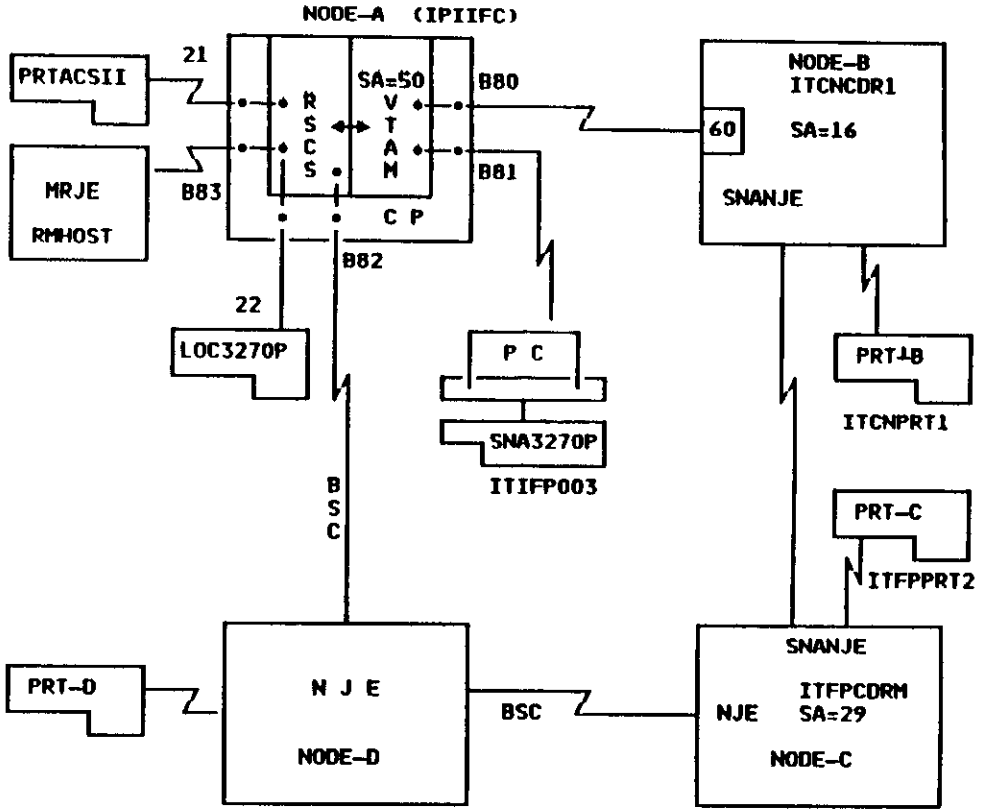
IBM

```
RSCSTAB  ASSEMBLE

*
RSCSTAB  CSECT
RSCSTAB  MODETAB
RSCSNJE0 MODEENT  LOGMODE=RSCSNJE0,FMPROF=X'03',TSPROF=X'03',          X
                  PRIPROT=X'72',SECPROT=X'72',COMPROT=X'4020',          X
                  SSNDPAC=X'03',SRCVPAC=X'03',RUSIZES=X'0000',          X
                  PSNDPAC=X'03',PSERVIC=X'00000000000000000000000000'
RSCSPRT0 MODEENT  LOGMODE=RSCSPRT0,FMPROF=X'02',TSPROF=X'02',  *VA24778X
                  PRIPROT=X'60',SECPROT=X'40',COMPROT=X'0000',          X
                  SSNDPAC=X'00',SRCVPAC=X'00',RUSIZES=X'C7C7',          X
                  PSNDPAC=X'80',PSERVIC=X'00800000000000185018507F00'
RSCSPRT1 MODEENT  LOGMODE=RSCSPRT1,FMPROF=X'03',TSPROF=X'03',  *VA24778X
                  PRIPROT=X'B1',SECPROT=X'30',COMPROT=X'3080',          X
                  SSNDPAC=X'01',SRCVPAC=X'01',RUSIZES=X'C7C7',          X
                  PSNDPAC=X'81',PSERVIC=X'01000000E100000000000000'
RSCSPR1H MODEENT  LOGMODE=RSCSPR1H,FMPROF=X'03',TSPROF=X'03',  *VA27763X
                  PRIPROT=X'B1',SECPROT=X'30',COMPROT=X'7080',          X
                  SSNDPAC=X'01',SRCVPAC=X'01',RUSIZES=X'C7C7',          X
                  PSNDPAC=X'81',PSERVIC=X'01000000E100000000000000'
RSCSPRT3 MODEENT  LOGMODE=RSCSPRT3,FMPROF=X'03',TSPROF=X'03',  *VA24778X
                  PRIPROT=X'B1',SECPROT=X'20',COMPROT=X'3080',          X
                  SSNDPAC=X'00',SRCVPAC=X'00',RUSIZES=X'C7C7',        X
                  PSNDPAC=X'80',PSERVIC=X'03800000000000185018507F00'
RSCSRJE1 MODEENT  LOGMODE=RSCSRJE1,FMPROF=X'03',TSPROF=X'03',          X
                  PRIPROT=X'A1',SECPROT=X'A1',COMPROT=X'7080',          X
                  RUSIZES=X'8585',PSNDPAC=X'07',SSNDPAC=X'07',          X
                  SRCVPAC=X'07',PSERVIC=X'01102000F100C00000010040'
         MODEEND
         END
```

- Default provided with the product.
- Can be modified and reassembled then Link-edited in VTAMUSER LOADLIB

Sample NJE network

IBM



Define Links to CP

IBM

- Links and devices defined to Operating System
- **DMKRIO ASSEMBLE**

```
DMKRIO   CSECT
*
CLS001 CLUSTER CUTYPE=3274,LINE=B83.                              c
       TERMINAL TERM=3289,                                        c
       TERMINAL TERM=3287
 .
 .
*
       RDEVICE  ADDR=(021,2),DEVTYPE=3287
*
       RDEVICE  ADDR=(B80,2),DEVTYPE=ICA,                         c
                ADAPTER=SDLC
*
       RDEVICE  ADDR=B82,DEVTYPE=ICA,                             c
                ADAPTER=BSCA
       RDEVICE  ADDR=B83,DEVTYPE=ICA,                             c
                ADAPTER=BSCA,CLUSTER=CLS001
 .
 .
       RCTLUNIT ADDR=020,CUTYPE=3274
       RCTLUNIT ADDR=B80,CUTYPE=3274
 .
 .
       RCHANNEL ADDR=0,CHTYPE=MPLX
       RCHANNEL ADDR=8,CHTYPE=MPLX
 .
 .
```


SNA Links definition

IBM

- Links and resources defined to VTAM

```
NET5000  VTAMLST

* LINK  to SNA3270P  Addr=B81
*
IFNET50 VBUILD TYPE=CA
*
IFGRSDLC GROUP LNCTL=SDLC,DIAL=NO
LN50B81  LINE  ADDRESS=B81,ISTATUS=ACTIVE
PU50B80  PU    PUTYPE=2,ADDR=C1,                                  X
               MODETAB=ISTINCLM,DLOGMOD=D4C32782,                 X
               SSCPFM=USSSCS,USSTAB=USSSNA
ITIFV002 LU    LOCADDR=2,ISTATUS=ACTIVE      D/T display
*
ITIFP003 LU    LOCADDR=3,BATCH=YES,          D/T printer          X
               MODETAB=RSCSTAB,DLOGMOD=RSCSPRT3,                  X
               ISTATUS=ACTIVE
         ..    ..............
         ..    ..............
         ..    ..............
         ..    ..............
*
* Cross-Domain Link to NODE_B - NCP adj-SA=60, addr=B80
*                                                                 X
LN50B80  LINE  ADDRESS=B80,
               RETRIES=7
PU50B80  PU    PUTYPE=4,                     37xx  NCP node       X
               MAXOUT=7,                                          X
               SUBAREA=60                    adj NCP_SA
*
```

Application and Path

IBM

- Defineing applications and Path to VTAM
- The RSCS VTAM application at NODE_A

```
ITIFAPPL  VTAMLST

ITIFAPPL VBUILD TYPE=APPL
*
IT...    APPL  . . . . . .
               . . . . . .
               . . . . . .
* add ↓
*
ITIFNJE  APPL  AUTH=(ACQ,VPACE),ACBNAME=IPIIFC,DLOGMOD=RSCSNJE3,        X
               AUTHEXIT=YES,MODETAB=RSCSTAB,VPACING=2
*
IT...    APPL . . . . . .
```

If ACBNAME not specified ACBNAME defaults to the label of APPL statement

IF ACBNAME = local node_ID, the RSCS start command can avoid the APPLID

NETWORK START (applid acbname)

- The path to the other domains

```
PATH5000  VTAMLST
*
PATHT060 PATH DESTA=(60,16,29, .... )
                . . . . . .
```


Cross-Domain Support

IBM

- CDRM resources definition

```
CDRM VTAMLST

*
         VBUILD TYPE=CDRM
*
ITCNROCN NETWORK NETID=ITCNROCN          (if SNI only)
*
*               (VTAM IPIIFC )
*
ITIFCDRM CDRM  SUBAREA=50,ELEMENT=1,                                    X
               CDRDYN=YES,CDRSC=OPT
*
*               (VTAM NODE_B )
*
ITCNCDR1 CDRM  SUBAREA=16,ELEMENT=1,                                    X
               CDRDYN=YES,CDRSC=OPT
*
*               (VTAM NODE_C )
*
ITFPCDRM CDRM  SUBAREA=29,ELEMENT=1,                                    X
               CDRDYN=YES,CDRSC=OPT
*
  . . .   . .  . . . . . . . . . .
IT. . .   . .  . . . . . . . . . .
               . . . . . . . . . .
*
*
```

- *If no direct session required with non adjacent nodes these definitions can be omitted.*
  - *in this case the transmission will be of Store-and-Forward type.*
- *SNA allows dynamic definition of resources*

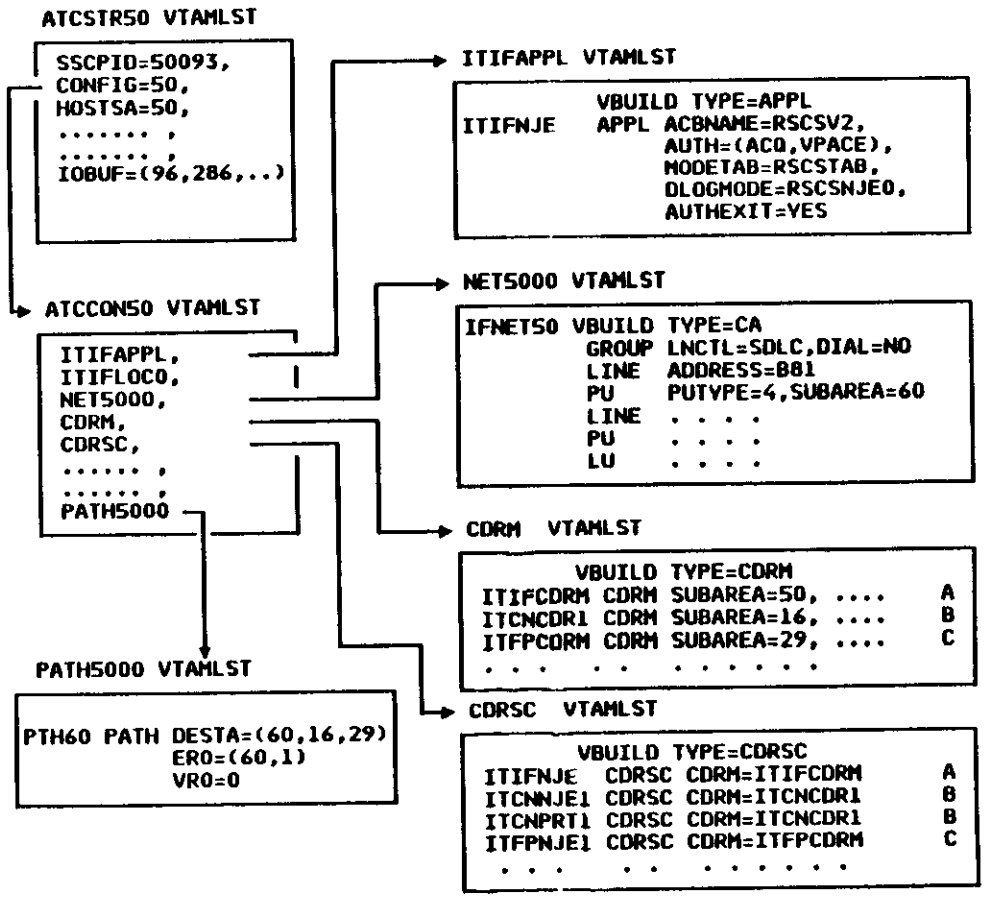
- CDRSC resources definition

```
CDRSC  VTAMLST     at IPIIFC

*
CDRSC    VBUILD TYPE=CDRSC
*
*
*
ITIFNJE  CDRSC CDRM=ITCNCDR1                RSCSV2  of IPIIFC / NODE_A
*
ITCNNJE1 CDRSC CDRM=ITCNCDR1                RSCSV2 of NODE_B
ITCNPRT1 CDRSC CDRM=ITCNCDR1    (*)         SNA Printer at NODE_B
*
ITFPNJE1 CDRSC CDRM=ITCNCDR2                RSCSV2 of NODE_C
ITFPPRT2 CDRSC CDRM=ITCNCDR2    (*)         SNA Printer at NODE_C
*
IT....   CDRSC . . . . . .
                . . . . . .
*
*
```

- Add entries in CDRSC at NODE_B an NODE_C

```
CDRSC  VTAMLST

*
CDRSC    VBUILD TYPE=CDRSC
*
*   . . . . .  add ↓
ITIFNJE  CDRSC CDRM=ITCNCDR1                RSCSV2  of NODE_A
*
   . .   . . .   . . . . . .
*
```


- NODE_A - Subarea 50 Definition Files



RSCS Configuration File

IBM

- Statements to define the network to RSCS
  - and options parameters
- Three categories of statements
  1. Network Definition Statements
     - identify the components in the network by their node names or IDs
  2. RSCS Funtions
     - provide details and options that define how RSCS will function
  3. CP Functions
     - provide instruction how RSCS can use some CP functions

Note: It's important to follow NodeID and Naming convention.

- *NodeID, LinkID and UserID must be **unique** within the network.*

Sample RSCS config file

IBM

```
*     Local Nodeid     Application ID
*
 LOCAL      IPIIFC        *   RSCSV2
*
 CHANNELS    F            ( default virt channel reserved for RSCS spool Op.
*
*               Link      Virt    Spool Keep Queue              LOGMODE  Auto
*     Linkid    Type      Addr *  Class Slot Type  DP LUNAME     Name     Start
*
 LINK NODE_B    SNANJE    *     * *     2    PRI   *  ITCNNJE1 RSCSNJE3 AST
 PARM NODE_B    BUFF=1024
 LINK PRT_B     SNA3270P  *     0 *     *    FIFO  7  ITCNPRT1 *
*
 LINK NODE_C    SNANJE    *    24 *     16   SIZE  5  ITFPNJE1 RSCSNJE2
*
 LINK NODE_D    NJE       100 24 *     16   SIZE  5  *         *
 PARM NODE_D    BUFF=1024 STREAM=1 TA=0
*
 LINK SNA3270P SNA3270P   *     * *      2   FIFO  *  ITIFP003 RSCSPRT1 AST
 LINK LOC3270P 3270P      022   * *      2   FIFO  *  *         *         AST
 LINK PRTASCII ASCII      021   * *      2   SIZE  *  *         *         AST
 PARM PRTASCII EXIT=ASCXPROP ITO=10 ATTN=NO
*
 LINK RMHOST    MRJE      B83   0 *      *   FIFO  7  *         *
 PARM RMHOST    SYS=HOST RMT=7 PASS=H1BSC
*
 AUTH * OPERATOR IPIIFC CP
 AUTH * SNAMAINT *      CP

*         RSCS  Route Specification
*
* List of neighbours:                    <-- Remarks
*
*       NODENAME                        nnnn (nodenum)
*                                        Int.
*       Node     Vianode                 Nodes
*                                         | Country
*                                         |  Institute/Location
 ROUTE  NODE_C   NODE_B                   1 IT   Dept PH/Pisa, Italy
 . . .  . . . . . . . . .   . .  ......................
 . . .  . . . . . . . . .   . .  ......................
 ROUTE  US*      NODE_B                      US   all US nodes through NODE_B
*
 PORT 80  DIAL                  for switched BSC connection
*
 EXIT 2 ON IFAXACC             ( option, e.g.for Account exit routine
 TAGS 2400                      Additional Tags slots (traffic dependent
 DUMP VM                         Dump format
 MSGNOH                         Allow rscs to use CP cms MSGNOH for msgs
*/
```

Note: EARN users will receive periodically a ROUTING file for all registered EARN e BITNET nodes.
This file must be appended to RSCS CONFIG file afer the local network nodes.

Appendix Ax.

Appendix Ax.

- **VM/SNA Implementation Considerations**
  - The attached document has to be considered just as a guide for people who is going to install VM/SNA
  - Official documentation is provided with Products.

TITLE : VM/SNA IMPLEMENTATION CONSIDERATIONS

SOURCE MATERIAL DATED: SEP89

VM/SNA User IDs and Minidisk Considerations

There are, of course, many ways to implement a VM/SNA environment. By VM/SNA I mean such products as VM/VTAM (ACF/VTAM Version 3 program number 5664-280), ACF/SSP Version 3 (program number 5664-289), RSCS Version 2, and some form of ACF/NCP, either full or subset. This is merely one way to set up such an environment, but one that was found useful and workable in several accounts. It is appropriate to emphasize here that this item assumes more VM/SP knowledge than SNA knowledge, and also that either education in the SNA products or the active involvement of a communications specialist (preferably with some VM knowledge), is essential to a successful installation and implementation of a VM/SNA environment. An SNA environment is very different from a non-SNA environment, it has its own language and terminology, and knowing and understanding that language makes all parts of the installation and tailoring processes much simpler. Similarly, the customer personnel supporting the new VM/SNA environment need both VM and SNA product training, as appropriate, in order to install, test, and customize it, not to mention doing problem determination. There are multiple courses available, which the reader is left to find in the various sources which are available. One that is especially useful is VM/SNA Networking Facilities (course code G3610), which is taught from the VM viewpoint to assist in installing and maintaining SNA products in a VM environment, it does not teach SNA product tailoring, tuning, etc., which are taught in the various communication products courses. You will see that there are multiple userids defined, each with specific links to specific minidisks, in order to implement the SNA products. (I emphasize implement because all of the installation procedures are well documented in the various IBM SRL publications that ship with the products; implementation is left to the user - and the intention of this paper is to help in the implementation effort.) The idea behind the multiple userids is to allow the customer access to all the code needed to perform his or her immediate job, but at the same time to reinforce exactly what task they are performing. To put that another way, MAINT still does all the traditional VM maintenance functions, VTAM runs VTAM code, VTAMBLD builds (or customizes, if you prefer) VTAM for the installation, and NCPBLD builds (or generates or customizes, if you prefer) the NCP; thus, when logged on as NCPBLD, the user knows that his or her immediate interest is NCP only - not VTAM, not VM system maintenance, not program development, but NCP. This may seem silly - but it works. (In fact, if the user has guest SCPs running with tailorable subsystems, such as CICS, the "philosophy" can be easily extended by setting up separate userids, such as CICSBLD for tailoring CICS, DL1BLD to do DL/1 tailoring, etc.; again, this reinforces the task at hand.) Each user also has access only to disks that concern the immediate task; for example, NCPBLD has access to the SSP disks where the necessary SSP functions reside to generate and load an NCP, but not to the other SSP disks which are not needed, such as the ZAP disk. Let's examine each user individually.

MAINT:
MAINT, as by tradition, owns all the IBM code and thus has access to all the minidisks containing it. Watch out for the PARM disk - there may be several, depending on the code installed (NCP and NCP Subset, for instance). It seems more logical and simpler to put all the PARM files on 34B, and in some releases with some products that in fact happens, but this doesn't match the documentation, so you should be aware that, if you have several SNA products, you may in fact have several PARM disks and will have several PARM files. This really shouldn't matter, though, as only MAINT uses them, and even MAINT uses them only at install time and when applying maintenance (a PUT tape or a PTF). Also note that there is no specific user for SSP, but that MAINT owns the minidisks containing the code and shares them as needed. As we'll see later, MAINT also needs access to the SSP disks to run ACF/SSP's Trace Analysis Program (TAP) to format a VTAM trace. The reason for this is the assumption that MAINT is the real systems programmer and is also the only user in the installation capable of reading a VTAM trace; therefore, too, the VTAMTRAC EXEC directs the trace to MAINT. It might be more logical to spool it to VTAMBLD, assuming that that user has the capability of reading and interpreting a VTAM trace; a comment in the VTAMTRAC EXEC notes this possibility.

VTAM:

The user called VTAM runs VTAM and VSCS. It must be F1 mode and a member of a group. It IPLs GCS, not CMS. Note in the chart that MAINT's 298 is VTAM's 191. This is the normal way, according to the VTAM documentation, to access this minidisk; it contains the IBM code and therefore it should not be modified, it except for the PROFILE GCS. Copy the VTAM GCS exec to be called PROFILE GCS, and change the PROFILE GCS to point to a different startup list (the VTAM START statement takes a parameter LIST=nn to point to ACTSTRnn) and to access all the appropriate minidisks. If there is a link to it, it needs to be accessed. There is a sample modified PROFILE GCS for VTAM later in this document with additional comments. The VTAM user is intended to run disconnected. It is a good idea, at least initially, to spool the console to and in later problem determination. Spool it to MAINT or to VTAMBLD - there's generally no need to print it, but it's nice to have it sitting in somebody's reader when you need it. By running disconnected, however, there is no way to issue VTAM commands (without NetView or equivalent). This is generally not a desirable way to run, fortunately VM provides a facility called Secondary Console Image Facility (SCIF or, more simply, secondary user) to get around this - see "Miscellaneous Considerations" below for the details. In the PROFILE GCS we let VTAM do an AUTOLOG of the RSCS Version 2 virtual machine. Although RSCS could be AUTOLOGed by AUTOLOG1, this method, especially in an environment where the printers were generally controlled by VTAM, eliminates any potential timing problems in bringing up RSCS before VTAM was ready to allow the ACB to be opened. During maintenance of either RSCS or VTAM you can leave RSCS up, close the ACB, make your VTAM changes, re-initialize VTAM, and re-open the ACB. This saves a small amount of time, and if there are printers that are not, in fact, controlled by VTAM, this allows them to stay up. This will, however, look different to the operators, and they will need to be warned that it is okay.

VTAMBLD:
This userid, pronounced VTAM BuiLD, is responsible for building all the VTAM customized code, such as the startup list (ATCSTRnn VTAMLST), configuration list (ATCCONnn VTAMLST), USS tables, COS tables, and major and minor node definitions (VBUILDS, LBUILDs, path tables, CDRMs, CDRSCs, etc.). These files must have a filetype of VTAMLST, except for those containing code that needs to be assembled, such as USS table(s) and COS tables, which must have a filetype of ASSEMBLE. Tables that need to be assembled need to have access to the appropriate macro libraries (MACLIBs). In the back of this paper is an EXEC called VTAMASM, which takes a filename as an argument, issues a GLOBAL MACLIB, and invokes the normal system assembler. The output from this is, as normal, a TEXT file and a LISTING file. The TEXT file is input to VMFLKED to build the load library that is actually used by VTAM. Also input is a file of linkage editor control statements, which must have a filetype of LKEDCTRL; the filename of this LKEDCTRL file becomes the name of the load library that gets built. An example used in this document is VTAMUSER as the filename, with an alternate of VTAMUSR1, this allows you to keep your existing load library, assemble and build new tables, change the GLOBAL LOADLIB in LOOK GCS, run LOOK from OPERATOR, and have a simple recovery procedure - namely pointing to the old, previously working library in LOOK GCS and re-issuing the LOOK command from OPERATOR. Remember also that in some levels of VM/SP the GLOBAL command (which in my scheme is issued only in the LOOK GCS on VTAM's 191 disk) is limited to 8 LOADLIBs and in some levels is capable of naming 63. From a problem determination standpoint, one should think carefully before using 63 libraries, as it becomes more and more difficult to determine where code actually came from the longer the list gets, as we've learned time and again in both MVS and VSE environments with their concatenated library support. VTAMBLD has WRITE access to VTAM's 191 disk, but generally should not change anything there, other than the PROFILE GCS. Keep all the VTAMLSTs on VTAMBLD's 191, and let VTAM have a read-only link to it. VTAMBLD also has a link (read-only) to NCPBLD's 191, to see the NCP, and to MAINT's 343, for the SSP code, just in case you need to generate or, more likely, load an NCP from VTAMBLD.

NCPBLD:
This userid, pronounced NCP BuiLD, is for NCP generation. Like VTAM, if there is a minidisk, it should be accessed. There are several sample modified EXECs later in this document for NCPBLD, also. The output of the NCP generation process goes into a LOADLIB on NCPBLD's 191 disk, to which both VTAM and VTAMBLD have read-only access. After you rebuild an NCP, be sure to have VTAM re-access the minidisk, the LOOK EXEC takes care of this. It is possible to regenerate an NCP with VTAM up and running, de-activate the running NCP, have VTAM re-access all its minidisks, and re-load and re-activate the new NCP (obviously in a controlled environment).

OPERATOR:
This is the normal VM operator id. It is included here as an SNA id simply because it is referred to it several times and because there are, in this document, several EXECs on OPERATOR's 191 disk for use exclusively with VTAM, mainly to issue commands (the VTAM, VTAMTRAC, and NOTRACE EXECs), but also the very important exec that causes VTAM to re-access all of its minidisks (the LOOK EXEC).

RSCS Version 2 Considerations

RSCS Version 2 tends to be rather easier to setup and implement than the other products discussed, as it is a logical successor to the old RSCS/Networking product (5748-XP1). It is, however, somewhat different, especially if you are using VTAM link drivers (first difference: they're now link drivers, not line drivers). Because it is a logical successor product, we found it easier to implement in the same way as we did RSCS, namely by giving the RSCS virtual machine read-only links to its own minidisks and doing all the tailoring from MAINT. Admittedly this violates the suggestion of separating functions, but RSCS was traditionally tailored from MAINT anyway, so this is in that sense simpler from the customer's viewpoint. For a new-to-VM shop, one might consider setting up an RSCSBLD userid, with write links to MAINT's 59F, which contains the RSCS customization files. The major item to be careful of in tailoring RSCS is in naming the VTAM ACB to be used. On the VTAM side, in the VBUILD for the APPL, the label is the default ACB name, but it may be overridden by using the ACBNAME parameter on the APPL statement. Regardless of where the ACB gets named to VTAM, it gets named to RSCS in the RSCS configuration file (normally RSCS CONFIG) on the LOCAL statement. These ACB names must match, if they do not, you get an OPEN error from VTAM. In the back of this book is a sample RSCS EXEC to allow any user to issue an RSCS command, it should be on one of the common disks so RSCS will check to see if the user is authorized to issue the command. It is a good idea to have at least 2 users, OPERATOR being one of them, be authorized to issue all RSCS commands. If you have printers in department, consider authorizing at least one user in that department as a privileged user for that particular link. Miscellaneous Considerations. Thoughts on Operations- This entire scheme will work in any size shop, but may be especially relevant to smaller shops with only a few TP lines and some local 3270 control units, since in this environment it is often difficult to justify NetView. But we do need to be able to communicate with VTAM without having to logon as VTAM, to meet this requirement, use the secondary console image facility (SCIF) of VM/SP by specifying OPERATOR as the secondary user on VTAM's CONSOLE statement in the directory:

```
CONSOLE 009 3215 T OPERATOR
```

and running VTAM disconnected. This allows the OPERATOR to issue VTAM commands at any time. The VTAM EXEC on OPERATOR's minidisk allows the system in this scheme to look the same to the operator (the person, not the userid now) whether his or her terminal is logged on as VTAM or as OPERATOR; for instance, to display all the major nodes known to VTAM, the command is always "VTAM D NET,MAJNODES", which, if logged on as OPERATOR, is transformed by the VTAM EXEC into "CP SEND VTAM VTAM D NET,MAJNODES" where the first VTAM is telling CP where to SEND the command (the virtual machine's userid) and the second VTAM is telling the VTAM virtual machine that this is a VTAM command (as opposed to a GCS command or a VSCS command).

Thoughts on Customizing

Since VTAM's disks are subject to change by VTAMBLD, NCPBLD, or MAINT, you need to provide a way to tell VTAM to re-access its minidisks and re-establish the GLOBAL LOADLIB sequence. One simple way to do this is with an EXEC, which has already been referenced several times, called LOOK. There are two versions of this EXEC, one on OPERATOR's minidisk and one on VTAM's minidisk. The one on OPERATOR's minidisk does a CP SEND VTAM LOOK, the one on VTAM's minidisk (which must have a filetype of GCS and which must be written in REXX, since it is running in a GCS and not a CMS environment) issues ACCESS commands and a GLOBAL LOADLIB command. The two versions exist so that, again, the system looks the same whether logged on as VTAM or as OPERATOR. To make maintenance simpler, VTAM's PROFILE GCS should not issue any ACCESS or GLOBAL commands, but should invoke LOOK GCS instead, this way, if you change LOOK, you've changed the PROFILE GCS as well. Again, in the back are samples of these suggested EXECs.

```
NEVER, EVER DELETE IBM CODE
```

Instead of deleting IBM code, copy it with the old date and a filetype of Oxxxxxxx, where xxxxxxx is the original filetype. This not only gives you a fall-back position, but also something to compare to when your code doesn't work. Actually, about the only file you should need to do this to is VTAM's PROFILE GCS, but it can also be useful to change the VMFAST and VMNCP EXECs on the SSP disks after moving them to NCPBLD's 191, the changes most

useful are to set them up with default OBJLIBs, MACLIBs (SSP1.1 determines them automatically now), version, and filetype and filemode. For simplicity, make the NCP source code have a filetype of VTAMLST rather than ASSEMBLE, this way VTAM can use it directly and, since the generation process doesn't care what the filetype is, you have one less thing to worry about and thus the best of all possible worlds. Another good technique to allow simple fallback is to not use or change any of the IBM supplied startup lists (ACTSTR00 VTAMLST and ATCCON00 VTAMLST), instead, point in the PROFILE GCS to LIST 01, for instance, and code your own ATCSTR01 VTAMLST (on VTAMBLD's 191, of course, as this is a local customization). In this startup list override the options you need to, such as TRACE parameters, various buffer sizes or quantities, or the host subarea number, and then point to your own configuration list with CONFIG=nn (also of course on VTAMBLD's 191) with the nodes you want VTAM to start for you. Remember that ATCSTR00 is always processed by VTAM, so you need code in your ATCSTRnn only those specific parameters that you want to override. This makes it easy to change your lists, easy to migrate to a new release of VTAM by copying your local customizations, and easy to test "vanilla" IBM code by simply using LIST=00 as a startup parameter. Again, the best of all possible worlds.

VTAM Tracing

VTAM tracing is almost a world unto itself and deserves its own section. There are courses which spend a great deal of time looking at traces of things working and not working, and this paper is most certainly not going to teach anything about actually reading a trace. I would be remiss, however, if I didn't mention the classes, the trace capability, and if I didn't say that the nice thing about the VTAM traces is that you can really get some excellent documentation about what is going on, whereas in a non-VTAM environment the tracing ability was much more limited. It is, however, also somewhat confusing as to how to go about actually getting and printing the traces, and the documentation, although excellent and comprehensive, is somewhat scattered. One effective technique involves three areas: 1) the EXECs to turn on and off the traces (VTAMTRAC and NOTRACE on OPERATOR's minidisk) and to do the data reduction (TAP, if you have it, or VTAMTRAC on MAINT's minidisk), 2) VTAM initialization options for the trace, and 3) a command on the first invocation of the trace to reduce the amount of output. All of the EXECs are in the back of this paper and are commented, I will not explain them here. A few words on the first invocation of the trace and on initialization are appropriate, however. It is easier to trace externally rather than internally, both because the reduction process seems to end up easier and because you could collect more data, if needed. In order to do this, you must initialize VTAM with TRACE,TYPE=VTAM,MODE=EXT in your ATCSTRnn VTAMLST. You cannot dynamically modify your system to use external tracing. While these particular initialization parameters cause significant volumes of trace data for even a simple trace, such as activating a logical unit, no data is actually captured until an appropriate CPTRAP command is issued, the CPTRAP command is issued for you in the VTAMTRAC EXEC. In order to reduce the output to a manageable volume, before the first trace you should issue the following command:

```
VTAM F NET,NOTRACE,TYPE=VTAM,OPT=END
```

This will turn off the VTAM internal trace (called in the documentation VIT). You can then set up whatever you want to trace and activate the trace. Buffer traces tend to be the most useful, the shortest, and the easiest to read, but if you're tracing, you need and probably have a communications person involved; let them tell you which type of trace to run. It also is a good idea to make sure you know how to do tracing - all the steps - before needing to trace. In other words, as part of customization, try turning on a trace of a terminal, doing a transaction (do a LOGON to the VSCS APPL, for instance), turn the trace off and print it. This not only assures that you can run a trace when you need to, but it also gives you a sample of a successful BIND (if you selected the LOGON to VSCS), which is also useful later. Again I should point out that when problems arise, the help of a communications specialist is invaluable.

Miscellaneous Comments

Another series of EXECs that are useful to all these userids are FT, FV, and FG. Each consists of simply an invocation of FILELIST, but with specific filetypes only (all minidisks, however), namely EXEC, VTAMLST, and GCS respectively. It is also nice to have EXECs on MAINT to set up accesses for each specific component, for instance, ACCSSP would access all the SSP minidisks, ACCVTAM would get VTAM's, and so on for ACCNCP25, ACCRSCS, etc., one could also write ACCNETV (for NetView) MAINT should also be capable of IPLing GCS and running VTAM code for test purposes, so the directory entry should have the necessary entries (e.g., DIAG98, IUCV, etc.). Remember to make MAINT a member of the GCS group of which VTAM is a member and to SET EC ON when trying to bring up VTAM. All of these items are documented in the various publications for VM/VTAM and are

included here only as a reminder.

VM/SNA MINIDISK SETUP

The following chart shows all the users except RSCS as described above, their minidisks addresses, how they are accessed by each user (i.e. read only, write, etc.) using the parameter normally coded on the LINK statement, and minidisk volume serial number. An installation with both an NCP and an NCP subset might want to make the subset volume serials SUBBAS, SUBDEL, etc. See the next sections for EXECs for each user which actually access the various disks. For security and simplicity, all links should be done in the directory and no minidisks should have passwords. This is the "safest" way to set up a VM system because it eliminates the danger of anyone writing down the passwords to access another minidisk. It also is the simplest way to set up a VM system: if a user has a minidisk in his or her virtual machine, they are authorized to see it. In fact, in this chart and in this implementation scheme, if a user other than MAINT has a link to a minidisk, it must be ACCESSed in order for that user to do all the various tasks they are supposed to be performing (e.g., NCPBLD needs to ACCESS the SSP minidisks at 33F and 343 to generate an NCP using NDF, the Network Definition Facility.) Finally, please note that this scheme was originally developed on VM/SP Releases 4 and 5; on one or both of those releases it was necessary for NCPBLD to have access to MAINT's 193 for certain modules used by VMFLKED, but this may not be true in every release of VM/SP or in VM/HPO or VM/XA environments.

MAINT			VTAM		VTAMBLD		NCPBLD	
ADDR	ACC	VOLSER	ADDR	ACC	ADDR	ACC	ADDR	ACC
		VTMBLD	291	RR	191	MR*		
		NCPBLD	193	RR	192	MR	191	MR*
VTAM Minidisks								
298	WR	VTM191	191	RR	298	RR		
299	WR	VTMBAS			299	RR		
29A	WR	VTMRUN	29A	RR	29A	RR		
29B	WR	VTMMRG			29B	RR		
29C	WR	VTMZAP			29C	RR		
29D	WR	VTMDEL			29D	RR		
ACF/SSP Minidisks								
33F	MR	SSPBAS					33F	RR
340	MR	SSPDEL						
341	MR	SSPMRG						
342	MR	SSPZAP						
343	MR	SSPRUN	343	RR	343	RR	343	RR
NCP/3725 Minidisks								
33A	WR	NCPBAS						
33B	WR	NCPDEL						
33C	WR	NCPMRG						
33D	WR	NCPZAP						
33E	MR	NCPRUN	33E	RR	33E	RR	33E	RR
NCP Subset Minidisks								
357	WR	NCPBAS						
358	WR	NCPDEL						
359	WR	NCPMRG						
35A	WR	NCPZAP						
35B	MR	NCPRUN	35B	RR	35B	RR	35B	RR
GCS Minidisks								
595	MW	GCS595	595	RR				
596	MW	GCS596						
Miscellaneous Minidisks- 193 is IPCS, 348 is PARM, MAY have others								
193	MW	MNT193					193	RR
348	MR	VTMPRM						

* *This userid is the minidisk owner. ALL other minidisks are owned by MAINT*

SAMPLE EXECS AND MISCELLANEOUS CODE:

The following pages contain sample EXECs and some miscellaneous code from real accounts to implement the suggestions from the first part of this paper. The minidisk addresses should correspond to those in the chart on the preceding pages. The EXECs are grouped by the userid on whose minidisk they should reside in my addressing scheme, but you should feel free to move them to other disks if appropriate for your shop. The code has comments scattered throughout as was deemed necessary for a user to understand the EXEC. Please remember that these are sample EXECs and files; although they worked in real accounts, your minidisk addresses may be different (if you didn't follow the minidisk scheme described) or you may have different SNA products installed than the EXEC were written for (e.g. full NCP rather than NCP subset), so all of these should be reviewed for applicability to your account. Also remember that, if you have multiple levels of a product installed (e.g., NCP V4 and NCP V5), you must keep them on separate minidisks or risk contaminating your system. As with any install process, make sure you back up your system up before you start and plan a recovery technique before you start.

Sample EXECs and files for MAINT:

****** *These EXECs and files should go on MAINT's 191 disk*

```
ACCGCS EXEC - access the GCS minidisks
/* Access GCS minidisks */

CLRSCRN
Say "Access GCS minidisks"
ACCESS 595 J    /* sysres */
ACCESS 596 K    /* fixes disk */
ACCESS 59E L     /* GCS extension disk */
query disk

ACCNCP25 EXEC - access the NCP for 3725 minidisks
/* Access NCP for 3725 minidisks */

CLRSCRN
Say "Access NCP for 3725 minidisks"
'ACCESS 33A J/J     '
'ACCESS 33B K/K     '
'ACCESS 33C L/L     '
'ACCESS 33D M/M     '
'ACCESS 33E N/N     '
```

```
'ACCESS 348 R/R     '    /* PARM disk */
QUERY DISK

ACCNCPSS subset EXEC - access the NCP subset minidisks
/* Access NCP subset minidisks */

CLRSCRN
Say "Access NCP subset minidisks"
'ACCESS 357 J/J     '
'ACCESS 358 K/K     '
'ACCESS 359 L/L     '
'ACCESS 35A M/M     '
'ACCESS 35B N/N     '
'ACCESS 348 R/R     '    /* PARM disk */
QUERY DISK

ACCRSCS EXEC - access the RSCS minidisks
/* Access RSCS Version 2 minidisks */

CLRSCRN
Say "Access RSCS Version 2 minidisks"
ACCESS 59F J
ACCESS 49F K
ACCESS 39F L
ACCESS 29F M
ACCESS 193 N
query disk

ACCSSP EXEC - access the SSP minidisks
/* Access SSP minidisks */

CLRSCRN
Say "Access SSP minidisks"
'ACCESS 33F J/J     '
'ACCESS 340 K/K     '
'ACCESS 341 L/L     '
'ACCESS 342 M/M     '
'ACCESS 343 N/N     '
'ACCESS 348 R/R     '     /* PARM disk */
QUERY DISK

ACCVTAM EXEC - access the VTAM minidisks
/* Access VTAM minidisks */

CLRSCRN
Say "Access VTAM minidisks"
'ACCESS 298 J/J     '
'ACCESS 299 K/K     '
'ACCESS 29A L/L     '
'ACCESS 29B M/M     '
'ACCESS 29C N/N     '
'ACCESS 29D O/O     '
'ACCESS 348 R/R     '        /* PARM disk  */
```



```
QUERY DISK

TAP EXEC - reduces a trace file using ACF/SSP/TAP - the output looks
           much better than TRAPRED's
/*-------------------------------------------------------------------*/
/* Exec to run ACF/SSP/TAP.                                          */
/*                                                                   */
/* To use (assume spoolid 1234):                                     */
/*        TAP 1234                                                   */
/*        TAP TRAC1234 DATA A                                        */
/*                                                                   */
/* Stolen from GG24-3060-00 VM/SNA PSI GUIDE USE OF TOOLS            */
/*-------------------------------------------------------------------*/
Trace off
Address COMMAND
Parse source . . efname eftype efmode rname
/* default settings */
dftype = 'DATA';dfmode = 'A';
Arg input '(' opts ')' .
input = STRIP(input)
opts = STRIP(opts)
Parse var input fname ftype fmode .
If fname = '?' | fname = 'HELP' | fname = '' then call HELP
If ftype = '' then ftype = dftype
If fmode = '' then fmode = dfmode
/* Find out how we were called. If called from RDRLIST, FILELIST or*/
/* via the CMS command line.                                       */
'GLOBALV SELECT $execut$ GET EXECUTE'
If opts ¬= '' then,
if opts ¬= 'PRINT' then call ERRORS '5 005E'
'FILEDEF * CLEAR'
'ERASE * REPORT A'
CHECKENTRY:
Select
  When execute = 'FILELIST' then Signal CMSFILE
  When execute = 'RDRLIST'  then Signal SPOOLFILE
  When DATATYPE(fname,'N')  then Signal SPOOLFILE /*switched these*/
  When DATATYPE(fname,'A')  then Signal CMSFILE   /*lines         */
  Otherwise call ERRORS '6 006E'
End
SPOOLFILE:
/*-------*/
If input = '' then call ERRORS '1 001E'
If ¬DATATYPE(input,'N') then call ERRORS '2 002E'
 'EXECIO * CP (STRING Q R' input 'ALL'
Pull hdr
Pull org input sfclass stype . . . . . sfname sftype .
If sfclass ¬= 'P' | stype ¬= 'DMP' | sfname ¬= 'CPTRAP',
then call ERRORS '3 003E'
'DESBUF'
'EXECIO 1 CP (VAR RDR STRING QUERY VIRTUAL 00C'
Parse var rdr . . . rclass .
If rclass ¬= 'P' then 'CP SPOOL RDR CLASS P'
```

```
'FILEDEF GTOUT DISK TRAC'input 'DATA A (LRECL 284 RECFM VB PERM)'
'DSJVMCMS' input
If rc ¬= 0 then call ERRORS rc '007E'
fname = 'TRAC'input
CMSFILE:
/*———*/
If SUBSTR(fname,1,4) ¬= 'TRAC' | ¬DATATYPE(SUBSTR(fname,5,4,),'N'),
then call ERRORS '5 005E'
If ftype ¬= 'DATA' then call ERRORS '5 005E'
'FILEDEF SYSTRACE DISK' fname ftype fmode '( PERM'
'FILEDEF SYSLSPRT DISK LSPRT REPORT A      ( PERM'
'FILEDEF SYSLDPRT DISK LDPRT REPORT A      ( PERM'
'FILEDEF SYSSSPRT DISK SSPRT REPORT A      ( PERM'
'FILEDEF SYSSDPRT DISK SDPRT REPORT A      ( PERM'
'FILEDEF SYSNEPRT DISK NEPRT REPORT A      ( PERM'
'FILEDEF SYSDTPRT DISK DTPRT REPORT A      ( PERM'
'FILEDEF SYSGSPRT DISK GSPRT REPORT A      ( PERM'
'FILEDEF SYSVTPRT DISK VTPRT REPORT A      ( PERM'
'FILEDEF SYSPRINT DISK ACFTAP REPORT A     ( PERM DISP MOD'
'FILEDEF SYSIN    DISK ACFTAP PARM A       ( PERM'
Queue 'QUIT'
'ACFTAP'
If opts = 'PRINT' then call PRINTIT
call EXIT rc
PRINTIT:
/*———*/
Address CMS ' ACCESS 191 A'
'CP SPOOL PRT CONT'
Address CMS 'LISTFILE * REPORT A (STACK DATE NOHEADER'
Do n=1 while QUEUED() ¬= 0
Pull report.n
Parse var report.n report.n 'F' . numrec .
If numrec > 1 then Address CMS 'PRINT' report.n '(CC'
End
'CP SPOOL PRT NOCONT CLOSE'
Return
EXIT:     /* single routine exit. */
/*—*/
If execute = 'RDRLIST' then 'CP SPOOL RDR CLASS' rclass
Arg rcode .
If execute = 'RDRLIST' | execute = 'FILELIST' then Exit rcode
else Exit rcode
ERRORS:  /* Routine contains and issues all error messages. */
/*——*/
Arg rcode number text
Select
   When number = '001E' then message =,
   "SPOOL file '"input"' not found."
   When number = '002E' then message =,
   "Invalid SPOOL fil '"input"' specified."
   When number = '003E' then message =,
   "SPOOL file '"input"' invalid class- '"type"'."
   When number = '004E' then message =,
```



```
   left(fname,8) left(ftype,8) left(fmode,2),
   "** Invalid filename/filetype ** for '"efname"'."
   When number = '005E' then message =,
   "** Invalid options specified for '"efname"' ** '"opts"'."
   When number = '006E' then message =,
   "SPOOL file '"input"' invalid class- '"type"'."
   When number = '007E' then message =,
   "** ACFTAP failed to produce the goods ** command 'DSJVMCMS'."
   When number = '008E' then message =,
   "** LINK failed to ACFSSP product disk. **"
   Otherwise number = 0   /* Invalid message number. */
end
If execute = 'RDRLIST' | execute = 'FILELIST' & number ¬= 0 then Do
             message = '      'message
             'GLOBALV SELECT $execut$ SET1 MSG1' message
             Call EXIT rcode
             end
If number ¬= 0 then "EXECIO 1 EMSG (STRING ACFTAP"number message
Call EXIT rcode
HELP:
/*—*/
Say ''
Say efname 'Syntax is:—'
Say ''
Say efname 'fname <ftype <fmode> > <( PRINT>'
Say ''
Say 'Where  fname    is the input file name of the spool file id.'
Say ''
Say '       ftype    is the file type (default is DATA).'
Say ''
Say '       fmode    is the file mode (default is A).'
Say ''
Say '      ( PRINT  causes files to be printed (default is to disk).'
Say ''
Call EXIT 5
ACFTAP PARMS — parameter file used by TAP EXEC
INPUT=ALL
PRINT=YES,SUMMARY=EVERY
LDPRT=YES,LSPRT=YES,DTPRT=YES,
SDPRT=YES,SSPRT=YES,GSPRT=YES
SOURCE=GTF
GO
VTAMTRAC EXEC — reduces a VTAM trace using TRAPRED
&TRACE OFF
* This prints a VTAM trace using TRAPRED—not as pretty as ACF/SSP/TAP
&IF .&1 = . &GOTO —MSG
&STACK 3D
&STACK FORMAT
&STACK PRINTER 999999
&STACK QUIT
TRAPRED &1
&EXIT 0
—MSG
```

```
   &TYPE You MUST give a spool file number.
   &TYPE Here are the cptrap files:
   &STACK QUERY READER * CLASS P ALL
   &EXIT 999

/*************************************************************************/
/*    The  following  EXECs  are  very  general  and can go on a         */
/*    common disk, such as MAINT's 19E or 319 disk.                      */
/*************************************************************************/
COMMENT XEDIT - adds a comment "box"
/* ********************************************************************* */
/* XEDIT macro to put a REXX-style comment box into a file.  Takes       */
/* as an argument the number of "blank" lines to insert.                 */
/* ********************************************************************* */
SET CMSTYPE HT
arg num
IF num ¬= ''          /* check for no argument */
    then COUNT = num
    else COUNT = 1    /* default to 1 if no arg */
'INPUT
do COUNT
    'input
    end
'INPUT
COUNT = COUNT + 2     /* to get us where we want to go with next stmt. */
'UP ' COUNT           /* be nice and reposition to original location   */
SET CMSTYPE RT
CONT XEDIT - put a continuation mark in column 72
&TRACE OFF
* Put a continuation mark in column 72
CLOCATE :72
COVERLAY X
MARK XEDIT - put an identifier, such as account name in column 65
&TRACE OFF
* This XEDIT macro is used to put an identifier, such as account name
* or your name, in column 65 of a file.
* It's very useful in tailoring the sample NCP and VTAM
* definitions provided by IBM to MARK those lines which were changed
* for the account.  A crude by effective "change control" procedure...
CLOCATE :65
* Replace the ?s with your account abbreviation  ......
COVERLAY _?????_
MARKQ XEDIT - put an identifier in column 65 and remove ? marks
&TRACE OFF
* This XEDIT macro is used to put an identifier, such as your name or
* the account name in column 65 of a file after removing
* the question marks.  It is very useful in
* tailoring the sample NCP and VTAM definitions provided by IBM which
* have question marks on some lines which must be changed for the
* installation.  This will MARK those lines which were changed and
* remove the question marks.  See also MARK XEDIT.
UP 1
CLOCATE /?/
```



```
COVERLAY _
CLOCATE :65
* Replace the ?s with your account abbreviation  ......
COVERLAY _?????_

RSCS EXEC - use CP Special Message facility to issue an RSCS command
/* RSCS EXEC to issue an RSCS command */
/* ********************************************************************* */
/* Use the CP Special Message facility (SMSG) to issue an RSCS           */
/* command.  Any user can check his or her own spool files, you must     */
/* be an RSCS-authorized operator via the AUTH statement in the          */
/* RSCS configuration file to issue other commands.                      */
/* ********************************************************************* */
arg cmd
'CP SMSG RSCS' cmd /* RSCS is the name of the virtual machine.... */
/* ********************************************************************* */
/*  If you get an invalid command message from RSCS, try changing       */
/*  the command to the following:                                        */
/*                 'CP SMSG RSCS RSCS' cmd                               */
/*  where the first RSCS is the name of the virtual machine and          */
/*  the second one indicates to the virtual machine that this is an      */
/*  RSCS command, not a GCS command.                                     */
/* ********************************************************************* */

Sample EXECs for NCPBLD
/*************************************************/*
/*                                               */
/* These EXECs should go on NCPBLD's 191 disk.   */
/*                                               */
/*************************************************/*
PROFILE EXEC for NCPBLD
&TRACE OFF
EXEC DTRIPF NOPAN
CP SET PF12 RETR
CP SET PF24 RETR
CP TERM HIL ON
CP SET RUN ON
* Now access SSP disks.....
ACCESS 33F G
ACCESS 343 E
* Now access the NCP and SSP disks.....
* Note that 35B is NCP Subset, for NCP/3725 ACCESS 33E F instead
ACCESS 35B F
* And finally MAINT's 193 for a couple of modules needed by linkedit.
ACCESS 193 T
CLRSCRN
QUERY DISK

VMFAST EXEC - modified with defaults provided
/*************************************************************************/
/* REXX EXEC TO RUN A FASTRUN GENERATION                                 */
/* Modified.                                                             */
/* YOU MUST SUPPLY THE FILENAME AND FILETYPE OF THE INPUT GENERATION     */
```

```
/* DEFINITION ON THE COMMAND LINE WHEN INVOKING THE EXEC.            */
/*                                                                   */
/* YOU ARE ALLOWED TO SPECIFY THE FILEMODE OF YOUR INPUT GENERATION */
/* (WHICH DEFAULTS TO '*').  THIS PARAMETER IS OPTIONAL.             */
/* CORRECT FORM FOR INVOKING THE EXEC:                               */
/*      VMFAST FN FT FM                                              */
/*********************************************************************/
   ADDRESS COMMAND                      /* ENSURE CP/CMS ENVIRONMENT  */
   TRACE OFF
   GEN_FN=""
   GEN_FT=""                            /* INITIALIZE STRING VARIABLES*/
   GEN_FM=""
   ARG FN FT FM                         /* GET PARAMETERS FROM COMMAND*/
                                        /* LINE                       */
   IF FM="" THEN                        /* DEFAULT FILETYPE TO "*" IF */
     GEN_FM="*"                         /* NOT CODED                  */
 /* SEE IF FN AND FT WERE PASSED ON COMMAND LINE.                     */
 /* IF GEN NAME WAS NOT SPECIFIED, GIVE CORRECT FORM AND EXIT.        */
   IF (FN="")|(FT="") THEN
     DO
       SAY "CORRECT FORM:"
       SAY ""
       SAY "   VMFAST FN FT FT"
       SAY "     -FN, FT, AND FM ARE VARIABLES WHICH"
       SAY "      YOU SUPPLY ACCORDING TO YOUR GENERATION"
       SAY "     -IF OMITTED, THE DEFAULT FOR FM IS '*'"
       SAY "     -FN AND FT ARE REQUIRED"
       EXIT
     END
 GEN_FN = FN
 GEN_FT = FT
   'STATE' GEN_FN GEN_FT GEN_FM         /* SEE IF GEN EXISTS ON DISK  */
   IF RC ¬= 0 THEN
     DO
       SAY GEN_FN GEN_FT GEN_FM "DOES NOT EXIST"
       EXIT RC                          /* EXIT IF GEN DOESN'T EXIST  */
     END
 /* CLEAR OLD FILE DEFINITIONS                                        */
   'FILEDEF * CLEAR'
 /* WORKING SPILL FILE                                                */
 /* THE DBWORKFL IS NEEDED ONLY WHEN THERE IS NOT ENOUGH VIRTUAL      */
 /* MEMORY TO HOLD ALL OF NDF'S WORK DATA OR IF USERGEN IS SPECIFIED.  */
 /*'FILEDEF DBWORKFL DISK  DBWORKFL FILE A ( XTENT 40'                */
 /* INPUT FILE WITH NCP/EP GENERATION STATEMENTS                      */
   'FILEDEF GENDECK DISK' GEN_FN GEN_FT GEN FM
 /* GENERATION VALIDATION STEP OUTPUT                                 */
   'FILEDEF SYSPRINT DISK' GEN_FN 'LISTING A'
 /* NDF SUMMARY LISTING                                               */
   'FILEDEF PRINTER TERM'
 /* RUN THE NDF STEP                                                  */
   'ICNRTNDF (FASTRUN(ON))'
   EXIT RC
```



```
VMNCP EXEC - modified with "correct" default answers
/*********************************************************************/
/* REXX EXEC TO RUN A NCP/PEP GENERATION WITH ALL OUTPUT             */
/* FILES WRITTEN TO DISK                                             */
/* This is a modified version of VMNCP SMPLEXEC on 33F minidisk.     */
/*********************************************************************/
   ADDRESS COMMAND                      /* ENSURE CP/CMS ENVIRONMENT */
CP QUERY TIME
   TRACE N
   GEN_FN=""
   GEN_FT=""                            /* INITIALIZE STRING VARIABLES*/
   GEN_FM=""
   VERSION="V4S"                        /* Default it to V4 Subset   */
   MODEL="3720"                         /* Default this, too         */
   T="NO"
   ARG FN FT FM                         /* GET PARAMETERS FROM COMMAND*/
                                        /* LINE                       */
   IF FM="" THEN                        /* DEFAULT FILETYPE TO "*" IF */
     GEN_FM="*"                         /* NOT CODED                  */
 /* SEE IF FN AND FT WERE PASSED ON COMMAND LINE.                     */
   IF (FN="")|(FT="") THEN
     DO
       SAY ""
       SAY "CORRECT FORM:"
       SAY "VMNCP FN FT FM "
       SAY ""
       SAY "NCP GENERATION FAILED!!!"
       SAY ""
       EXIT 999
     END
 GEN_FN = FN
 GEN_FT = FT
  MACRO=MAC3725
  OBJECT=OBJ3725
   'STATE' GEN_FN GEN_FT GEN_FM         /* SEE IF GEN EXISTS ON DISK  */
   IF RC ¬= 0 THEN
     DO
       SAY GEN_FN GEN_FT GEN_FM "DOES NOT EXIST"
       EXIT RC                          /* EXIT IF GEN DOESN'T EXIST  */
     END
   'ESTATE' MACRO 'MACLIB *'            /* SEE IF MACLIB EXISTS       */
   IF RC ¬= 0 THEN
     SAY "ERROR IN ACCESSING" MACRO "MACLIB"
 /* Check for work disk (tdisk)  */
 CP QUERY V 100
 /* If rc is 40, doesn't exit, so better define and format it.        */
 IF RC = 40 THEN DO
    CP DEFINE T3380 100 10 /* Note this is 3380   change if needed!. */
    PUSH 'TMP100'
    PUSH 'YES'
    FORMAT 100 B
    END
 ELSE ACCESS 100 B
```

```
/* CLEAR OLD FILE DEFINITIONS                                          */
  'FILEDEF * CLEAR'
/* WORKING SPILL FILE                                                  */
/* THE DBWORKFL IS NEEDED ONLY WHEN THERE IS NOT ENOUGH VIRTUAL        */
/* MEMORY TO HOLD ALL OF NDF'S WORK DATA OR IF USERGEN IS SPECIFIED.   */
/*'FILEDEF DBWORKFL DISK DBWORKFL FILE A ( XTENT 40'                   */
/* MACRO LIBRARIES USED IN THE TABLE ASSEMBLY PHASE OF NDF             */
  'FILEDEF SYSLIB DISK' MACRO 'MACLIB *'
  'GLOBAL MACLIB' MACRO
/* INPUT FILE WITH NCP/EP GENERATION STATEMENTS                        */
  'FILEDEF GENDECK DISK' GEN_FN GEN_FT GEN FM
/* GENERATION VALIDATION STEP OUTPUT                                   */
  'FILEDEF SYSPRINT DISK' GEN_FN 'LISTING A'
/* NDF SUMMARY LISTING                                                 */
  'FILEDEF PRINTER TERM'
/* SOURCE FOR TABLE 1 ASSEMBLY - OUTPUT FROM GENERATION VALIDATION     */
  'FILEDEF TBL1SRCE DISK TABLE1 SOURCE B'
/* LISTING FROM THE TABLE1 ASSEMBLY                                    */
  'FILEDEF TBL1LIST DISK TABLE1 LISTING B'
/* TEXT OUTPUT FROM THE TABLE1 ASSEMBLY                                */
  'FILEDEF TBL1OBJ DISK TABLE1 TEXT A'
/* SOURCE FOR TABLE 2 ASSEMBLY - OUTPUT FROM GENERATION VALIDATION     */
  'FILEDEF TBL2SRCE DISK TABLE2 SOURCE B'
/* LISTING FROM THE TABLE2 ASSEMBLY                                    */
  'FILEDEF TBL2LIST DISK TABLE2 LISTING B'
/* TEXT OUTPUT FROM THE TABLE2 ASSEMBLY                                */
  'FILEDEF TBL2OBJ DISK TABLE2 TEXT A'
/* LINK EDIT CARDS OUTPUT FROM THE GENERATION VALIDATION STEP          */
  'FILEDEF LNKSTMT DISK NCPINCL TEXT A'
/* TEMPORARY WORK FILE USED BY THE TABLE ASSEMBLIES                    */
  'FILEDEF SYSUT1 DISK SYSUT1 TEMP 24 (BLOCK 4000'
/* RUN THE NDF STEP                                                    */
  'ICNRTNDF'
/* EXIT BECAUSE OF AN ERROR DURING GENERATION VALIDATION               */
  IF RC ¬= 0 THEN
    DO
      SAY "***ERROR IN EXECUTING NDF***"
      EXIT RC
    END
CP QUERY TIME
/* PUT TEXT OUTPUT FROM TABLE ASSEMBLIES INTO A SIMULATED PDS          */
  'TXTLIB GEN OBJ TABLE1 TABLE2'
  IF RC ¬= 0 THEN
    DO
      SAY "CANNOT FIND TABLE1 TEXT OR TABLE2 TEXT"
      EXIT 99
    END
CP QUERY TIME
/* ERASE TEMPORARY FILES                                               */
  'ERASE SYSUT1 TEMP B'
  'ERASE TABLE1 SOURCE'
  'ERASE TABLE2 SOURCE'
  'ERASE TABLE1 TEXT'
```



```
  'ERASE TABLE2 TEXT'
  'ESTATE' OBJECT 'TXTLIB *'          /* SEE IF OBJLIB EXISTS       */
  IF RC ¬= 0 THEN
    SAY "ERROR IN ACCESSING" OBJECT "TXTLIB"
/* FILDEFS FOR THE LINK EDIT STEP                                     */
  'FILEDEF SYSUT1 CLEAR'
  'FILEDEF' OBJECT 'DISK' OBJECT 'TXTLIB *'
/* NCP/EP TABLE TEXT                                                  */
  'FILEDEF SYSPUNCH DISK OBJ TXTLIB A'
/* NAME OF OUTPUT LIBRARY FOR THE LOAD MODULE                         */
  'FILEDEF SYSLMOD DISK' GEN_FN 'LOADLIB A'
/* RUN LINKAGE EDITOR                                                 */
  'LKED NCPINCL (MAP NCAL NOTERM LET LIST ALIGN2 SIZE 512K'
CP QUERY TIME
  EXIT RC

Sample EXECs for OPERATOR
/*****************************************************************/
/*  These EXECs should go on OPERATOR's 191 disk.      */
/*****************************************************************/
LOOK EXEC - tell VTAM from OPERATOR to re-access minidisks
/* Tell VTAM to re-access his 191 disk */
'cp send vtam look'
NOTRACE EXEC - turn off VTAM tracing from OPERATOR
/* This exec stops a VTAM trace.                                      */
ARG STUFF
'CP SEND VTAM VTAM F NET,NOTRACE,'||STUFF /* Note concatenation here!.
'CP SEND GCS ETRACE GTRACE OFF'
'CP CPTRAP STOP'
VTAM EXEC - use CP SEND from OPERATOR to issue a VTAM command
&TRACE OFF
* Use the CP SEND command to issue a VTAM command from OPERATOR
* OPERATOR must be a secondary user to VTAM for this to work and
* VTAM must be running disconnected
CP SEND VTAM VTAM &1 &2 &3 &4 &5 &6

VTAMTRAC EXEC - start a VTAM trace from OPERATOR spooled to MAINT
/* This exec starts a VTAM trace.                                     */
PARSE ARG STUFF
'CP CPTRAP START TO MAINT'   /* Might change to VTAMBLD..... */
'CP CPTRAP 3D'
'CP CPTRAP GROUPID GCS'
'CP SEND GCS ETRACE GTRACE GROUP'
'CP SEND VTAM VTAM F NET,TRACE,'||STUFF /* Note concatenation!. */

Sample EXECs for VTAMBLD
/*****************************************************************/
/*   These  EXECs  should  go  on  VTAMBLD's 191 disk, which is  */
/*   accessible to VTAM as 192 and thus automatically  accessed  */
/*   as  a  "D"  disk.   Remember that VTAM runs under GCS, not  */
/*   CMS, and therefore all EXECs must have a filetype  of  GCS  */
/*   and must be written in REXX.                                */
/*****************************************************************/
```

```
LOG GCS
/* Try to prevent VTAM from issuing LOGOFF... */
SAY 'LOGOFF of VTAM machine not allowed - use CP LOGOFF to logoff.'
VTAMASM EXEC - assemble a VTAM module
&TRACE OFF
* ASSEMBLES A VTAM MEMBER - AFTERWARDS YOU NEED TO RUN VMFLKED
GLOBAL MACLIB MYMAC VTAMAC CMSLIB DMSSP
ASSEMBLE &1
PROFILE EXEC for VTAMBLD
&TRACE OFF
 EXEC DTRIPF NOPAN
* Next few added
CP SET PF12 RETR
CP SET PF24 RETR
* ACCESS VTAM's 191 DISK
ACCESS 298 B
* Note that NCPBLD's 191 is our 192, so is automatically the D disk
* And the rest of the VTAM disks owned by MAINT
ACCESS 299 C
ACCESS 29A E
ACCESS 29B F
ACCESS 29C G
ACCESS 29D I
* Now access SSP run disk
ACCESS 343 J
* Now access NCP Subset run disk - ACCESS 33E if NCP/3725
ACCESS 35B K
SYN SYN
CP TERM HILIGHT ON
CP SET RUN ON

/*************************************************************************/
/*  These EXECs should go on VTAM's 191 disk, which is                   */
/*  accessible to VTAMBLD as 298; you can consider it to be              */
/*  "owned" by VTAMBLD.                                                  */
/*************************************************************************/
LOOK GCS - re-ACCESS all disks and re-issue GLOBAL LOADLIB
/* Reaccess all disks and re-issue the GLOBAL LOADLIB. */
/* This goes on VTAM's 191 disk to minimize maintenance coding. */
/* Reaccess all disks and the loadlibs. */
/* First my 191 disk, just in case it's been changed.... */
'ACCESS 191 A'
/* next VTAMBLD'S 191 for VTAMLSTs, EXECs, etc... access it ahead */
/* of the IBM disks in case we use the same names..... */
'ACCESS 291 B'
/* then MAINT's VTHRUN disk....        */
'ACCESS 29A F'
/* and NCPBLD's 191 for NCP source, RRT, etc. ..  */
ACCESS 193 E
/* and MAINT's SSPRUN disk....                 */
ACCESS 343 I
/* and finally MAINT's NCPRUN disk.            */
ACCESS 35B G /* this is NCP Subset, use 33E for NCP/3725 */
```



```
/* Finally, we issue GLOBAL after ALL ACCESS commands.                  */
/* Added VTAMUSER to loadlib list.  It is first in the list in case     */
/* we name a member the same as an IBM-supplied member.  This, of       */
/* course, is not recommended, but Murphy's Law guarantees that, in     */
/* real life, it will happen at least once... .  Note that this         */
/* should be a small library, so searching it first should take a       */
/* very small amount of time.                                           */
/* Be sure to put the name of YOUR NCP LOADLIB in the GLOBAL - for      */
/*  example, NCP45                                                      */
    'GLOBAL LOADLIB VTAMUSER VTAM VSCS NCP45 SSPGCS SSPLIB'

PROFILE GCS for VTAM - initializes VTAM, VSCS, RSCS
 /*****************************************************************/
 /* Title-      PROFILE                                           */
 /* Function-   Initialize VM/VTAM and VSCS for use.              */
 /* Returns-                                                      */
 /*      00 (VTAM has been successfully activated)                */
 /*      -0 (VTAM activation failed)                              */
 /*****************************************************************/
CP M OP RUNNING MY PROFILE GCS
CP M VTAMBLD RUNNING MY PROFILE GCS
CP M MAINT   RUNNING MY PROFILE GCS
/* Now spool the console to VTAMBLD for debugging purposes. */
CP SPOOL CONSOLE START TO VTAMBLD
    parse source . . exec_name
    arg list_value . '(' options
/* Now define a couple of 3270's to dial into.  .... */
CP DEFINE GRAF 501
CP DEFINE GRAF 502
CP DEFINE GRAF 503
CP DEFINE GRAF 504
/* Do ATTACHes here - e.g., SNA 3174s, 37XX NCP boxes, etc.....          */
/* You might want to do this in another EXEC, stored on VTAMBLD's 191   */
/*   disk, to make maintenance and migration simpler.                   */
/* And set some other stuff.          */
CP SET PF12 RETR
CP SET RUN ON
/** Set CP options to improve performance of VTAM virtual machine       */
/** 'CP SET QDROP VTAM OFF'          /* don't flush pages when idle     */
/** 'CP SET FAVORED VTAM'            /* VTAM always dispatchable        */
/** 'CP SET PRIORITY VTAM 7'         /* give priority to VTAM           */
/** VTAM initialization                                                 */
   'ACC 291 B' /* This is VTAMBLD's 191 disk   gets us to LOOK exec.    */
   'LOOK'      /* Run the LOOK EXEC - save duplicate coding.            */
/* Added FILEDEF for NCPLOAD.                                          */
 'FILEDEF LOADNCP DISK NCP45 LOADLIB *'
    'LOADCMD VTAM ISTINV00'
    'LOADCMD VSCS DTISLCMD'
/* Note HARD-CODED LIST= parameter on the next card - no operator!.    */
    'VTAM START LIST=01'
    rcode=rc
    if rcode¬=0 then                 /* If VTAM start failure          */
      do                             /* Error, VTAM startup failed     */
```

```
        say '**ERROR** VTAM initialization failed'
        exit rcode
      end                              /* Error, VTAM startup failed    */
/** VSCS initialization          **/
    'VSCS START'/* Initialize VSCS
    rcode=rc                           /* Save startup return code      */
    if rcode¬=0 then                   /* If VTAM start failure         */
      do                               /* Error, VTAM startup failed    */
        say '**ERROR** VSCS initialization failed'
        exit rcode
      end                              /* Error, VTAM startup failed    */
/** RSCS initialization              **/
    'CP AUTOLOG RSCS ????????' /* Initialize RSCS                 */
    rcode=rc                           /* Save startup return code      */
    if rcode¬=0 then                   /* If RSCS start failure         */
      do                               /* Error, RSCS startup failed    */
        say '**ERROR** RSCS autolog failed'
        exit rcode
      end                              /* Error, VTAM startup failed    */
    exit 0
```

A Cookbook Procedure for Applying VTAM Corrective Service (a PTF)

There are numerous places in the VTAM documentation where the procedure for applying a VTAM PTF is described. However, in another instance of Murphy's Law at work, these places can never be found when you most need them; this short "cook-book" may suffice to get you through. It could be considered part of a systems programmer's "tool-kit" (or "cheat-sheets", if you prefer). Although it is written for VTAM, it should work for other OCO-maintained products as well, such as RSCS Version 2, any NCP, ACF/SSP, or even NetView. Just remember to use the appropriate product number and you should be okay (e.g., as shown the procedure is correct for VTAM V3R1 (5668280), but for VTAM V3R1M1 you should use 5668280A, for VTAM V3R2 use 5668280B, etc.). Please note that, although step 10 below describes resetting VTAM after doing the maintenance, you should always back up all the applicable minidisks before starting maintenance (see the chart earlier in this paper) and, if necessary, the SAVED system. Finally, step 10 is obviously disruptive to the running system, and normal change management procedures should be implemented before starting on this procedure. For the most part "normal" VM command notation is shown in the procedures by capitalizing that part of the command which is required and putting in lower case the rest of the command to make it readable. Keying only the capitalized part should work fine and saves the fingers, but for novice VM users tends to be more confusing.

1. *Read this procedure all the way through to make sure you understand what you're going to do and have all the necessary materials on hand (backup tapes, manuals, etc.). I can't emphasize enough that this is an informal, "cookbook" approach - you must also read and understand the normal SRL documentation on maintenance procedures for the particular product involved. If you understand the formal documentation, this guide will then aid you in getting you through.*

2. *SPool CONSole START to keep a record of everything you do. This is invaluable if things go wrong, but is also a useful guide the next time you need to do maintenance. Remember that consoles are spooled in mixed case, so you should load an FCB into your printer with the LOWER option before printing it.*

3. *Back up your running system. You needn't back up the entire system, in all probability, but you most certainly should back up all of the minidisks for the component on which you are about to do maintenance. Remember to do the PARM disk, too. Although it should be obvious, remember to label each backup (if on tape) and to put them someplace safe. When in doubt, back it up twice and put one backup in your desk. Remember that Murphy was an optimist, you may need this second tape only once in your lifetime, but that one time will make all the time you spent doing the extra backups worth it.*

4. *Logon as MAINT, DEFine STORage as at least 12Meg, and Ipl CMS. If your system has a CMSL, use it instead to keep CMS out of the way when you need to do the SAVESYS of VTAM.*

5. *ACCess your 191 disk as C. This is necessary because the VTAM install exec 5668280 must run on the C disk.*
6. *The PTF tape has 2 files on it. The first is the same as the listing you got with the tape, the second file has one or more CMS files. You really don't need the first file, but just in case, do a VMFPLC2 SCAN to see if there is more than a MEMO file. If there is, better look at it. Otherwise you need to access the DELTA disk (MAINT's 29D) as the A disk (key in ACCess 29D A) and then do a VMFPLC2 LOAD * * A to load the fixes.*

6. *Now create a file using XEDIT with a filetype of APPLIST on the 29D disk. Each PTF you wish to apply must appear in this file. Refer to the normal VM documentation for help if necessary.*

7. *ACCess 348 as O. 348 has the VTMPARM file which tells VMFMERGE and VMFZAP where to find and put things for VTAM. Note that some products refer to 349 or the PARM disk, use whichever one is appropriate for your installation. In this document all PARM files are shown as being on 348.*

8. *Now you're ready for business. Run VMFMERGE 5668280 PTFLIST listname to merge in the new fixes from the PTF tape. When this completes, ALWAYS run VMFZAP 5668280, in case there have been any ZAPs, this will re-apply them. Finally, to rebuild and resave VTAM and VSCS, run 5668280 BUILD.*

9. *If VTAM was not logged off before starting this, from OPERATOR key in SEND VTAM LOOK to have VTAM re-access its disks. Then try to shut VTAM down. If this fails (and it probably will, since pointers are probably messed up), disconnect as operator, logon as VTAM, do a SYS RESET to clear memory, and then IPL GCS ("***NOT*** CMS!!). VTAM should come right up.*

10. *If you have problems, check first to make sure that all the steps above completed successfully. If they did not, it is probably best to restore your minidisks (remember those backups you put in your desk?) and start all over again after checking the appropriate formal documentation again.*

Appendix Bx.

- *SNA Concept and Products*

  IBM manual GC30-3072

- *SNA Technical Overviewe*

  IBM manual GC30-3073

- *VM SNA Implementation*

  Presentation Guide

  J.M. Dupont - IEC La Hulpe 1988

- *IBM 9370 Systems in SNA Networks*

  IBM manual GG24-1710

- *SNA Network Interconnection*

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