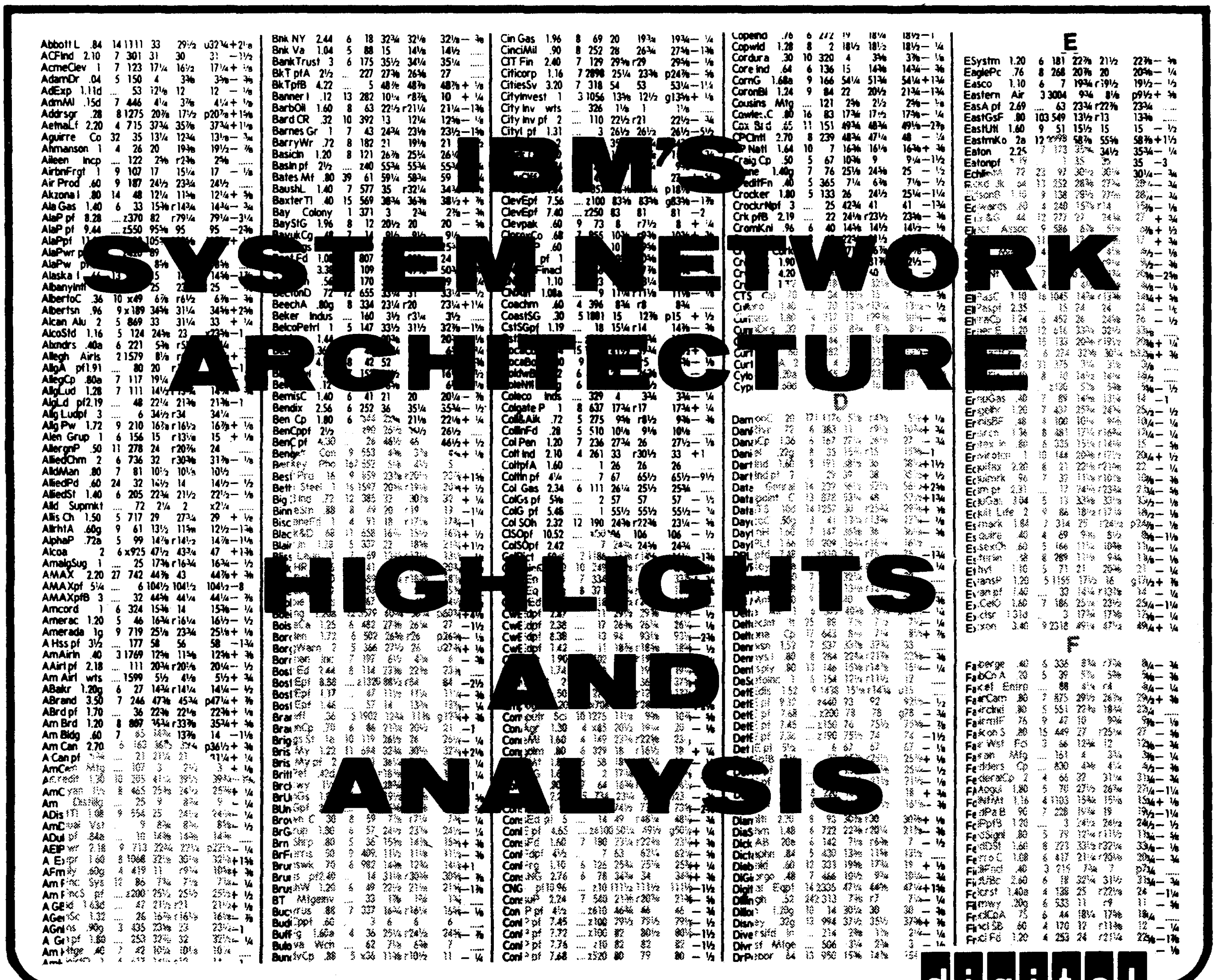
# competitive update

DECEMBER 15, 1980

# IBM'S SYSTEM NETWORK ARCHITECTURE HIGHLIGHTS AND ANALYSIS



digital

The Competitive Analysis area is divided into two clusters — Commercial, managed by Don McGinnis and Technical, managed by George Hayes.

Although each cluster is responsible for its respective marketing areas, the groups are well aware of overlap within the Commercial and Technical marketplace and are prepared to work together to service all requests for competitive data.

**COMMERCIAL CLUSTER**

| COMPETITOR | CONTACT | DTN/LOCATION |
|---|---|---|
| **IBM GSD**<br>**HP Commercial**<br>**Mainframe Competitors** | Don McGinnis | 264-5375<br>MK1-2/N38 |
| **IBM DPD** | Rick Case | 264-7307<br>MK1-2/N38 |
| **Wang (Integrated Information Processing)**<br>**Prime Commercial**<br>**Datapoint**<br>**IBM OPD** | **(OPEN)** | <br>MK1-2/N38 |

**TECHNICAL CLUSTER**

| COMPETITOR | CONTACT | DTN/LOCATION |
|---|---|---|
| **Data General** | George Hayes | 231-4886<br>MR1-1/A95 |
| **Prime Technical**<br>**Perkin-Elmer** | Martin Harrison | 231-7194<br>MR1-1/A95 |
| **HP Technical**<br>**Honeywell**<br>**SEL**<br>**Communications** | Nizar Huddani | 231-7194<br>MR1-1/A95 |

The following are trademarks of DIGITAL EQUIPMENT CORPORATION

COMPUTER LABS; DDT; DEC; DECUS; DIGITAL; FLIP CHIP; FOCAL; PDP; TYPESET-8; UNIBUS; DECtape; IDAC; DIBOL; EDUSYSTEM; OMNIBUS; OS/8; COMTEX; RSX; RSTS; DECCOMM; PHA; LAB-8; DECsystem-10; MASSBUS; TYPESET-11; VAX 11/780; DECnet; TRAX

**COMPETITIVE UPDATE/HIGHLIGHTS & ANALYSIS** IS PUBLISHED BY CORPORATE SALES COMMUNICATIONS, BG/S51 MAYNARD, PRINTING AND CIRCULATION SERVICES, NORTHBOROUGH

| | | |
|---|---|---|
| **EDITOR:** | Deanna Michaelson | 223-6353 |
| **COVER:** | Brenda Haywood | 223-5355 |
| **EDITORIAL DIRECTOR:** | Pat Manning | 223-4373 |

Member of IABC
International Assoc. of Business Communicators

# IBM'S SYSTEMS NETWORK ARCHITECTURE: HIGHLIGHTS & ANALYSIS

Nizar Huddani
Toronto
(416) 977-2844
RCS: TORD

TABLE OF CONTENTS

# 1.0 INTRODUCTION

Since its announcement in 1974, IBM's System Network Architecture evolved from providing only terminal access for mainframes to providing distributed processing with a mainframe emphasis. This mainframe emphasis is embodied in the primary implementation of the network's intelligence and functionality (and thus complexity) in the host.

The fundamental difference between SNA and DNA (Distributed Network Architecture) is that SNA is optimized (and thus excels) in providing terminal and intelligent cluster controller access to large hosts, while DNA is intended to provide broad distribution of processing on small to large systems with available access to large mainframes. As a result, DNA and SNA are two solutions to two different problems.

SNA has a 'layered' implementation similar to DNA and most other contemporary network architectures. Within this architecture, SNA defines node types in a strict hierarchial fashion, differentiating hosts (controlling specified 'domains'), communications controllers (front-ends), cluster controllers (slave nodes) and terminals.

The software and hardware products that compose SNA are numerous, and rest primarily in the host. The most prominent software products include two 'access methods' (TCAM and VTAM) by which user programs and IBM's database and transaction processing packages (IMS and CICS) can utilize SNA networking. The software (NCP) that controls such lower level functions as path control, routing and link control, polling and error recovery, reside in the 3705 front-end processor.

IBM's two distributed processing computers, the 8100 and 4331, have some additional SNA products. The 8100, which is not 370 compatible, has a large repertoire of cluster controller SNA capabilities (slave-to-host), but little in the way of independent (peer-to-peer) functions. The 4331, being 370 compatible, is somewhat improved with a stripped-down version of VTAM that does not require the very expensive 3705 front end.

Until the announcement of the 4300 Series, IBM could not compete in a DECnet type of environment. Since the 4300s are in approximately the same performance range as the VAX systems, Digital should now expect to experience more competition from IBM in a networking environment.

This document does not contain pricing information on construction of a network for the IBM systems. Please refer to VAX-11/780 vs. IBM 4341-1 dated October 6, 1980 and VAX-11/750 vs. IBM 4331-2 dated October 20, 1980 Highlights & Analyses for details.

## 2.0 SNA BACKGROUND

- 1974: IBM's Systems Network Architecture (SNA) was introduced as part of a product family announcement called "Advanced Function for Communications." As originally announced, SNA was totally terminal-to-computer oriented.

- 1976: IBM announced an extension to SNA called "Advanced Communications Function" (ACF). ACF added a "multisystem networking facility" to SNA, allowing computer-to-computer SNA communications.

- 1979: With the announcements of the 8100 and 4300 systems, IBM aggressively entered the distributed data processing marketplace. SNA is an essential part of IBM's DDP strategy.

## 2.1 SNA HOSTS

Only the following systems can be hosts in an SNA network:

IBM 303Xs
IBM 4300s } Only the larger ones
IBM 370s

It is possible to have an 8100-to-8100 network with very minimum functionality (task-to-task, in Assembler only).

## 3.0 SNA USER ACCEPTANCE

IBM's customers were initially reluctant to move to SNA because:

- SNA can be expensive in terms of hardware and software overhead (details are in Section 5.0); and

- A large investment would be required in applications programs and terminals using binary synchronous or START-STOP (asynchronous) communications.

Factors now leading to increased acceptance of SNA by IBM customers are:

- The functionality of SNA has advanced to the point where it is viable for use in DDP

- New IBM products offer features which can be fully utilized only with SNA

- IBM's high-level selling has resulted in customer corporate management decisions to "standardize on a uniform network architecture"

- SNA now allows coexistence with BISYNCH terminals.

## 4.0 S N A  C O N C E P T S  A N D  A R C H I T E C T U R E

### 4.1 S N A  V S .  D N A  A P P R O A C H

The following sections (4.0, 5.0 and 6.0) describe the technical concepts of SNA, products that use SNA, and sales strategies for competitive situations involving SNA. In using this material, you will often find that technical 'DECnet vs. SNA' comparisons are of limited value in competitive situations. Technical comparisons are not practical in this instance because DNA and SNA are not two different solutions to the same problem, but two different solutions to two different problems. DNA is the solution to the problem of interconnecting computers for distributed data processing (thus decreasing the customer's dependence on larger IBM computers). IBM is now entering the race for this market which companies like Digital have competed in for so long. SNA is the solution to the problem of providing access to large, centralized computers (thus increasing the customer's dependence on larger IBM computers).

Unless the customer is convinced of Digital's concept of distributed data processing, you cannot win against SNA. SNA provides both terminals and computer interconnections with the 4300 and 8100s, allowing IBM to provide a technically viable alternative to DECnet. If the customer wants only to provide access to a large, central, IBM computer, and not true distributed processsing, then he will probably choose SNA.

### 4.2 L A Y E R  S T R U C T U R E

SNA, like DNA, is a layered protocol architecture. SNA defines five layers (Refer to the Digital Network Architecture General Description, order number AA-H202B-TK for full details on DNA and its layers):

| DECnet: | | SNA |
|---|---|---|
| Data Access Protocol (DAP) | 5 | Presentation Services |
| Network Services Protocol (NSP) | 4 | Data Flow Control |
| Transport Protocol | 3 | Transmission Control |
| | 2 | Path Control |
| Digital Data Communications Message Protocol (DDMCP) | 1 | Synchronous Data Link Control (SDLC) |

It is important to note that in the strict sense, DNA no longer means just DECnet. It also now encompasses connections to both foreign vendors (principally IBM) and to Public Data Networks (PDN) implementing the X.25 protocol.

- Layer 1: Synchronous Data Link Control (SDLC)

  - Functions: SDLC controls the physical communications link. SDLC is a 'bit stuffing' protocol compatible with International Standards Organization (ISO) High-Level Data Link Control (HDLC) and American National Standards Institute (ANSI) Advanced Data Communication Control Procedure (ADCCP).

  - Comments: SDLC uses a Cyclic Redundancy Check (CRC) for error detection, and controls the retransmission of blocks received with errors. SDLC supports full and half-duplex point-to-point leased, switched, and multipoint lines at speeds from 1200 to 230.4K bits/second. It also supports a line configuration called a loop, which is used to connect local terminals to the 8100 and 4331 (much like the DEC Dataway is used).

    Note that SDLC without the remainder of SNA offers very little in user functionality (like DDCMP without the remainder of DECnet). When a customer asks for SDLC support, the assumption can usually be inferred that he means SNA support.

  - DNA Equivalent: In SNA, SDLC corresponds functionally with Digital Data Communications Message Protocol (DDCMP) in DECnet. The message formats for SDLC and DDCMP are totally different, but the functions they perform are almost identical. DDCMP more efficiently utilizes line and CPU with variable length messages (see Section 7 of DDP Marketing Guide).

- Layer 2: Path Control

  - Functions: Routes messages out of, through, and into SNA nodes. Routing is performed according to network address. Conversion of logical unit names to network addresses is performed by the SNA host at session initiation (SNA hosts are described in Section 2.1 of this document).

  - Comments: Because SNA was originally developed for terminal-oriented networks, a remote communications controller was an early feature of SNA (terminal concentrator). To provide this, route through was implemented in SNA path control in 1976.

  - DNA Equivalent: Path control in SNA corresponds functionally with the 'transport' routing function of the Transport Layer in DECnet. Route through is now implemented with Phase III. Routing in DNA is adaptive while with SNA, it is fixed by 'host' tables.

- Layer 3: Transmission Control

  - Features: Provides sessions (i.e., logical links) between network addressable units (i.e., tasks). Transmission control maintains the integrity of each session, logically isolates it from other sessions, keeps messages in sequence, and provides positive confirmation of message delivery.

  - DNA Equivalent: Transmission control in SNA corresponds functionally with the logical link functions of NSP in DNA.

- Layer 4: Data Flow Control

  - Features: Insures that messages are not sent over a session unless the receiver is willing to accept them. SNA includes an assortment of data flow control protocol options. The primary purpose of these is to give the session, which is inherently full-duplex, the appearance of being half-duplex.

  - Comments: The reason for this is historical, and follows from the terminal orientation of SNA. Ever since IBM first attached a 1050 terminal to a 7094 host (before the PDP-8 existed), IBM terminals have been half-duplex. All the software IBM developed to use those terminals (CICS, IMS, TSO, etc.) assumed that terminals were half-duplex. Using SNA, this software communicates with its terminals over sessions. SNA data flow control allows this software to use the same terminal handling logic used with pre-SNA terminals.

  - DNA Equivalent: Data flow control in SNA corresponds functionally with the flow control function of NSP in DNA. However, flow control in DNA is full-duplex and not half-duplex as in SNA.

- Layer 5: Presentation Services

  - Features: Provide the interface between SNA and the user. The primary emphasis in the currently available SNA product is on terminal handling: control of printers, displays, keyboards, etc. However, long term trends point to its importance in office automation areas such as document retrieval and word processing. SNA presentation services include both interactive and batch terminal handling. IBM has recently started offering file transfer/access presentation services in SNA products.

  - Comments: Presentation services are normally by-passed when performing task-to-task communication. In this case, the application programs interface directly to data flow control. Task-to-task communication requires Assembler programming to obtain access from COBOL and PL/I programs.

    Unlike the lower layers, not all presentation service protocols are formally and publicly documented. This blurs the distinction between presentation services, which are part of SNA, and IBM-supplied application programs, which use SNA but are not part of it.

  - DECnet Equivalent: DNA provides various levels of support, e.g. file transfers, network management, etc. Task-to-task communications can be from MACRO and any of the supported high-level languages (COBOL, FORTRAN IV PLUS, BASIC PLUS, etc.) Refer to the appropriate SPD.

## 4.3 NETWORK ADDRESSABLE UNITS

SNA defines several different types of nodes. To understand the differences between node types, recall that sessions in SNA connect Network Addressable Units (NAUs) which are like logical link addresses with DECnet, with the cooperating tasks being architecturally defined as the users of NAU services. NAU types include:

- Application program NAUs are called Logical Units.
- Physical Units control the operation of SNA nodes: starting and stopping lines, collecting error statistics, etc. A Physical Unit in SNA corresponds logically with the Network Information and Control Exchange (NICE) task in DECnet in that both may be regarded as 'links' for various network management requests directed to the node on which they run.
- The System Services Control Point (SSCP) controls access to all network resources within its 'domain' (described below), including Logical Units.

An example is presented here to help illustrate this procedure. Application program X wants to open a session with application program Y. The sequence of messages is:

1. Program X sends a message to the SSCP saying "I want to open a session with Y,"
2. The SSCP sends a message to program Y saying "X wants to open a session with you and has my permission,"
3. Program Y sends a message to program X saying "the SSCP says you want to open a session with me,"
4. Program X sends a message to program Y saying "yes, I do." Only then can X and Y exchange data.

NOTE: It takes four messages for SNA to do what DECnet does with two messages.

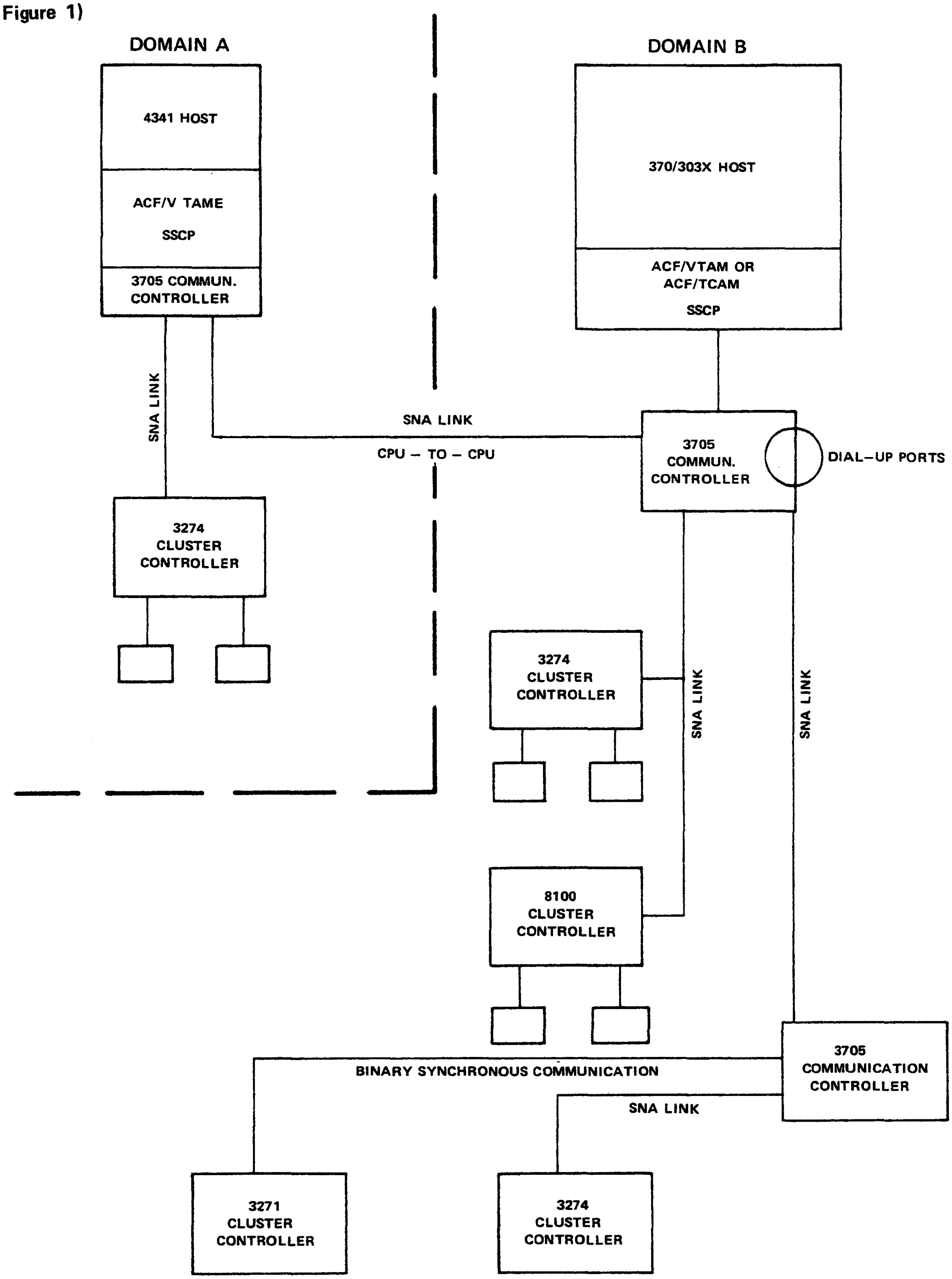
### 4.3.1 Node Types

There are four types of SNA nodes:

1. HOST: A host in SNA is any node that contains an SSCP. In Figure 1, the 4341 and System/370 are hosts. The set of nodes controlled by a host is called its 'domain.' There must always be at least one host running in an SNA network. The host knows the network address (used by path control) of every logical unit in its domain. In the example above, program X knows only the <u>name</u> of Y, not its address, at Step 1. In Step 2 the SSCP provides to <u>Y</u> the address of X. Only when the message of Step 3 arrives does X learn Y's address.

2. COMMUNICATIONS CONTROLLER: In Figure 1, the 3705s are communications controllers. Conceptually, communication controllers are routing nodes. They also reformat SNA protocol headers as required for the two node types described below. Practically, communications controllers are front-end processors and terminal concentrators to reduce host overhead and line costs.

(Figure 1)


DOMAIN A
DOMAIN B
4341 HOST
ACF/V TAME
SSCP
3705 COMMUN.
CONTROLLER
370/303X HOST
ACF/VTAM OR
ACF/TCAM
SSCP
SNA LINK
SNA LINK
CPU – TO – CPU
3705
COMMUN.
CONTROLLER
DIAL–UP PORTS
3274
CLUSTER
CONTROLLER
3274
CLUSTER
CONTROLLER
SNA LINK
SNA LINK
8100
CLUSTER
CONTROLLER
3705
COMMUNICATION
CONTROLLER
BINARY SYNCHRONOUS COMMUNICATION
SNA LINK
3271
CLUSTER
CONTROLLER
3274
CLUSTER
CONTROLLER

3. CLUSTER CONTROLLER: In Figure 1, the 8100 and 3274 are cluster controllers. Cluster controllers may or may not be programmable. On programmable cluster controllers, the logical units are application programs interfacing to terminals. On nonprogrammable cluster controllers, the logical units are devices such as displays, printers, etc. A cluster controller must attach to either a host or a communications controller.

4. TERMINAL: In Figure 1, the 3767s are terminals. Terminals use a simplified set of SNA protocols. A terminal must attach to either a host or a communications controller. It can also pass through a cluster controller (8100).

## 5.0 S N A P R O D U C T S

In Section 4.3.1, SNA products and descriptions were divided into four node types: hosts, communications controllers, cluster controllers, and terminals. The discussion of the particular SNA products follows the same structure.

## 5.1 S N A H O S T P R O D U C T S ( T C A M & V T A M )

Full SNA host functionality is available only on System/370, 303X and 4300 systems. IBM provides two types of software access methods to communicate from the host system using SNA:

- Virtual Telecommunications Access Method (VTAM)

  VTAM is the basic access method for SNA communication. An application program using VTAM participates directly in the session (i.e., logical link) with the logical unit on the remote cluster controller, terminal or system. The application program can directly manipulate the various SNA Data Flow Control protocols to maintain tight control over the exchange of messages on the session.

- Telecommunications Access Method (TCAM)

  In contrast to VTAM, a TCAM application program does not directly access the SNA session, rather it reads and writes messages from queues maintained either in memory or on disk by TCAM. The messages in those queues are transmitted or received over sessions by a Message Control Program (MCP).

In practice, only sophisticated installations write their own VTAM application programs. They use VTAM through CICS, IMS or TSO instead. This allows for the use of programs written in higher level languages such as COBOL or PL/I. (VTAM supports Assembler language only.) An installation choosing not to use CICS, IMS or TSO would most likely use TCAM as its SNA access method, as TCAM provides support for PL/I and COBOL application programs. The message control program required as part of TCAM's operation must however, be written in Assembler.

### 5.1.1 Host-To-Host Support

In the early phases of SNA, both VTAM and TCAM were available as what IBM calls System Control Programs (SCP). System Control Programs are provided as part of the system price. With the development of enhanced SNA capabilities, including the multisystem networking facility, IBM introduced Program Product versions of both VTAM and TCAM. These are called Advanced Communications Function VTAM and Advanced Communications Function TCAM respectively (ACF/VTAM, ACF/TCAM). In the remainder of this document, the term VTAM will be taken to mean ACF/VTAM and TCAM will be taken to mean ACF/TCAM. The SCP versions of these products (the ones without ACF) support only single host networks, will not run on newer hardware, and are of limited interest in distributed data processing.

Both VTAM and TCAM support only task-to-task communications, either with other programmable SNA nodes or with logical units such as printers or display stations on nonprogrammable nodes.

Presentation services must be implemented by the VTAM or TCAM application program. There are however, various other IBM software products which provide presentation services support.

### 5.1.2 Database Transaction Processing Support

Both IMS (Information Management System) and CICS (Customer Information Control System) provide screen handling, forms oriented presentation services. These work similar to Digital's FMS Forms Management System in that the application programmer writes a form description separate from the procedural part of the application program. CICS and IMS allow the SNA presentation services to take these form descriptions and build the proper SNA presentation service protocol messages to go to the display logical unit. Likewise, display presentation service protocol messages generated from the display logical unit, identify where on the screen various data fields were filled in by the display keyboard operator. The CICS and IMS presentation services use that information to determine which fields have been filled in and pass the information back to the application program, formatted as defined in the screen definition.

### 5.1.3 Remote Job Entry Support

Support for remote job entry is provided by the Job Entry Subsystems JES1, JES2 and JES3 under OS/VS and Power/VS under DOS/VS. These permit the same type of remote job entry functions to be performed from an SNA RJE station that are traditionally performed in a bisynchronous environment from a 2780/3780 or HASP multileaving RJE station. In addition, the Job Entry Subsystems provide support for Network Job Entry (NJE), which is the remote submission of a batch job from one host to another host in the network. This is comparable to the remote command file or batch file submission and execution facilities of DECnet.

### 5.1.4 Cluster Controller Support

Many of the programmable cluster controllers such as the 3790 and 8100 under DPCX, require that program development be performed on the host system, and programs and data field descriptions be down-line loaded from the host to the cluster controller. A set of programs supplied by IBM called Subsystem Support Services (SSS) are used for the down-line loading function. A similar facility called Distributed System Executive (DSX) is host support for the 8100 as a cluster controller.

### 5.1.5 Presentation Services Support

IBM has recently added host software presentation services oriented more toward true distributed data processing. The most significant of these is a facility offered in CICS for host-to-host linking of transaction steps for a given transaction. It also supports transparent remote file access for CICS to CICS, IMS to IMS, and CICS to IMS.

Note that with the exception of Network Job Entry, all of the presentation services as implemented by the software described herein are asymmetric. Control of these functions is performed by the host software.

### 5.1.6 4331 Support

Advanced Communications Function Virtual Telecommunication Access Method Entry (ACF/VTAME) is a special version of VTAM that is supported only on the 4331 host processor. Using ACF/VTAME it is possible to connect up to eight SNA lines to a 4331 without requiring an external communications controller. This is done using the communications adapter feature of the 4331.

On other 4300s, standard communications controllers (3705) are required. Since the 4331 is a very slow CPU (about the speed of a PDP-11/34 to -11/44), and there exists a very high overhead of SNA software, IBM will not recommend a 4331 as a central host. The 4331-2 may be able to support two lines at most. 4341 and 303X series CPUs would be a logical choice to provide reasonable performance even in a small terminal network (16-48 terminals).

### 5.1.7 Network Generation

Both VTAM and TCAM are extremely large pieces of software, using from 256K bytes to 2M bytes of real memory depending on configuration and performance requirements. The generation procedure for both VTAM and TCAM is fairly complex, requiring the explicit definition of all nodes and logical units within the host's domain. This means that all application programs that will run on either the host or remote nodes must be declared in the generation process. In addition, use of TCAM requires that the Message Control Program be written (in Assembler) before one can run application programs. Systems programming time needed for a VTAM or TCAM generation can range from a week to several months, depending on the complexity of the network.

## 5.2 SNA COMMUNICATIONS CONTROLLERS (3704 & 3705)

Each of the hosts described above requires an IBM 3705 communications controller, except the 4331 running ACF/VTAME. The 3705 is a programmable minicomputer-like device, specifically designed for controlling communications lines. It can be attached either directly to the host channel (i.e., similar to a UNIBUS on a PDP-11 system) or may be attached over a communications line through another 3705.

IBM offers another model of communications controller, the 3704, which is program compatible with the 3705. The 3704 is limited to 64K bytes of memory, however, which is not sufficient to run the latest releases of the SNA communications controller software. SNA requires a 3705 for remote connections.

Prices for 3705 communication controllers range from $40,000 and above depending on configuration, with $100,000 as a fairly typical price.

### 5.2.1 Network Control Program

The SNA software for the 3705 is called Network Control Program VS or NCP/VS. The VS, which means 'Virtual Storage,' is superfulous as the 3705 itself does not have virtual storage. Rather, VS is used to distinguish NCP/VS from an earlier version of the NCP which does not provide SNA support. As with VTAM and TCAM, a Program Product version of NCP/VS called ACF/NCP/VS (Advanced Communications Function Network Control Program VS) is required to support the multisystem networking facility.

Given sufficient memory, a 3705 can support over 300 SNA lines, depending on the line speeds being used. Only a very large system such as a 3033-MP can support this many lines and provide reasonable performance.

The term Network Control Program is itself a misnomer as the System Services Control Point located on the host actually controls the network (see Section 2.0). The Network Control Program on the 3705 communications controller provides path control and routing functions and controls the SDLC physical communications links.

### 5.2.2 Partitioned Emulation Program

Both NCP/VS and ACF/NCP/VS offer the Partitioned Emulation Program (PEP) as an option. The Partitioned Emulation Program permits the use of a portion of the 3705 to emulate the earlier IBM 2701, 2702 or 2703 nonprogrammable communications controllers that were used for asynchronous and binary synchronous communications. The Partitioned Emulation Program is not part of SNA, but is used to share a 3705 between SNA and non-SNA communications access methods.

## 5.3 SNA CLUSTER CONTROLLERS

IBM offers a wide range of cluster controllers, both programmable and nonprogrammable, that are supported by SNA. Programmable cluster controllers include:

- General-purpose minicomputers, such as the 8100, System/32, System/34, System/38 and Series/1, and
- Limited function programmable cluster controllers which require program development on the host system. These include the 'general-purpose' 3790 and industry-specific systems for retail stores, grocery stores and banks.

The major nonprogrammable SNA cluster controllers are:

- The 3274 cluster controller for the 3270 display system, and
- The 3770 family of batch remote job entry terminals.

GSD products are not yet fully integrated into SNA.

### 5.3.1 IBM 8100

The IBM 8100 is a repackaged, enhanced version of the IBM 3790 cluster controller. The major enhancement to the 8100, in addition to more cost-effective processors, is a new operating system called DPPX (Distributed Processing Programming Executive).

DPPX application programs may communicate task-to-task with programs running on an SNA host. In addition, optional software is offered under DPPX for remote job entry presentation services to an SNA host and for 3270 data stream compatibility. The 3270 data stream compatibility features allow a 3278 terminal that is physically connected to an 8100 to access the SNA host system as if it were attached instead to a 3274 cluster controller. This is effectively a virtual terminal facility from an 8100 to a host system. Similar facilities are offered on the programmable cluster controllers.

The 8100 is unique among IBM cluster controllers in that IBM has announced support for peer-to-peer 8100 communications in the absence of a 4300, 303X or System/370 SNA host.

IBM has enhanced its offerings on the 8100 in recent months. Refer to your branch copy of DATAPRO Reports or other industrial publications for more details on IBM 8100 Series.

### 5.3.2 IBM 3274

Nonprogrammable cluster controllers such as the 3274 and the 3770 family, are specific to interactive display oriented or batch RJE types of presentation services.

### 5.3.3 IBM 3790

Some of the programmable SNA cluster controllers like the 3790, are capable of being hosts to their own miniature SNA networks. When used in this manner, they are referred to as sub-hosts. It is important to recognize however, that the networks coming into a sub-host must consist only of nonprogrammable cluster controllers and terminals, and are separate networks from the network in which the cluster controller appears. This is analogous to the 'network' of terminals attached to a Digital system through terminal drivers, rather than a distributed data processing network.

## 5.4 SNA TERMINALS PRODUCTS

There are only two IBM products which are terminals as defined by SNA:

- The 3767 is a matrix printer terminal that is similar to a DECwriter, but communicates with the host using SNA protocol rather than asynchronous START/STOP communication.
- The SDLC version of the 3271 control unit is used with 3277 terminals. This is distinct from both the bisync version of the 3271, and the 3274, which is an SNA cluster controller.

# 6.0 COMPARISON OF DECnet AND SNA

| DNA | SNA |
|---|---|
| • Primary Emphasis<br><br>DECnet is primarily designed for distributed processing on mini-computers and mainframes. | • Primary Emphasis<br><br>SNA is primarily designed for distributed terminal access to large IBM hosts. |
| • Range of Systems<br><br>Full DECnet user capabilities are available on systems from RT-11 to VAX. Task-to-task is available on DECsystem-10/20. File transfer is available on the DECSYSTEM-20 only. | • Range of Systems<br><br>Full SNA capabilities are limited to 4300, 303X, and System/370 host systems. The 8100, System/32, 34, 38 and Series/1 have limited SNA capabilities. |
| • Task-to-Task Communication<br><br>Available to FORTRAN, BASIC PLUS, COBOL and MACRO programs. | • Task-to-Task Communication<br><br>Requires Assembler programming to obtain access from COBOL and PL/I programs. |

## DNA

- **File Transfer**

  Transfer of data, program, or batch files can be initiated by a simple user terminal command or batch command file on sending or receiving system.

- **File Access**

  Available on VAX, RSX, IAS and RT-11 systems. File access on VAX is integrated with RMS and is program transparent.

- **Terminal Support**

  All Digital operating systems have terminal drivers designed in as integral parts. Phase III DECnet network command terminal sypport is integrated with the terminal driver of each operating system.

- **Network Topology**

  DECnet places no constraints on network topology (the configuration of nodes and links in a network). This allows Digital to configure a network to match the user applications' data movement requirements.

- **Route-through and Multipoint**

  Route-through and multipoint may be used with Phase III DECnet to reduce communications line costs. Phase II nodes may be used in Phase III networks.

## SNA

- **File Transfer**

  Data files may be transferred between host and cluster controller (8100, S/32, 34, 38, Series/1) under host control. Program files may be transferred from host to cluster controller. Inter-host file transfer is batch oriented.

- **File Access**

  Available only CICS-to-CICS. File access from 8100 is not program transparent, but requires task-to-task communication with a CICS or IMS application program.

- **Terminal Support**

  Terminal support was added to IBM's major operating systems as an afterthought. SNA was developed primarily to bring order to IBM's former assortment of incompatible terminal access methods. As such, SNA has excellent terminal support (for SNA terminals and 3270s).

- **Network Topology**

  SNA networks, except those consisting only of 8100s, require a 4300, 303X, or System/370 host. All communications must flow through a host. Networks consisting only of 8100s are limited to task-to-task communication.

- **Route-through and Multipoint**

  Route-through and multipoint may be used to reduce communications line costs. Route-through is limited to hosts and 3705 communications controllers. Only hosts and 3705s may be multipoint masters; only cluster controllers (8100, S/32, 34, 38, Series/1) and terminals may be slaves.

## DNA

- Network Generation

  Network generation is done interactively for each node. DECnet netgens typically take one-half to four hours. Network configurations may be changed while DECnet is running. Parameters may be changed whenever DECnet is started. Application programs do not need to be defined before execution.

- Hardware Requirements

  DECnet requires 16K bytes to 24K bytes of dedicated memory depending on operating system and configuration.

  A DPCL-11B, the highest performance DECnet communications line interface hardware, costs $7,300/line.

- Delivery

  All DECnet capabilities are currently available.

## SNA

- Network Generation

  All nodes and application programs in a host's network domain must be explicitly defined to VTAM or TCAM. All hosts except the 4331 require generation of NCP/VS for the 3705. VTAM, TCAM, and NCP/VS generations often take several weeks.

- Hardware Requirements

  VTAM, the primary SNA host software, requires 256K bytes to 2M bytes of dedicated memory, depending on configuration and performance requirements. Hosts other than the 4331 require a 3705 communications controller which costs $100K in typical configurations.

- Delivery

  The SNA capabilities currently being sold by IBM were announced June 1979. The products to implement these capabilities have FCS dates as late as May 1981.

## 6.1 MARKETING STRATEGIES AGAINST SNA

DECnet and SNA are two different solutions to two different problems. Discussed here are three different applications of SNA and alternative Digital solutions.

- Terminals-Only Network

  SNA excells in this area. Digital, however, has always had terminals attached to its computers. A large DECsystem-10/20 should provide a cost-effective solution. With Digital, there is no need for high overhead software (VTAM, CICS, etc.) to attach terminals.

  **NOTE:** Digital does not support certain terminals (point of sale, teller terminals, etc.) In this situation, Digital does not have a viable solution. However, CSS can design and implement support for these terminals.

- Intelligent Network

  Intelligent cluster controllers are attached to an IBM host via SNA. These cluster controllers could be 8100s, 4300s, Series/1, etc. There is no interaction between the various cluster controllers. Digital can provide an alternate solution to the IBM cluster controllers; on a product-by-product basis, Digital has superior offerings, e.g. PDP-11s vs. 8100, VAX vs. 4300s. With the availability of SNA PE, Digital provides a better solution to the various IBM cluster controllers. Please refer to VAX-11/780 vs. IBM 4341-1 dated October 6, 1980 and VAX-11/750 vs. IBM 4331-2 dated October 20, 1980 **Highlights & Analyses** for details.

- Distributed Processing Network

  The Distributed Processing Network consists of a large IBM host with cluster controllers. However, the customer's application demands resource and data sharing among these nodes. DECnet would be an ideal solution as SNA does not provide support for slave node-to-node communication. Depending on the customer's requirement, the interaction with the host might be minimum. An alternate solution to SNA can be CICS or IMS-based system using Digital's 3271 PE, thus saving the customer the large overhead of SNA.

DNA

- Network Generation

  Network generation is done interactively for each node. DECnet netgens typically take one-half to four hours. Network configurations may be changed while DECnet is running. Parameters may be changed whenever DECnet is started. Application programs do not need to be defined before execution.

- Hardware Requirements

  DECnet requires 16K bytes to 24K bytes of dedicated memory depending on operating system and configuration.

  A DPCL-11B, the highest performance DECnet communications line interface hardware, costs $7,300/line.

- Delivery

  All DECnet capabilities are currently available.

SNA

- Network Generation

  All nodes and application programs in a host's network domain must be explicitly defined to VTAM or TCAM. All hosts except the 4331 require generation of NCP/VS for the 3705. VTAM, TCAM, and NCP/VS generations often take several weeks.

- Hardware Requirements

  VTAM, the primary SNA host software, requires 256K bytes to 2M bytes of dedicated memory, depending on configuration and performance requirements. Hosts other than the 4331 require a 3705 communications controller which costs $100K in typical configurations.

- Delivery

  The SNA capabilities currently being sold by IBM were announced June 1979. The products to implement these capabilities have FCS dates as late as May 1981.

## 6.1 MARKETING STRATEGIES AGAINST SNA

DECnet and SNA are two different solutions to two different problems. Discussed here are three different applications of SNA and alternative Digital solutions.

- Terminals-Only Network

  SNA excells in this area. Digital, however, has always had terminals attached to its computers. A large DECsystem-10/20 should provide a cost-effective solution. With Digital, there is no need for high overhead software (VTAM, CICS, etc.) to attach terminals.

  **NOTE:** Digital does not support certain terminals (point of sale, teller terminals, etc.) In this situation, Digital does not have a viable solution. However, CSS can design and implement support for these terminals.

- Intelligent Network

  Intelligent cluster controllers are attached to an IBM host via SNA. These cluster controllers could be 8100s, 4300s, Series/1, etc. There is no interaction between the various cluster controllers. Digital can provide an alternate solution to the IBM cluster controllers; on a product-by-product basis, Digital has superior offerings, e.g. PDP-11s vs. 8100, VAX vs. 4300s. With the availability of SNA PE, Digital provides a better solution to the various IBM cluster controllers. Please refer to VAX-11/780 vs. IBM 4341-1 dated October 6, 1980 and VAX-11/750 vs. IBM 4331-2 dated October 20, 1980 **Highlights & Analyses** for details.

- Distributed Processing Network

  The Distributed Processing Network consists of a large IBM host with cluster controllers. However, the customer's application demands resource and data sharing among these nodes. DECnet would be an ideal solution as SNA does not provide support for slave node-to-node communication. Depending on the customer's requirement, the interaction with the host might be minimum. An alternate solution to SNA can be CICS or IMS-based system using Digital's 3271 PE, thus saving the customer the large overhead of SNA.