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I Introduction

A. Purpose of the report

IBM has announced a major program to provide a coordinated, expert software environment across its hardware systems. The major program is known as System Application Architecture. It has the long range growth perspective of the IBM corporation as a major objective and has presented the Information Services industry with yet another approach in how to evaluate IBM's direction.

As IBM dominates the computer industry it is important that DPMT review the SAA concept and provide its client base with some insight and perspective. This report analyzes SAA (as of the Oct 1988) and provides a summary of the current snapshot of SAA and its impact on the market

B. Scope

The report reviews the current status of SAA and provides insight into possible future directions the report is organized in the following fashion:

- Chapter I is the Introduction describing the report contents, purpose, scope and general overview

I Introduction

A. Purpose of the Report

IBM has announced a major program to provide a coordinated, cogent software environment across its hardware systems. The major program is known as Systems Application Architecture. It has the long range growth perspective of the IBM corporation as a major objective and has presented the Information Services industry with yet another approach in how to evaluate IBM's direction.

As IBM dominates the computer industry it is important that DataPro review the SAA concept and provide its client base with more insight and perspective. This report analyzes SAA (as of the Q2 1988) and provides a summary of the current snapshot of SAA and its impact on the market.

B. Scope

The report reviews the current status of SAA and provides insight into possible future directions. The report is organized in the following fashion:

- Chapter I is the Introduction describing the report contents, purpose, scope and general overview.

- Chapter II is the Executive Overview which is designed to provide the interested yet hurried reader with an overall summary or view of the report

- Chapter III through IV examine the background, the SAA definition, issues, trends and directions of the SAA program

- Chapter V offers conclusions and recommendations on how to view SAA and benefit from its broad acceptance.

C. Methodology

This report is based on primary research performed by INPUT ~~calling~~ interviewing 20 vendors of software products, major hardware manufacturer competitors and several end users.

In addition ~~a~~ secondary sources and materials ~~and~~ were used to provide an insight and perspective.

Finally several IBM documents were reviewed and comments from leading IBM spokespersons studied to ~~round out~~ develop the overall perspective of IBM's own directional and announced statements.

D Use of the Report

The report can be used by those individuals responsible for understanding the major directions and driving forces in the Information Services industry. Such individuals involved in marketing, selling, planning and product development will benefit from the comprehensive coverage of SAA in this report.

Readers will be able to determine how the SAA concepts and program unfolded by IBM will impact their company's support and response to SAA. The formal announcement of SAA places the computer industry on notice that IBM will (and is) competing more effectively in the ~~future~~ future.

[redacted]

B. General Overview

Systems Application Architecture (SAA) is a recent development program within IBM to offer a consistent collection of software interfaces, conventions and protocols to provide a framework for application systems across the different hardware offerings of the IBM Corporation.

Prior to SAA, the IBM Corporation hardware/software in the 3 lines of micro, mini and mainframe were largely incompatible with different operating systems, programming languages, systems tools and application capabilities. Thus when a user desired to expand operations or add additional functionality a major conversion was required.

The basis for the apparent difference in hardware/software architecture is based on the desire of the IBM Corporation to provide the maximum price/performance ratios for each of the major lines. This necessitated different hardware characteristics, which in turn placed unique requirements on operating systems development which in turn led to subtle differences in compilers, languages, ~~systems~~ application enabling tools, etc to compliment the unique hardware.

This in further led to application implementation differences meaning the same application could not run on different line hardware without a significant effort. This was true inspite of an application using

the same language as the data structure, and formats was considerable different across the tiers. This also meant that application developers had to consciously decide which tier to target their development, sales and marketing efforts and all other company activities that support the vendor's business pursuit.

II Executive overview

A SAA - WHY?

IBM has responded to competitive forces in the market that were capitalizing on niches of opportunity in what it perceived to be their natural market. Workstations, Sun, Apollo, DEC and HP were making inroads; in supercomputers Cray was carrying the day; in super-mini/minisuper computers like Alliant, Convex and Multiflow are having an impact; in UNIX systems UNISYS and NCR were making significant progress and last and the most DEC was eating IBM's lunch in the mid-range or departmental systems.

IBM's initial response was the 9370 which did not make much of an impact.

IBM also responded, on what seems a short timeframe, with Systems Application Architecture a means of unifying all the disparate IBM platforms. This was due to the determination that users were buying DEC VAX solutions because their application investment was preserved as they upgraded their hardware. Exhibit II-1 provides additional reasons for SAA.

B. SAA - WHAT?

Exhibit II-2 discusses the major elements of SAA. The elements are:

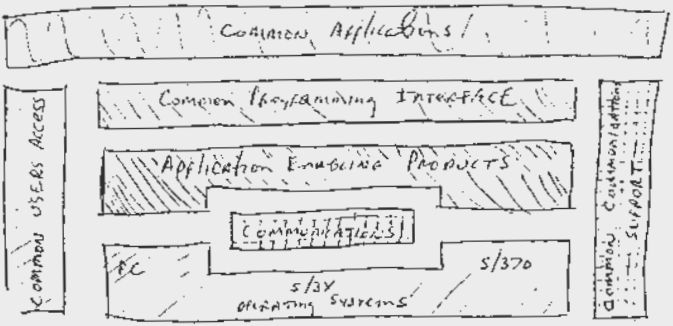
Exhibit II-1

Reasons for SAM

- RISC success with migration strategy
- Changing buyer patterns
- Software - fastest growing part of IBM
- Slowdown of mainframe purchases

SAA - WHAT IS IT?

IBM Systems Application Architecture



- Common Programming Interface providing languages and tools for application development.
- Common Communications Support providing tools and interfaces to allow IBM's ~~and~~ platforms to communicate with each other.
- Common User Access provides conventions and standards to describe screens, support user interaction and hardware layouts of keyboards
- Common Applications providing IBM delivered and supported applications

C. SAA-When?

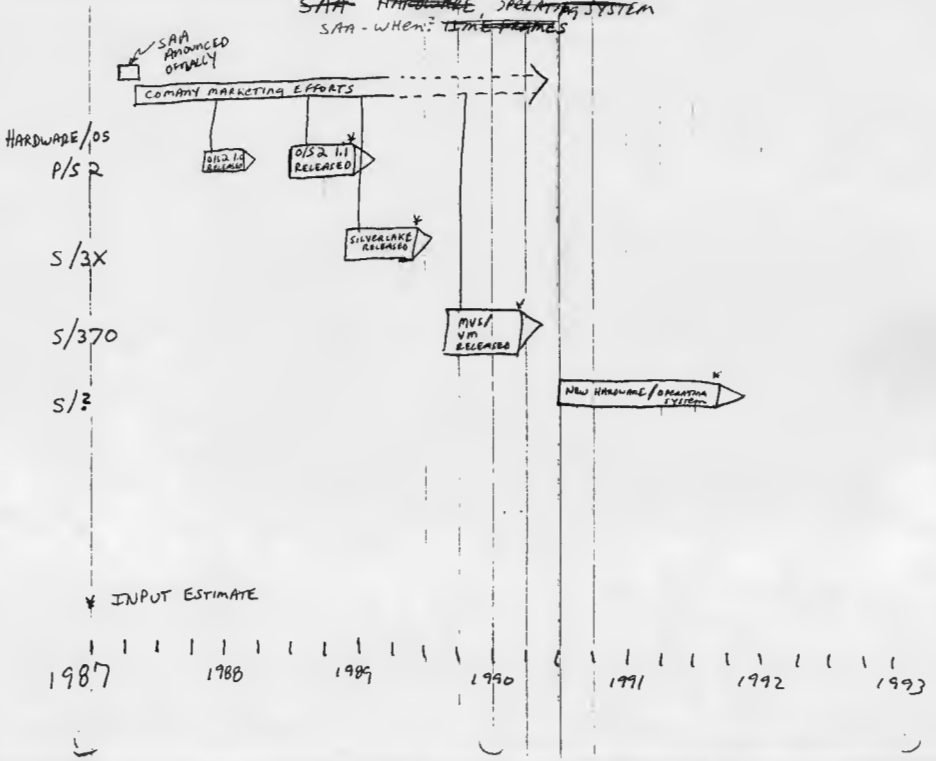
The first clear and distinct examples of SAA will be in the summer of 1988 when OS/2 Extended and Silverlake are shipped. These will provide insight to how SAA will unfold in the next few years. Exhibit II-3 provides a timetable for ~~how~~ when the different platforms will have their initial SAA-compliant thrust (Note the left portion of the bullet signifies INPUT's estimate for when that functionality will occur for the first time)

Also it should be noted that D/VT Release, a next generation hardware is under ways and will be ~~available~~ available mid-1990 announcement.

Exhibit II-3

~~SAA~~ ~~HARDWARE~~, OPERATING SYSTEM

SAA - WHEN: ~~TIMEFRAMES~~



D SAA - ISSUES

SAA is an ambitious undertaking and one that will have a major impact on IBM itself, independent software vendors and users. As such there are a number of issues that are unresolved as SAA has not been definitively designed. Much like SNA has evolved over the past 12 years it is expected that SAA will evolve. However INPUT believes the timeframe is more likely to be 3-5 years before essentially steady state is reached.

SAA was not conceived and designed over a protracted period of time resulting in papers in the IBM Systems Journal and presentations to major clients prior to official announcement. Thus there are some holes in the announcement and these holes are subject to being plugged. Exhibit II-4 lists some of the issues raised by the introduction of SAA.

IBM has formed an Applications Systems Division that will be a key factor in its ability to deliver application solutions. IBM will develop some solutions internally focusing on cross-industry and ~~large~~ industry-specific application in ~~large~~ the large or faster growing industry segments.

Input does not believe that SAA is marketing hype based on the amount of senior management involvement and development resources being deployed to implement SAA. ~~The potential of [illegible] of SAA will~~ The recent

Exhibit II-4

SDA ISSUES

- IMPACT ON SOFTWARE INDUSTRY
- USER ACCEPTANCE/BENEFITS
- IMPACT OF ASD
- MARKETING HYPE?
- CAPABILITY SHORTFALLS

creation of 2 new lines of business called Application Solutions and Programming Systems elevate the importance of software within the IBM Corporation.

E Conclusions

The announcement and implementation of SAA will have a noticeable impact on the software industry. IBM has set new ground rules for applications systems that will cause more competition, better functionality and likely lower prices. While SAA may have been imperfect in its totality those vendors who do not analyze and determine how to react may face difficult times. Exhibit II-5 describes some of the conclusions DIRT has reached in looking at SAA and its impact on the market. There is no doubt that IBM is using SAA as a means to maintain dominance in the software market and increase its penetration in application software/systems and an area that has not been as successful as systems software.

II-#5

Exhibit

SAA Conclusions

SAA WILL &

- DRIVE PRODUCT Consolidation
- BE A USER Requirement
- DRIVE New Applications / PRODUCTS
- DRIVE SOFTWARE PRICING
- RE-SHAPE the SOFTWARE INDUSTRY

III SAA Background, Definition and Concepts

A WHY SAA?

Systems Application Architecture is a response by IBM to several major factors that were occurring in the computing marketplace. Those factors are:

- the successful penetration of Digital, Hewlett Packard and UNISYS in the mid-range computing environment.
- the slowdown of the large mainframe, centralized approach to computing caused by the acceptance of the micro and mid-range computing environments
- the initial success of the so-called portability of software across several hardware platforms by its competitors
- the awareness that the software and services portion of IBM is the fastest growing and most profitable portion of IBM's business.
- the changing purchasing patterns of major corporations wherein customers are shifting to the outlying divisions to provide application systems pertinent to running the business.
- the apparent IBM migration strategy offered by IBM's competitors

While some of the above factors are interrelated

they all, in some fashion, are reasons for the concept of SAA as a competitive thrust by IBM to attempt to maintain control over its major accounts and re-assert its dominance in the industry.

Exhibit III-1 shows the IBM corporate financials for the past few years in terms of several business segments. It is clear the fastest growing and most profitable business segment is software and services. Similarly the portion of the business accounting for hardware sales is growing less dramatic and corporate profits have not kept up with the spectacular growth of the early 1980s.

Part of IBM's success in the early 1980s was the growing performance and application requirements of IBM's customers fueling a significant growth in large main-frame environments with heavy DASD (Direct Access Storage Device) requirements. When the computer industry slump of 1984, 1985 hit the mainframe business was largely impacted. The re-awakening of the industry in 1986 occurred mostly in the mid-range and micro-~~mid~~ range (workstations included) as the purchasing authority shifted to the end-user divisions and departmental groups.

This shift occurred due to the localized need to have adequate computing resources to perform

the business functions of the work group. It also meant there were new buying points in the organization who were less likely to be first time end users as well as upward migration paths.

IBM had no easily identifiable migration strategy for any of its clients and it was generally well understood that a shift in hardware caused by growth of business or an increased application portfolio necessitated a major conversion on the part of the customer. This was viewed as the price of success so to speak.

This migration process while understood was expensive and unproductive. However IS managers were able to convince their management that it was a necessary and acceptable event. This helped the IS manager increase his importance in the organization in terms of educational headcount and budget requirements.

In the 1984 timeframe several of IBM's competitors had had significant market share in certain smaller segments of the market such as DEC in engineering and scientific, HP in manufacturing (order entry and MRP) and UNISYS in banking became very proactive about penetrating additional commercial segments.

Small to medium sized businesses and mid-range

became active in solving their application needs and they were effectively sold on the mid-range computer systems due to ~~their~~ the mid-range systems ability to coexist and communicate with the IBM mainframe as well as offer an upward migration path free from conversion torment and hassle. The so-called end user purchasing authority had no inborn sense of loyalty to "big blue" and therefore was not "true blue".

This resulted in significant growth and penetration by DEC, HP and others in the mid-range with the associated profitability that generally results from such growth. This further resulted in these companies' stock prices rising as the Wall Street investment market research firms ~~or~~ noticed the success of these companies and the fundamental changes in the market.

This leads in INPUT's view to the two major announcements of Systems Application Architecture and Application Systems Division. SAA and ASD are very related to the future success of IBM as it attempts to maintain account control in its major customer set.

SAA describes an applications environment that speaks to the major upgrade and migration strategy of the workgroup, departmental and mid-range computing groups. SAA is a major investment on the part of IBM to coalesce a strategy that builds upon SNA while slowly changing the focus of the platform

interaction from mainframe master to connection drive to a more peer to peer relationship.

ASD is the major marshalling of IBM's resources and forces to provide applications ~~and~~ from IBM itself as well as be a focal point and catalyst for 3rd party application vendors. Thus ASD will have a mission of providing significant communication to the success of SAA ASD will be discussed in greater detail in the section on IBM's commitment (see chapter _)

b. what is SAA?

II.D Introduction

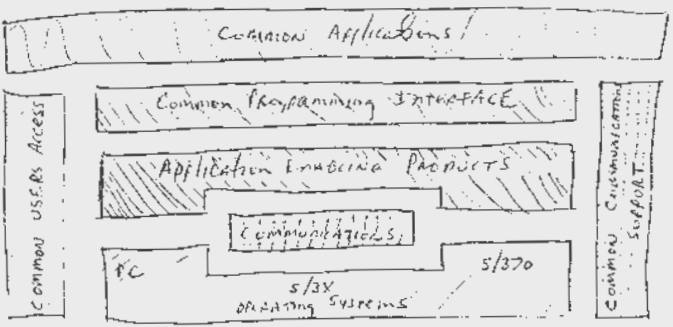
IBM SYSTEMS Application Architecture is comprised of four distinct elements that provide an environment for applications in each of the major hardware platforms instilling a singular look and feel across all environments. These elements are graphically depicted in Exhibit III-2 and are known as the following:

- Common Programming Interface
- Common Communications Support
- Common User Access
- Common Applications

In the succeeding pages chapters in this report Input will discuss each of the common elements describing their goal and functionality. In addition Input will provide perspective to the SAA concept discussing such factors as the issues, benefits, competitive responses, product timetables, shortfalls or needs and IBM's corporate

Exhibit III-2

IBM Systems Application Architecture -
ORGANIZATION



commitment.

There are many ramifications to SAA from the impact on IBM itself, to the 3rd Party software vendors and independent software vendors to the end user community as well, not to mention the impact on IBM's competitors.

For if IBM is successful and timely in its SAA capabilities there is no doubt that its competitors will have a more difficult time positioning themselves against IBM. SAA is an ambitious undertaking which has been underway for more than a year (at this writing). There are no tangible examples of SAA and thus there is much conjecture about the "SAA reality" or marketing

[redacted]

(1

happen. The rest of this document will discuss the present concept of SAA and more concrete conclusions on the "SAA reality". The next few pages describe SAA's 4 major interfaces.

[redacted]

1.) Common Programming Interface

The Common Programming Interface is the programming logic core of SAA. It consists of the original types of programming elements:

- Languages
- ~~High-level programming tools~~
- ~~[illegible]~~
- ~~4th generation application generator~~
- Services

The main elements are detailed in exhibit ~~CPI-1~~ III-3 and ~~CPI-2~~ III-4 describing Languages and Services respectively. It should be noted that the specific program products selected all exist in ~~some~~ significant implementation on at least one hardware platform in a particular operating system. [Note: As will be mentioned in other sections SAA is an amalgamation of existing application programming/enabling tools as well as communication products/capabilities from SNA] There fundamentally is nothing "new" in SAA

a.) Languages

The languages chosen to be included in SAA are Fortran, Cobol and C. Fortran and Cobol are fairly obvious and straightforward as they have been key languages in IBM's user environment

Fig. ~~CTS-1~~ III-3

SAA - Common Programming Interface
Languages

Programming Languages:
COBOL
FORTRAN
C

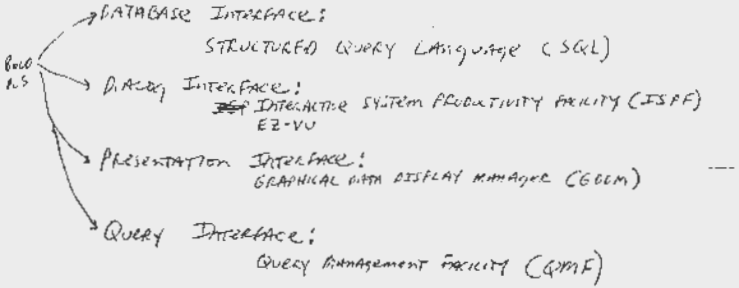
Application Generator:
Cross System Product (CSP)

Procedures Language:
~~REXX~~
Restructured Extended Executor (REXX)

Exhibit III-4
Page 2

(2)

SAA - Common Programming Interface Services



(67)

for many years. The choice of C, however, could be considered a surprise as it is a relatively new language and one that is not natural to IBM's traditional thrust. ~~While~~ very little has been mentioned regarding the choice of C versus including PL/I ~~at~~ ~~to~~ C. It is INPUT view that C was chosen for 2 main reasons:

- C is becoming more and more a language of choice for those independent software companies that desire so-called portability in the marketplace through sidling.
- IBM is likely to make an assault on the UNIX market which requires C capability
- The ~~present~~ computer science essential college graduates are trained in C as part of their curriculum and seem to be predisposed toward it in robust functionality and flexibility

(ii) COBOL

Exhibit ~~III-5~~ III-5 depicts the ~~ANSI~~ SAA language and their ANSI compliance. The COBOL language within SAA will be the Intermediate Level with some elements from the same standard - High Level. In addition due to IBM's EBCDIC for data interchange code the special requirements of COMP-3 and binary 4 data elements are required.

It is IBM's belief that the Cobol implementation will be ample and satisfactory to provide programmers with a familiar dialect of Cobol allowing the vast majority of existing Cobol programs to be run under SAA. In addition IBM believes it will be relatively simple to port Cobol programs from other hardware manufacturers to the SAA Cobol environment

(iii) Fortran

The Fortran selected for SAA is based on Fortran 77 (ANSI X3.9-1978) which also is ISO standard 1539-1980. In addition IBM will implement several enhancements to the Fortran-77 such as long variable names (up to 31 characters).

As in Cobol, IBM believes the Fortran implementation will be familiar to most Fortran programmers and will allow existing IBM platform Fortran programs and support other hardware vendor source code as it is ported to the SAA environment

III-5

SAA Language ANSI Compliance

COBOL	ANSI STANDARD X3.23-1985 (ISE Intermediate level) ~~[illegible] High level [illegible] and [illegible] requirements [illegible]~~
FORTRAN	Level 4 ANSI STANDARD X3.9-1978 (FORTRAN-77)
C	ANSI STANDARD - X3J11

iv) REXX

REXX as currently available in the VM operating system and is known as the SYSTEMS Product Interpreter. It is a procedural language familiar to VM/CMS users reputed to be straightforward and simple to use for 2 computer professionals and casual users.

The main design concepts of REXX are to provide program readability, system independence, natural data typing, symbolic manipulation, dynamic data definition, easy to learn, and capable of being used for applications and/or utilities needs.

REXX is the programming capability to perform command files, parse system commands and develop macros to provide a systems language to the environment.

v.) CSP

Cross System Product is IBM program product (#5668-814) which is available in MVS and VM environments. CSP has not been a resounding success up until now with many IBM mainframe users opting to use 4GLs from independent software vendors. An application

generators is an application enabling tool designed to build certain types of program without having to employ a traditional 3rd generation language without having to become involved with system details.

Application generators generally include some of the following features:

- fill in the blanks development environment
- interactive syntax checking
- tutorials, help and prompts

Independent software vendors products that have had considerable success in the market are listed in ~~Exhibit~~ III-6

It is Dept's view that CSC may get a better play in the market based on its participation in SAA but is unlikely to make major inroads against the formidable competition in Exhibit III-4 unless the vision on the AS/2 becomes more functional and competitive.

Exhibit III-6 ~~C-II-4~~

Successful Application Generators / 4GLs

FOCUS	Information Builders
NOMAD2	MUST International
RAMIS	Online Software International
MANTIS	Cincom
IDEAL	AMERITECH (ADR)
NATURAL2	Software AG

b.) Services

The Services content of the Common Programming Interface are Services that specify interactions either between ~~other~~ program elements or with the user-oriented input/output. These services are definitions of specifications distributing basic modules or programming logic communicating on a functional level to pass information between the user and execution processes or between two processes themselves.

These Services effectively become standard ways that program ~~developers~~ application developers can control environments and assure consistency. Many of the Services are external standards to IBM with the exception of SQL which is an ANSI standard.

The important factor to consider is that the Common Programming Interface specifies a consistent programming and interfacing environment which will be used by independent software developers as well as IBM to develop applications suitable for all the systems produced by IBM.

i) DATABASE Interface

The Database Interface allows program modules to define, retrieve and manipulate information in a shared database. The scope of the interface

is the Structured Query Language (SQL). SQL is a non procedural language which allows programs or users to specify what they want done without a concern as to how it will be accomplished.

SQL is straightforward and reasonably easy to use and remember. There are built in functions and operations that allow the most complex interactions with the database to be undertaken without the development of complex programs. SQL can be ~~sent to~~ used either interactively or in a batch fashion, i.e. submitted immediately or under program control.

SQL was developed as a complementary tool to the relational databases and is currently an ANSI standard. This facilitates the capability to interact with data that can easily be accessed and managed due to the special flexibility available in the relational algorithms.

The SQL included in IBM's SAA is compliant with ANSI Standard X3.135-1986. This SQL is almost identical to the SQL support in IBM's DB2 and SQL/DS, thereby licensed programs to System/370 users. A Database Manager family has been announced for OS/2 which is scheduled for July 1988. Apart between that

By late summer IBM's release OS/2 1.1 extended will provide SQL support. Even if IBM itself does not provide SQL support there will be numerous vendors offering SQL support such as Microsoft, Ashton-Tate, Lotus and SYBASE and Gupta Technology.

(ii) <u>Dialog ~~Services~~ CONTROLLER</u>

Dialog interfaces are necessary to assist programs/application developers in producing interactive applications. The predominant emphasis is on displaying and controlling the user's interaction with the application. The type of functionality offered is to standardize menu selections, help information requests and message output. In addition the Dialog Services will be responsible for providing a consistent vehicle for the user to interact with the application for data and function requests.

This user/application interaction can be viewed as a convenient, easy-to-use extension of the operating system that facilitates the programmer in providing functions such as input field validation, message input/output and help/tutorial features.

By providing Dialog Services SAA allows the user/programmer interaction to become hardware device independent. As part of SAA it ensures that the user/program interaction is consist across all of IBM's hardware platform

The major bases for Dialog Services is available in the mainframe program product Interactive System Productivity Facility (ISPF Version 2, Release 3) for MVS and EZ-Vu ~~for~~ from PC-DOS. For the PS/2, IBM will provide a Dialog Manager as part of OS/2.

(iii) Presentation Interface

Presentation Interface is an additional service for the programmer developer that allows consistent routines for how information is to be displayed or printed. ~~The significant difference between Presentation Interface and Dialog Interface~~ The functionality provided by the Presentation Interface is ~~to present the windows approach, support~~ as follows:

- Monitor and control the user interaction and display from a presentation or the screen perspective. This would be in concert with the conventions and specifications set out in the Common User

Access / SAA

- ~~provide~~ control the graphics support capabilities of the display managing image, vector and text.
- manage the fonts and character set requirements supported by the display
- manage the device driver support for various output devices such as ~~display~~ printers and plotters as well as the display output

The ~~Device Interface~~ and Presentation Interface are concerned with similar needs of the application programming system. They are the requirements to control the interaction of the user with the application system. The Dialog Manager controls the level interaction on how individual data elements are presented, typed, and interfaced to the application ~~from~~ a data value context point of view while the Presentation Manager is involved in the overall look and feel of the output be it to a display, printer or plotter

IBM will be using for the graphics portion of the Presentation Interface the existing System/370 Graphical Data Display Manager - (GDDM). There is a familiar interface to MVS and VM users.

In the OS/2 environment IBM is slated to use Presentation Manager being developed by Microsoft. However the recent legal suit by Apple to prevent Microsoft from and Hewlett Packard infringing the "look and feel" of its icon-based graphical interface may place a damper on an early release of Presentation Manager.

The major claim of Apple is that the "look and feel" of the Macintosh interface is copyrighted (also) and other vendors can not use a similar look in their interface without a licensing arrangement. This issue has stirred up the computer industry and its outcome will not be settled until near the end of 1988. In the meantime most is slowing down their PS/2 development activity and Microsoft and IBM claim to be vigorously continuing with other joint plans. If the Apple suit is judged to have merit there would be a significant reworking of the concept of standardization and consistency for the output devices closest to the user (i.e. printers, screens and mouse) that would affect a part of the SAA concept.

iv) Query Interface

The Query Interface is used to assist in developing query and report writing services to fetch data from a relational database (i.e. query) and structure reports using the data fetched.

Query and report writing in this context is highly interactive. The approach of these services is to use a menu-driven technique to develop a report structure to produce the report. The technique is called "Query by example" and saves the user from formally having to write a computer program to produce the desired result.

The Query Interface of the Common Programming Interface of SAA will be based on the current DB2 program product available to System/370 users called QMF - the Query Management Facility as one would expect the actual query statement format will be based on SQL as described in the DATABASE Interface services.

2. Common User Access

This portion of SAA specifies the conventions and protocol for the interaction between the user and the computer program/system. These are the rules and conventions that deal with the user's comfort, understanding and intuitive feel for how the application system is responding to the user's interaction.

The elements involved in the user access definitions deal with screen appearance, standard mechanisms to traverse the application system, standard keyboard conventions, user selection action criteria, help invocation, terminology and messages, to name a few.

Once applications adhere to the Common User Access conventions the amount of time to learn new applications will become minimal in terms of the external interfaces. This will have a significant impact on the training costs of the individual users as well as the ability to train a broader range of potential users.

As more users become comfortable with how an application behaves, there should be reasonably more acceptance to using computer

in general and no concern as to what specific system the user is actually deriving computer horsepower from.

a) BASIC elements

In exhibit III-7 the basic elements of the common user access are depicted. These elements describe the general interface characteristics between the user and computer.

i) Machine to user

This basic element describes conventions and rules for what the computer system/application delivers to the user in terms of what the user sees. This deals with how data or information is presented or laid out to provide the maximum comfort to the user. Examples of items in this part of the user interface deal with spacing, formatting, number of lines per screen, graphical conventions to name a few.

ii) User to machine

This basic element concerns itself with how the user recognizes the information or data in i) above and is afforded the opportunity to respond. Some of the actions are how to respond from a keyboard perspective, how to move a mouse or navigate with cursor keys or how to respond to

Exhibit III -)

SAA Common User Access - BASIC Elements

- Machine → user
- user → machine
- user awareness

multiple choice, yes/no or default considerations

(iii) User awareness

This basic element describes the intuitive nature of the machine to user and user to machine environment to allow the interaction to be logical, predictable and straightforward. User awareness is concerned with the minimizing of surprises and the general overall comfort level of the application and the system and the traversing of all applications and all systems.

These general concepts are a key element of how successful SAA will be in meeting its stated goals. It should be noted that the user access considerations are integrally a part of the Common Programming Interface discussed earlier.

b) Dimensions

In order to attain these ambitious interface goals there are three interface dimensions that need be considered. These are stated in Exhibit III-E as "interface dimensions."

c) Physical Consistency

This interface dimension deals with how the hardware is consistently used to the convenience and comfort of the user. Factors such as function keys being placed in the same location and/or on similar like devices

Exhibit III-6

SAA Common User Access - Interface Dimensions

- Physical connections
- Syntactical connections
- Semantical connections

across all hardware systems deals with physical consistency. Users of PC XT, AT and PS/2 systems are aware of different keyboards and the inconvenience they represent. Thus once the user learns one physical convention or mechanism the same should be available on all subsequent hardware supporting similar functionality.

(ii) Syntactical consistency

This interface dimension involves the flow of user interaction in invoking functionality. Examples are in presenting screen panels the system defaults are filled in and those that are most likely to be modified presented first rather than leaving to traverse defaults that are unlikely to change.

(iii) Semantical consistency considers the meaning of elements or keywords that are used in the user interface. An example would be the word EXIT leaves a program module with the ability to resume whereas QUIT means to leave without the ability to resume. While the difference may seem subtle the command meaning is consistent across all applications and within all systems.

Chapter III - Continued

3. Common Communications Support

a. Overview

A major factor in the completeness of SAA is the support for communications capabilities that allow provides platform interaction for applications, networks and specific devices. Fortunately IBM has been in the process of developing a communications architecture well-known as Systems Network Architecture (SNA). SNA was announced in April 7 1974 as the means to allow terminal to mainframe communication and provide networking.

Since 1974 IBM has been evolving SNA to meet the needs of the market. The original SNA functional description which was the ~~of~~ subject of a complete issue of the IBM Systems Journal of April, 1974 ~~do~~ detailed a relationship of device to platform of slave to master i.e. the centralized processor was totally in control of the communications process.

This has since changed to reflect the distributed processing evolution that has occurred and new functionality such as LU6.2 and 102.1 have been announced and implemented. In addition, IBM has shown its intention to embrace International Standards Organization's OSI communication

interface and X.25. after much foot dragging and reluctance.

Several distinct elements embody Common Communications support namely: data streams, application services, sessions services, ~~and~~ network and data link controls. These are very similar to the elements of the original SNA architecture as shown in Exhibit III-9. The similarities are best described as follows (although it is not a strict relationship):

Please list as shown on back

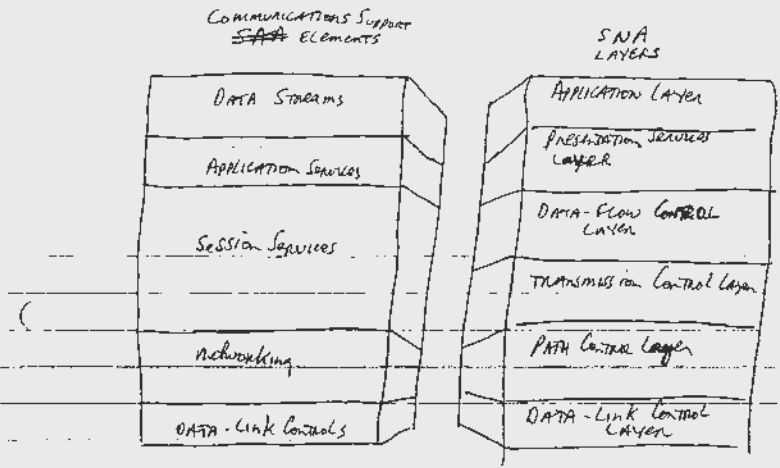
- SAA's Data Streams and Application Services are reworked versions of SNA's application layer
- SAA's session services approximately matches the capabilities of SNA's transmission control layer, Data Flow Control Layer and Presentation Services layer inclusive. The goal of both of these described facilities (or sets) is to arbitrate interactions between different platforms
- SAA's Data-Link Controls generally map to the SNA Data-Link Control layer
- SAA's Networking elements generally match the facilities provided by SNA's Path Control Layer.

However while the general conclusion is that the SAA Common Communications Support is reasonably similar to SNA it still is important to describe the individual

Exhibit III-9

SAA Common Communications Support

Similarities to SNA



elements, afterall SAA is more then SNA due to the other three Common interfaces.

Exhibit III-10 shows the sub-elements of the DATA Streams element.

b) DATA Streams

i) 3270 DATA Stream

This element of Common Communications Support (CCS) deals with how data and commands and control information are handled and and formatted for IBM displays and printers. Since the 3270 display terminal units are so prevalent it is key that this support be included. It should be noted that real 3270 devices are likely to give way to varieties based on IBM PS/2 hardware providing for additional basis for the need of SAA i.e. standardizing the user interface.

ii) Document Content Architecture is the specification for the form and structure of text documents. This is an important element for office environment applications and deals with the how documents are able to be optimized for eventual manipulation and revision.

iii) Intelligent Printer Data Stream defines the data and control information to support high performance high functionality page printers and typesetters. Page printers are the IBM 4250, the 3812 and 3800 which IBM calls all-point-addressable devices. ~~Etc~~ IPDS deals with how text and image data along with font information

are combined and supported to the output devices.

c) Application Services

The sub-elements of Application Services are depicted in Exhibit III-11

i) SNA Distribution Services (SNADS)

SNADS functionality involves the distribution of documents, files and information throughout the (~~a~~ IBM) network. It is able to support multiple users and applications through the use of routing and store and forward services. In addition it provides an asynchronous distribution facility causing the need for active ~~sessions~~ sessions between the communicating parties to no longer be required. SNADS is a key facility in supporting process to process communication and builds upon the Application Program to Program ~~Comm~~ Communications (APPC).

ii) Document Interchange Architecture (DIA)

DIA is the definition of protocols defining common office functions performed co-operatively by IBM program products. Examples of these functions are: the sending and receiving and filing of documents, library services and methods. DIA therefore facilitates the interchange of documents among devices and device types.

iii) SNA Network Management Architecture

This sub-element provides the IBM methods and techniques

Exhibit III-10

Common

SAA / Communications Support

DATA STREAMS

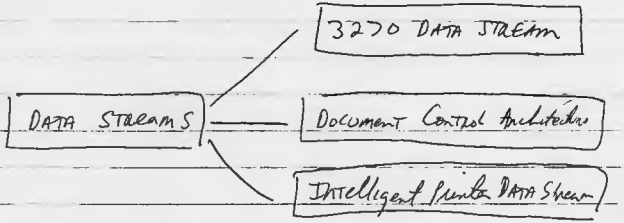


Exhibit III-11

SAA Common Communication Support
Application Services

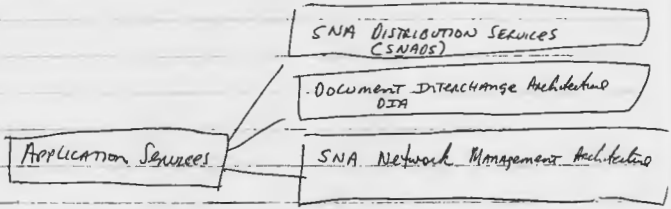


Exhibit III-12

SAA Common Communications Support
— Session Services

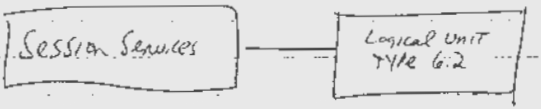


Exhibit III-13

SNA Common Communications Support

Networking

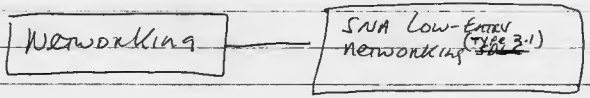
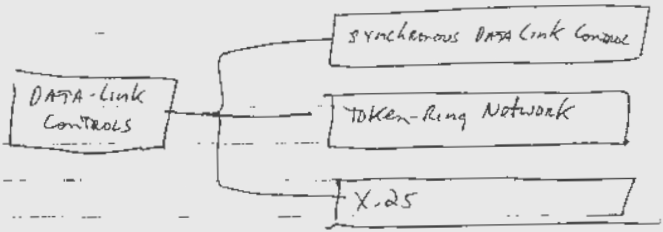


Exhibit III - 14

SAA Common Communication Support

DATA-Link Controls



for the management of communication networks these SAA elements play a key part in helping IBM's customers to understand, manage and configure their networks in a logical and consistent fashion. Thus the SNA SMA supports problem management, change management, configuration, operation and performance characteristics necessary to manage complex network environments.

d) Session Services
1) Logical Unit Type 6.2

Session Services are provided by Logical Unit (LU) 6.2 which describes program to program communication protocols. These facilities allow outlying devices, and computers to communicate on a peer to peer basis as opposed to a master-slave basis of the original SNA definition. LU6.2 is IBM's answer to providing distributed processing of dispersed applications. Session Services facilities and services ensure compatibility of communications function across the network.

e) Networking

i) Low-Entry Networking Nodes

SNA Low-Entry Networking (LEN) a more commonly called TYPE 2.1 nodes, support peer-to-peer communication functionality. LEN provides for programmable or fixed function system nodes.

LEN provides for multiple and parallel communication sessions to be established between nodes that are directly connected to each other. LEN is able to support a variety of protocols including Token-Ring, X.25, and SDLC both switched and non-switched.

F) Data-Link Controls

Exhibit III-14 lists the Data-Link Controls

i) Synchronous DATA LINK CONTROL

Synchronous Data Link Control (SDLC) is a well-defined discipline for managing serial-by-bit information transfer between nodes within a communication link. It includes comprehensive error-checking and detection and recovery procedures for link transmission errors. SDLC was a major improvement over the previous bi-synchronous communications, in the 1974 SNA announcements and also conforms to an operational subset of ISO's HDLC.

ii) TOKEN-Ring Network

IBM TOKEN-Ring Network consists of a wiring system, an access protocol and a set of communications adaptors. Transmission is accomplished via a "token" that passes through the ring providing attention to the node controlling the ring. Token-Ring Network is used to communicate between devices within an environment. Token-Ring protocols are based on IEEE 802.2

and 802.5 standards

(iii) X.25

X.25 is a packet-oriented interface for attaching host computers, communication controllers and terminals to packet-switched data-oriented networks. The support of X.25 is more than a data link protocol as defined in the OSI Reference Model.

4.) Common Applications Support

a) Overview

It is clear that Common Applications Support is the resultant of the adding together of the three other Common Interfacing elements in SAA. Historically IBM has not been known for developing applications for industry-specific or cross-industry functions. As part of the SAA announcement IBM indicated that it would be taking on more responsibility in this important area.

The IBM Corporation has taken some 3rd party applications such as Lockheed's CADAM, Hogan's banking software and sold them into the market. As part of SAA IBM will be making a more proactive stance in this fast growing opportunity area. ~~The first example of an IBM developed SAA applica~~

c) ~~[illegible]~~ Initial ~~[illegible]~~ Application

The first application to be developed by IBM using SAA conventions is to satisfy the needs of the office automation market. This application being cross-industry in focus is an attempt by IBM to sort through the plethora of existing office automation products to offer a single comprehensive system to meet the needs of its customers in the three major computing platforms.

Input believes this first application is a wise choice and is being precipitated by the popularity and success of Digital Equipment's ALL-in-ONE applications capability.

Having one consistent office automation view will allow IBM to solve the needs of electronic mail, calendaring, decision support, word processing and document processing. The more popular features are being drawn from PROFS (Professional Office System), DIOSS (Distributed Office Systems Support, ~~AS~~ Applications System) and DisplayWrite/370. The code name for the project is OFFICE 90 and based on the complexity of the undertaking will probably not be available until close to 1990.

(cc) Applications Systems Division

IBM formed the Application Systems Division in July of 1987 to provide focus and direction for the development and acquisition of applications across its entire product line. There are two basic mandates:

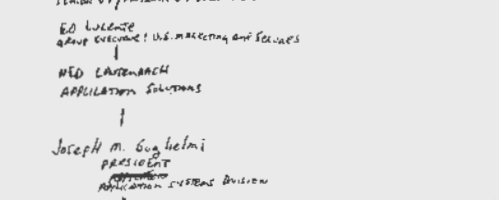
- Consolidate application software development from the previously disparate effort
- Manage the corporate-wide implementation of Systems Application Architecture

The overall goal is to increase the inventory of application software be it from internal developments or third parties. This effort should result in more meaningful applications and assist IBM in substantiating the Solutionpacs marketing concept. When initially formed the ASD was headed by Joseph Guglielmi (president of the division) reporting to Ed Lucente, VP and Information Systems Group executive.

Based in Milford, Conn ASD's activities are spread over 11 laboratories worldwide having more than 6000 people. Exhibit III-15 shows the organizational structure of the ASD and the major areas of responsibility of the key groups in ASD. It should be noted that SAA and ASD have received even higher importance and status within IBM by the formation

Exhibit III-15

ASD ORGANIZATION AND REPORTING LINES



of two additional lines of business operations called Application Solutions and Programming Systems under Ned Lautenbach and EARL Wheeler respectively. ~~Unless~~ ~~Based on~~ The major sweeping reorganization that IBM ~~and~~ announced in January, 1988 called described six U.S. divisions under Terry Lautenbach:

~~IBM~~ Personal Systems
~~IBM~~ Application Business Systems
~~IBM~~ Enterprise Systems
~~IBM~~ Technology Systems
~~IBM~~ Communication Systems
~~IBM~~ U.S. Marketing and Services Group

~~It should be~~

Earl Wheeler as head of the new Programming Systems reports to Terry Lautenbach while Ned Lautenbach (Terry's brother) reports to ED Lucente, head of U.S. Marketing and Services. ~~This IBM~~ Based on how the new organization was structured in January, Ned Lautenbach should have reported to his brother Terry. This ~~clearly~~ would have represented some difficulties to say the least but does bring forth two interesting thoughts

- Application Solutions will not truly get the line of business perspective as it reports still within another line of business
- IBM does consider the best people available

to manage its important business units and will not let reporting structure stand in its way

5. SAA Timeframes

A study on SAA is not complete without some forecast as to when it will be available. IBM is not announcing any specific time tables (as one would expect based on its previous behavior).

In order to present SAA timetable DRAT has developed a view based on major platform groupings i.e a hardware/operating system view and another view based on SAA applications available. The first view speaks to when is it physically possible to develop an application on particular platform groupings the second view presents the notion of when are end-user applications available that make SAA worth the want (so to speak)

a) Hardware/operating systems

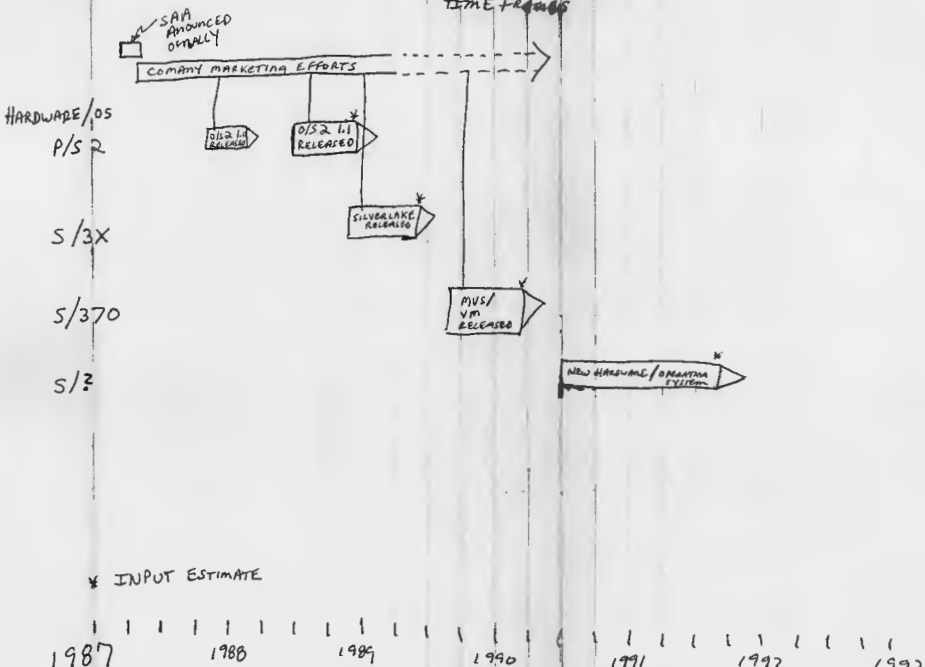
The hardware/operating systems IBM describes in its SAA product literature falls into 3 main classifications micro, mid-range and mainframe embracing 4 operating system MVS and VM on the mainframes, OS/2 on the micros and an ~~announced but not yet named~~ O/S for the mid ranged called AS400 (which has not been formally released) & the well-known "Silverlake". Silverlake is to be

announced late 2nd Quarte 1988 and is IBM's answer to what is called in the mid-range. [It should noted that RPG the most common programming language on the S/3X product families has not been announced as part of SAA].

Exhibit III-16 shows the DPMT estimate on the hardware platforms and requisite operating systems. The convention used in this exhibit is the flat side of the bullet is the actual time the operating system ships. The front part of the bullet signifies that enhancements will be made as the operating system takes hold. Note the last line of the exhibit is called "S/^{2}" and this signifies the DPMT belief that a whole new hardware architecture/product family will be available in the early 1990s.

A fitting name would be "490" (like for the 90s) however another computer manufacturer might take exception to this name. The underlying premise which should actually be very exciting for IBM's users is the concept that what ever the hardware/operating system that comes along in the 1990s ~~for the first time~~ a major conversion will not be required for SAA users. This mean SAA applications will execute easily in the follow-on hardware of IBM. The

SAA HARDWARE / OPERATING SYSTEM TIME FRAMES



is a major near win for SAA.

6) Application Systems

The value of SAA is in the number of applications that are developed using SAA conventions. After all what ~~of~~ value is an application architecture or environment if it isn't ~~not~~ used? Exhibit III-17 is DataQuest's estimate of the applications available in SAA from an end user, 3rd party and IBM perspective. This is shown using the same convention as Exhibit III-16 i.e. the flat side of the bullet is the time the actual start of the event occurs, ~~date~~

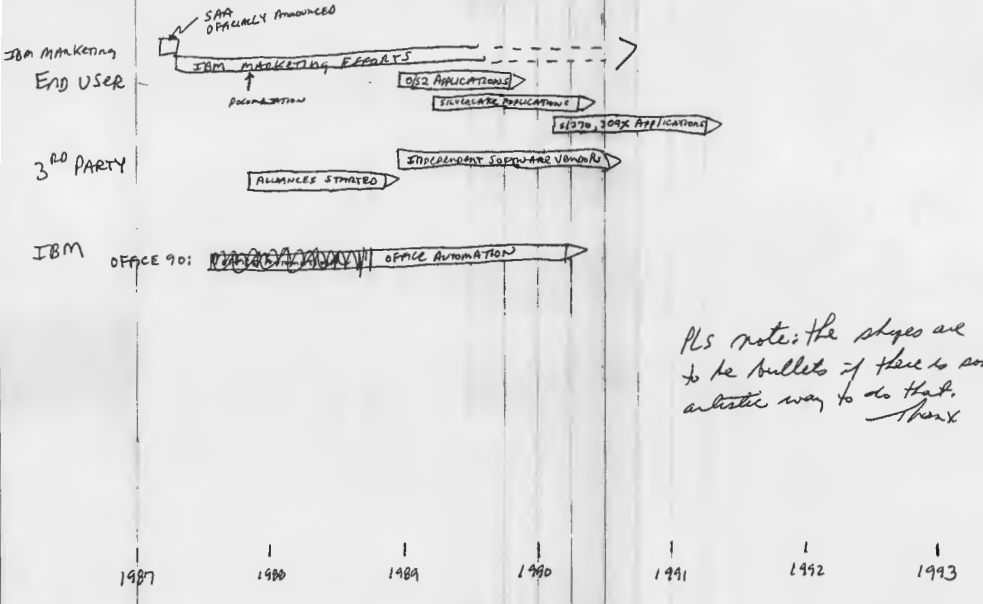
also shown on the chart is the start of SAA, ~~documentation~~ availability and continued marketing efforts. IBM marketing personnel have been making an effort of incredible proportions to reach the ~~independent~~ ~~party~~ software vendors to explain the merits of SAA. Furthermore these individuals have been visiting the F500 companies, conferences and the press to also explain the benefits of SAA.

It should be obvious that all independent software vendors ~~will~~ that currently offer products on IBM hardware will opt for stating that they also will support SAA. after all SAA is a major effort on the part of IBM that noone knows for sure how successful it will be. Until

4-22

SAA APPLICATIONS TIME FRAMES

~~HARDWA~~



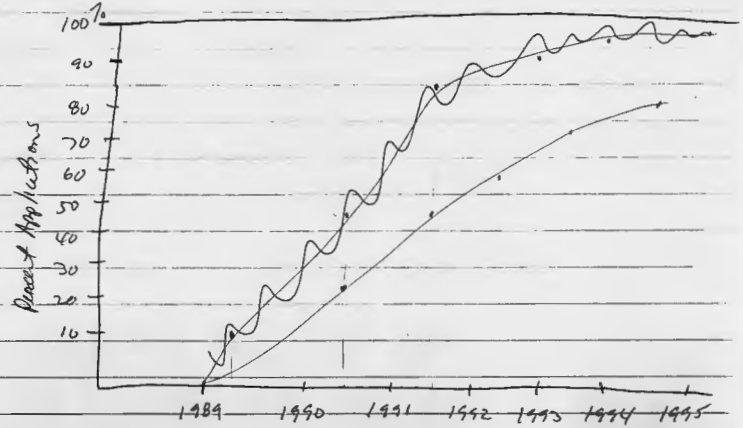
Pls note: the shapes are to be bullets if there is some artistic way to do that. Thanx

there is every reason to be believe it will be successful. There is absolutely no reason why a software vendor would not say it intends to be SAA compliant. In fact many software vendors have internally developed a similar concept for their software to facilitate the software vendors desire to port his software to another environment. An example of this is the related data base companies especially relational Technology who is going around with buttons saying "SAA TODAY".

Dataquest estimates that by 1993 almost 90% of the application programs available will say they are SAA-compliant. A graph of the SAA applications available as a percent of applications is shown in Exhibit III-18. At this time the user expenditures will be approximately $7 billion for those applications offering SAA capability. Exhibit III-19 shows the growth of user expenditures for SAA applications. It should be mentioned that applications will be SAA-compliant whether the user desires it to be or not.

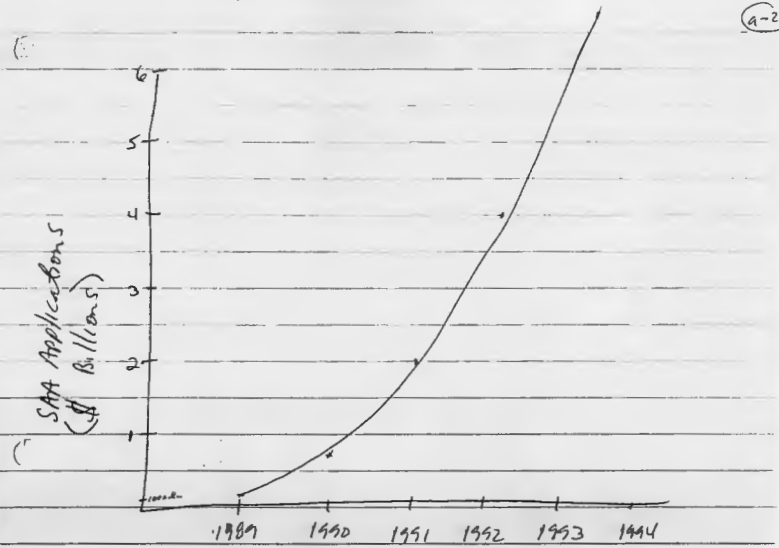
Exhibit III-18

SAA - [redacted] Applications Available (Percent)



Use these points		
	1989 1/2	10 %
	1990 1/2	25 %
	1991 1/2	45 %
	1992 1/2	55 %
	1993 1/2	70 %
	1994 1/2	80 %

Exhibit III-19
SAA- Applications Revenue



points	1989	.100 Billion
	90	.500 Billion
	91	2.000 Billion
	92	4.000 Billion
	93	7.000 Billion
	94	18.000

IV Issues, Trends and Directions

This section will discuss the market factors surrounding SAA and attempt to provide insight into the significant event and directional statement that IBM has staged on the market. Exhibit IV-1 summarizes the major issues.

A) SAA - is it marketing hype?

- SAA is a major "competitive option". However the reality is that if one considers the formal announcement as 3/17/87 (ST. PATRICK'S DAY) [note: there were leaks to the press as early as November, 1986] that of the reports existing there still is no significant or usable example of SAA

The SAA promise and IBM corporate commitment was the resolution of the architectural differences (from the user's viewpoint) amongst the myriad of hardware products being offered by IBM.

The architectural goals and major consulting effort on the part of the corporation sent a ripple of concern and curiosity to the end user community, the software development community and IBM's competitors. Users need to know what SAA means to them in terms of current options, and future options as they can take advantage of SAA and make sure their software development activities are compliant. Developers desperately need to understand SAA as the new basis of software to the SAA conventions so that

Exhibit IV-1

STAT
MAJOR ISSUES

- Marketing Hype?
- Software focus
- Hardware Independence
- Open Applications Environment
- Closed Hardware Environment

compatible applications
Competitors must track SAA and its developments to ascertain how to design their overall migration strategies, and system compatibilities.

At this writing based on what has been delivered one can argue that SAA is still mostly vacuous. The concept of architectural consistency is a very appealing and exciting concept, one that hardly anyone can contend does not make sense. A major observation Input would offer is that SAA is more a repackaging of existing capabilities, than a major development and approach that was conceived in the IBM Development labs

B) Software Focus

• IBM more focused on software.

no ¶ There is no doubt that IBM has enjoyed considerably more success in its software products and services business than in its hardware systems business. This potentially an ominous sign ice. IBM's software product success is in large measure accounted for by its ~~sales~~ marketing of systems software products as opposed to applications software.

As hardware, intrinsically, becomes ~~to~~ less expensive and software becomes a more significant portion of the total system it would only be natural to shift in the direction of where the longer range, economically, profit gains can be achieved. Add to this the current tendency to obtain distributed processing functionality witness the success of the mid-range/departmental computer systems i.e. DEC's VAX line, Sun's workstations and the newer IBM PS/2 (higher end). Application software is where the computer industry is heading.

C) HARDWARE INDEPENDENCE

SAA is a double-edged sword.

no ¶ IBM over the longer term can then make major changes in hardware technology without impacting the application investment of its user community. The large scale computer users will no longer accept the expense and chaos that IBM has asked them to incur when new hardware/operating systems are brought to the market. All of IBM's competitors have long solved that problem and provide minimal conversion effort to upgrade users, their systems families.

D) Open Applications Environment

SAA ~~and the~~ has a natural outcome of fostering an open environment with the same interface basis. This should benefit IBM's user community immensely as there is likely to be more software available.

The ability to develop and execute application software in all IBM hardware platforms should foster several ~~interesting~~ developments.

First, there will be more intense competition as independent vendors will no longer have to choose ~~a~~ hardware platform to develop application systems for and will not have to be as expert in the hardware/operating system.

Second, IBM itself has announced intentions to offer applications systems ~~which ordinarily~~ through its sales and marketing force. Some applications will be developed internally others contracted for such as the Hogan Systems deal of 1987 for banking software or the Transform Logic relationship in 1988. While IBM has the largest dedicated marketing force that in itself is not a guarantee of success patterns the Hogan software success.

(Third?) Third, there will be some pressure on legacy people, ~~power~~ as vendors position themselves into profitability niches and competitive pressure from smaller vendors

to either maintain market share or attempt to
buy market share

~~and finally~~

In addition users are likely to benefit
due to the application vendor's need to provide
enhanced functionality to more closely model the
application as a means of differentiation of the
vendor's product. Thus product functionality should
be more closely in tune with the user's requirement

These are the main ~~good~~ benefits
of the Open applications architecture that SAP
represents.

E) see next page

E) CLOSED HARDWARE ENVIRONMENT

• SAA only supports IBM hardware.

The current major application area of large systems users is to be able to accommodate heterogeneous hardware platforms. SAA clearly does little to enhance the possibility of users running a non homogeneous vendor environment. A number of users have worked at accomplishing application systems that use several vendors' hardware.

A number of independent vendors are having limited but increasing success in offering application tools that transcend multi-vendor environments. Examples of vendors offering these capabilities are ORACLE, Relational Technology, Informix, SYBASE. There also are several vendors offering connectivity tools such as Network Innovations (recently acquired by Apple), Communication Solutions and System Strategies.

All of the above vendors allow for cooperative processing applications and the ability to have diverse computing environments interact in an efficient fashion. The IBM SAA solution does not provide for interacting with other vendors' computing environments. However the fact that IBM itself is unlikely to participate in a multi-vendor application solution does not mean that other

vendors are precluded from such a strategy because as previously mentioned in chapter III the SAA announcements does provide for cooperative processing through APPC and LU6.2 functionality thereby permitting heterogeneous cooperative processing to be accomplished. Any aggressive hardware vendor (other than IBM) or software vendor could obtain significant market share by such a native strategy.

F) IS Issues

The IS departments of large IBM customers will have to study the SAA announcements to determine what longer term directions and commitments are logical by embracing SAA. One does not go out and buy SAA per se but rather factors it into a long term IS plan and budget scenario

1) User benefit

SAA offers the longer term perspective of training users and not losing the investment due to the consistent user interfaces and conventions that SAA provides for its users. This makes upgrades or product changing less difficult and less expensive

In addition, as mentioned previously, SAA should increase the choice of applications made

available to the user community.

SAA will allow users to choose the hardware that best suits their current computer resource needs and not have to make decisions to buy more hardware than necessary. This user will be able to manage their budgets more effectively and not be concerned about the orphan investments they made as these investments are now essentially guaranteed.

2) IS Manager - point of view

The IS Manager is a very key element in developing F1000 awareness & and acceptance of the SAA strategy. The IS Manager in an organization has a strong influence over the plans and buying decisions of the departmental systems that have been permeating the corporate division of large enterprises. By In addition the IS Manager has a principal architect responsibility about regarding the corporate plan.

The SAA announcements of IBM provide the IS manager with tool for a strong strategy improvement that provide the enterprise with a cogent basis for including IBM systems for the departmental system needs of the enterprise. IBM awareness of this significance and recognition have

historically received much attention and action based on intent and future. Most industry participants respect IBM's reputation and sense of commitment for IBM does tend to deliver on most of its promises.

Exhibit II-2 shows a brief check list the IS manager should use to calibrate SAA for the enterprise. Input suggests this check list as a convenient way to manage and understand the SAA opportunity.

a) Perform inventory

To effectively appreciate SAA the IS Manager must perform an applications inventory of those applications developed or purchased in the past, present and future. Items to review are those applications developed in-house, those packages purchased, those under development. The IS manager needs to look at the data base systems being used, file types used, security features, communication links and future equipment plans. It is key to the SAA assessment to know your application inventory.

b) Develop SAA expertise

Part of understanding SAA is making sure the organization has the necessary knowledge and expertise to understand what SAA is and where it is going. SAA is not totally cast

Exhibit IV-2

SAA - IS MANAGER PLAN of ACTION

- Perform APPLICATION INVENTORY
- Develop SAA EXPERTISE
- Discuss Vendor Actions
- Determine E-business needs
- Follow technology issues
- Focus on Strategic needs

in concrete and there is a constant flow of documentation. this individual would also attempt to influence IBM (to the extent that is possible) to provide additional functionality based on the aforementioned application inventory.

c) Vendor Discussions

Besides having open and frequent discussions with IBM the IS Manager and the SAA "expert" must have similar discussions with those vendors that have been identified to be part of the future application requirements. To determine how SAA fits into the future needs of the organization the IS Manager must know how other vendors intend to "play" in the SAA environment. Discussions with ~~the~~ independent software vendors will unlikely provide additional insights into where others see SAA evolving.

d) Business needs

In assessing the needs of the organization it is important to keep in mind the business needs of the organization. these business needs should satisfy the technical requirements of IS and be consistent with any long range and business objectives of the organization. In this category one needs to contemplate how other vendors can meet or impact the business needs of the organization how other vendors (both hardware and software) can interact at

a possible SAA plan.

e) Technology monitoring

While reviewing a possible SAA plan to meet the business and strategic needs of the organization it is imperative to keep an open eye and mind to new technologies on the horizon. While it is obvious that by sheer size and magnitude IBM has most of what any organization could need it is not always with the best price/performance available in the market.

In addition some companies have carved out special niches around application solutions that have had better functionality and fit in meeting the user's requirements. When it comes to applications IBM itself has not been as aggressive with solutions. SAA and ASD are intended to reverse that image. Solution Packs, under the responsibility of ASD have been slow in making any application production. There is no doubt in INPUT's mind that IBM will finally realize success with the Solution Packs concept.

f) Strategic focus

The final major SAA ASSESSMENT criteria is the long range goals and directions and how the competitive environment plays in to the strategy of the enterprise. The IS manager or CIO understands strength in the enterprise as in providing insight and direction to the

critical needs of the enterprise. From an information systems perspective, SAA may be consistent in meeting the long-range objectives of the enterprise. IBM has made a significant effort to have SAA be capable of being flexible in satisfying distributed needs, centralized needs, language, communications in an orderly and cogent fashion.

The six sections presented above should prove useful in assessing SAA for most enterprises. Something as key as SAA from IBM must be given serious consideration.

6) IBM IMPACTS

i) Benefits

The adoption of SAA as a major business strategy of IBM produces several important benefits. As most major announcements it introduces the well-known FUD (Fear, Uncertainty and Doubt) factor which generally has a negative effect on IBM competition. While this slowdown in new demand for competitive products IBM generally buys time to make the originally announced program a reality.

There are in SAA some additional non-term benefits that IBM itself accrues from the

introduction of SAA and this goes back to the original decision behind why SAA happened.

Prior to SAA IBM had disparate hardware and software for a number of product lines that were essentially developed without a major long-range plan. Thus each product had its division R+D that were trying for resources to execute their divisions business plans. Each product had its own language versions, its own documentation its own product marketing etc.

With the advent of SAA each division (now Line of business) has a mandatory commitment to comply with SAA. This means there is consistency and less redundancy of documentation, product marketing etc. While SAA may be long in coming its arrival will have some additional external benefits to IBM that should result in more efficiency for IBM's customers.

2) Risks

With any major announcement and strategy there are benefits and risks. The major risk that Input focuses on is that IBM's competition can more easily connect into the SAA environment provide a subtle bridge to this environment in addition vendors will be able to port their

systems to IBM hardware to make bridges to their environments more natural and transparent.

Another risk is that of independent software vendors no longer needing to pick a hardware environment in which to develop their applications. [illegible] As Dignit has indicated on numerous occasions in this report by referring to SAA guidelines there is the advantage of being environment independent. Thus the competitive doors are open wider ~~which~~ which is likely to have an impact on IBM's revenues and profitability. For as competition increases the weaker vendors will be willing to sell at lower margins thereby undercutting everyone ~~the~~ else's profitability.

A third significant risk is that IBM does not provide enough support for certain applications or systems. This risk has always been around and is only slightly heightened by SAA. The fundamental point is that IBM is a box oriented company and for it to fully succeed with SAA and AD it must change its ~~modify~~? marketing philosophy and strategy. SAA is a start in that direction.

4) SAA shortfalls

In spite of its comprehensive nature, SAA does have some obvious shortfalls which will be discussed at this time.

i) NET [illegible]

SAA, in all its majesty, does not completely specify everything everyone would like to know. This is viewed as a double edged sword in that it allows IBM to have flexibility and to include new concepts and needs. The other edge, however, is SAA then looks like a band-aid approach and lacks a sense of certainty.

There is no doubt that SAA will evolve and grow, much like SNA did to reflect new technology and user needs. An SAA example of change and growth is the IBM addition of APPC to SNA. There have been numerous industry consultants indicating that SAA is not a complete architecture and seems to lack the same academic characteristics that SNA possessed when it was introduced in 1974.

2) Not all OS covered

It is interesting that several operating systems are not covered in the initial documentation available for SAA. Examples are: MVS/SP (MVS), VSE and S/3X SSP & CPF. System/3X users are fairly vocal about their disdain for SAA as it leaves them in a bind. IBMOT believes that IBM has a reasonable upgrade path in the highly publicized SILVERGATE line in the economy of 1988.

3) Not all languages

All the current popular languages are not supported

For example APL II and RPG III on the System 36 and System 38 environment is not supported. This suggests that SAA is built for future direction. Also not covered in SAA are PL/1, APL and Basic, however a computer language that is covered is C the basic language in UNIX an operating system environment that has been blacklisted for IBM. INPUT believes that is likely to change. [See Futures discussion in Chapter V]

4) Networking limitations

In spite of all the time and effort that has gone into SNA, which is included in large measure in SAA, there are some networking limitations. Exhibit IV-3 lists these limitations. The lack of specification on supporting other vendors equipment is a key factor in network cooperation.

5) INITIAL LACK OF DOCUMENTATION

When SAA was announced on MARCH 17, 1987 there was no documentation or IBM SYSTEMS JOURNAL to provide a basis for the major strategy and direction being expressed. This lack of "academic" substance got SAA off to a slow start. Some documentation was not available in MAY, 1987 (the scheduled ... of an overview manual). More substantial documentation is now available.

SAA would be more ... the ... that

Exhibit III-3

SAA SHORTFALL
Networking Limitations

- Network support
- Network management for foreign equipment
- Communication Standards
  - Except X.25 and OSI
- DBM and ECF not clear

been a research-oriented firm on blueprint available

6) No CASE or SAA dictionary

Also conspicuous by its absence is the lack of an application development tool or CASE-type product. Also there is no SAA dictionary tool support to track the functional and business definitions in an organization. Also missing were tools for change control/change requests/and audit trail. Input believes this is an important shortfall as it will limit the ability of corporate development to easily stay within SAA guidelines. Input believes that IBM will announce a CASE capability by 3rd QTR 1988.

I) SAA - Future Possibilities

Input forecasts it will take several years for the full functionality of SAA to settle out and reach steady state. Based on how IBM is releasing support for SAA in each of its major platforms it is unlikely that major application software systems will be developed before the early 1990s.

However the very first signs of IBM's commitment to SAA are likely to be observed in mid 88 when both OS/2 Extended and Silverlake are made available. Advance information indicates the support for SAA conventions, products and protocols will be quite good. IBM will be announcing the first

"OFFICE/3X"

SAA application being called "SAA OFFICE", based on the OFFICE 9? work in ASD. In addition several industry-specific applications are expected with the Silverlake announcement:

Construction's Management Accounting System (CMAS)
Distribution Management Accounting System (DMAS)
Manufacturing Accounting and Production Information Control System (MAPICS)

These applications were extremely successful on the S/3X products and are believed to have been ported to Silverlake as opposed to be written from scratch. It is expected these applications will be reworked to conform with SSA conventions.

Two very important program products that were not originally part of SAA are likely to be included (or added) in the near future. These are UNIX and a CASE TOOLS KIT (probably based on CSP)

1) UNIX

While IBM has chosen "C" as one of its multi programming language capabilities it is noteworthy that IBM did not select UNIX as an operating system environment. There is no doubt that UNIX has been having more success in the general market place, and [illegible] system, the government [illegible] UNIX in its [illegible]

The [illegible] reason that [illegible]

due to its inability to control the UNIX technology. However that is subject to change based on the recent announcements of the nine member UNIX Open Software Foundation (OSF) to sponsor an open version of UNIX and associated tools. Each of the founding (seven) members has agreed to provide up to $4.5 million per year over the next 3 years, a total of over $90 million.

The OSF was formed as a direct result to the Sun/ATT relationship. ~~which~~ The OSF founders felt Sun would dramatically override ~~them~~ with ATT a distinct ~~dev~~ advantage in pursuing the UNIX market due to the advance information and insight they would gain in the contributing process to the next UNIX version. ATT by itself was never viewed as having that develop advantage because it lacked any penetration or success as a hardware vendor. However the equity relationship and developer relationship with Sun tilted the balance and caused considerable concern on the part of Apollo, DEC and H.P. Exhibit X-1 shows the OPEN Software Foundation's initial founders and the technology they are licensing to the OSF.

The most [illegible] contribution is a future release of IBM's AIX which will be the foundation for the efforts of the OSF partnership. This being the case makes the likelihood of UNIX joining the SAA product family highly likely. After all IBM will be able to exert some influence on the OSF agency and that would mitigate the main reason for not including UNIX in SAA to begin with.

n "OFFICE/3X"

alled "SAA OFFICE" based
ASO In addition several
with the Silverlake announcements:
[illegible] Accounting System (UMAS)
t Accounting System (DMAS)
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reason that DPCT believes
UNIX as part of SAA was

due to its inability to
the [illegible] that [illegible]
[illegible] environment
Software Foundation (OSF) ATO
UNIX and [illegible]
[illegible] expected to [illegible] up
the next 3 years, [illegible]
The OSF [illegible]
to the SUN/ATT [illegible]
felt it would provide the
disadvantage in pursuing
the relevance information
[illegible] on the [illegible]
version. ATT by itself was
developer advantage because
or success as a hardware,
relationship and developer
the balance and caused
part of Apollo, DEC and
the OPEN software Foundation
the technology they are
The most [illegible],
release of IBM's AIX
for the affinity of the [illegible]
case makes the [illegible]
product family highly
able to exert some [illegible]
that would mitigate the
including UNIX in SAA

due to its inability to [illegible] the UNIX [illegible]. However, that is subject to change based on the recent announcement of the newly formed Open Software Foundation (OSF) to sponsor an open version of UNIX and associated tools. Each of the (founding) seven members are expected to provide up to $5 million per year over the next 3 years, a total of over $90 million.

The OSF was formed as a direct result to the Sun/ATT relationship. The OSF founders felt it would provide [illegible] partner a distinct advantage in pursuing the UNIX market due to the advance information and insight they would receive as the contributing developer to the standard UNIX version. ATT by itself was never viewed as having that developer advantage because it lacked any penetration or success as a hardware vendor. However the equity relationship and developer relationship with Sun tilted the balance and caused considerable concern on the part of Apollo, DEC and H.P. Exhibit X-1 shows the Open Software Foundation's initial founders and the technology they are licensing to the OSF.

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Exhibit ~~[illegible]~~ IV-4

OPEN SOFTWARE FOUNDATION
FOUNDERS AND TECHNOLOGY

Apollo Computer
Network Computing System
OPEN Dialogue

Groupe Bull
UNIX Multi-processor Architecture
Software Development Tools
On-Line TRANSACTION PROCESSING
OSI Software Support

Digital Equipment
USER INTERFACE TOOLS
Application DATA Interchange Formats

Hewlett Packard
National Language Support
DISTRIBUTED UNIX SYSTEM
Real-time Expertise
NewWave - presentation Formats

IBM
Future AIX Release

NIXDORF Computer AG
Distributed Relational Database
Network Management

Siemens, AG
Communications
USER INTERFACE
TRANSACTION PROCESSING
Compilers

Please Bold all the company names.

2) CASE TOOLS

As mentioned in the previous section IBM is expected to add capabilities and functionality to its Applications generator (CSP) to make it more competitive and acceptable as a CASE product. CASE (Computer-aided Software Engineering) is the ~~new~~ fast growing software products niche that has come into its own in the past couple of years. Leading independent vendors are INDEX Technology, Texas Instruments, NASTEC and Knowledgeware. While IBM's Cross ~~the~~ Systems Product ~~...~~ is available to somewhat meet the needs of CASE users it falls short in several respects.

Input believes that IBM will add to CSP ~~with~~ internally developed enhancements as well as some external ~~third~~ 3rd party tools. This has been a significant part of how the CASE market has been shaping up with the independent vendors teaming with ~~an~~ other CASE vendors to offer a more complete CASE offering.

A Case tool kit is key to the SAA success to facilitate internal applications development by IBM clients. Providing CASE front end to back-end tools will be an important element in leading the IBM client into the SAA environment.

3) 3270 replacement

The new wave of PS/2 announcements (June 1988) makes it more evident that the PS/2 family will become a suitable

relevance for 3270 type terminals in the next few years. The anticipated functionality of OS/2 extended and the connectivity tools therein will allow users to more effectively use the PS/2 in 3270-type applications. It is apparent that one major long-range goal of SAA is the desire by IBM to become more oriented toward intelligent workstations for distributed processing requirements.

J. SAA Competition

SAA in some sense has no competition from the other hardware manufacturers. Digital Equipment, Unisys, Hewlett-Packard, NCR do not have an extensive marketing/public/engineering program to describe a corporate commitment to a homogeneous application environment. On the other hand there is little need to have this because these other manufacturers for the most part have not had the confused, disparate hardware and software strategy that IBM had evolved to.

Most of the these vendors have had an SAA-like strategy they used that provided upward migration with little difficulty. DEC for one has had a myriad of product that spanned quite a computing spectrum which were supported by the same O/S i.e. VMS and applications. Obvious limit to application portability are memory and storage constraints and quite possibly access responsiveness and access.

In fact DEC has implemented DECNET which can support IBM's SNA intimately well. Some industry analysts believe DEC can support portions of SNA better than IBM itself. DEC has announced Network Application Support. ~~[illegible]~~

1) DEC's Network Application Support (NAS)

DEC has never articulated its applications architecture or environment it merely evolved into an environment where its customers could easily upgrade and have the same ~~[illegible]~~ applications available as their ~~needs~~ resource requirements changed. However, perhaps as a response to SAA and prodding of industry consultants DEC has spent a little marketing effort to articulate NAS. NAS is a comprehensive integration strategy to achieve applications compatibility across all systems deemed "important to our customers". It in part ~~consists~~ of three prong program to achieve applications compatibility through the use of:

- VAX/VMS OS architecture, which has been protected and implemented as a vehicle to provide computing capability across DEC's hardware.
- DECNET (now called DECnet/OSI) to provide connectivity
- NAS - product designed to provide network communication services in three basic areas:
  - application access services
  - business communication services
  - information [illegible] [illegible]

Network World 1/23/89

As part of the strategy DEC entered into a strategic alliance with Apple to provide support for Macintoshes and DEC environments. DEC also supports Corporation processing applications that run on IBM PCs

2) Other Vendor Views

Input's survey of leading hardware manufacturers yielded a consensus opinion that expressed the feeling that IBM's SAA efforts were long overdue. IBM is validating implicit corporate strategy they have been following against for many years.

While on one hand they should feel that IBM has covered up a weakness in solving the migration difficulties on the other they expressed the belief that they now know what they are up against.

Software vendors are interested in developing their software for the SAA environment to obtain the same benefit that IBM is looking for in economies of scale for development, documentation and product marketing. Some software vendors that have avoided porting a moving target usability from IBM mainframe environments will now be taking a hard look at how to downscale their software

V Conclusions ~~[illegible]~~

IBM has "stolen a march" on its competitors by embarking on a application software connectivity program called SAA which will re-structure the software industry. Exhibit V-1 [illegible] Input's belief on what SAA is in terms of the marketplace.

IBM is very committed to users, vendors and the industry in general in bringing out the SAA concept. Whatever the genesis and planning that may have or may not have taken place prior to the official announcement of March 17, 1987 the fact remains that SAA is real, significant, expensive and an opportunity.

This leads to conclusion #1: **SAA will re-shape the software products market.**

As one industry individual put it, "IBM does not always make the correct decision, but it makes its decision correct." The point is it is sour grapes to claim that SAA is not the result of elegant planning with a crisp methodology and definition skillfully executed, announced and implemented. But is SAA, it provides a direction and commitment and throwing immense amounts of resources at proselytizing the world will (with much behind the scene effort) make it work.

As to say what it could have been or what

Exhibit II-1

SAA Conclusions

SAA IS:

- REAL
- Significant
- Expensive
- An opportunity

Result: Re-Shape the Software Market

it does not contain only delays the inevitable. The inevitable is that IBM's users, competitors and strategic alliances will have to deal with it.

~~The following conclusions re~~ SAA will have several noticeable effects over the next few years. These effects are listed in exhibit V-2 and discussed below.

A) PRODUCT CONSOLIDATION

SAA will force a consolidation of products based on the number of vendors that will automatically be competing once SAA is available across all IBM platforms. This will be caused by the fact that each application vendor ~~p~~ that previously had to choose a hardware platform will now have its application available across all IBM platforms.

This will force ~~a~~ application software vendors (including IBM) to develop applications that are better, offering more functionality and support to meet the needs of the users. Thus users win!

B) USER Requirement

It is Input's belief that users will demand that applications vendors provide (for the IBM environment) SAA compliant products and tools. SAA and compliant products offer users the benefits of an improved operating environment.

Users will benefit from reduced development expenses, more efficient training expenditures and increased competition

Exhibit V-2
SAA Conclusions

SAA WILL:

- Drive Product Consolidation
- Be A user Requirement
- Drive New Applications / Projects
- Drive Software Pricing
- Re-Shape the Software Industry

for their dollars

c) New Markets

Due to the increased competition DIDOT is forecasting that application software vendors will look for new markets and applications to sell. In addition, with interfaces known and well-documented it is likely that there will be more ~~inter~~ multi-vendor application systems developed that will feature cooperative processing features.

Searching for new applications will cause the creative developers to be forced to automate still more sophisticated aspects of the business. This driving market force is complimented by the availability of significantly more processing power and complimentary resources to continue to drive the user interface to be as "friendly" as possible

d) Software Pricing

As the competition intensifies it will be difficult to hold the prices up or increase them (for a given function so to speak). The weaker vendors are likely to drop prices in an effort to maintain a revenue basis and/or market share. Revenues will be slightly impacted and overall there will be gains due to significantly increased unit volumes being shipped. Software pricing will continue in the same vein with IBM continuing graduated pricing strategies.

In addition it is Bright's opinion that a

shift in pricing will occur which IBM will emphasize purchase versus rental/lease to maintain a stream of continued profitability. This is similar to the change of purchase versus rental mix in the early 1960's when purchase was emphasized.

f) IBM Domination

While SAA may seem like not as much thought went into it as could have the fact remains it is here (or virtually so). As stated previously IBM is going to make SAA the type of success SAA finally became by spending enormous amounts of its senior management time and dollars. SAA is part of a major strategic direction by IBM to dominate the applications software market.

IBM currently enjoys software at approximately 13% of worldwide revenues. The bulk of IBM's growth in 1987 can be attributed to the growth in software products. It is left to the reader to decide what the implications are.

VI Recommendations

The previous chapters of the report revealed the motivation ~~targets~~ behind SAA, the content of SAA and the issues and driving forces for SAA. In addition forecasts ~~[illegible]~~ were provided on the acceptance of SAA, product time table and conclusions. This section describes recommendations that Input suggests other vendors in the Information Services industry might employ to take advantage of SAA as an emerging opportunity. SAA will not go away.

Exhibit VI-1 lists the Input recommendations which are discussed in the subsequent paragraphs.

A) Accept SAA

Input recommends that vendors or 3rd parties that are impacted by SAA learn to live with it. There are some that seem to be resisting the obvious consequences which only makes them more frustrated. Accepting SAA does not mean putting your head in the sand but rather becoming knowledgeable and learning how to take advantage of the ramifications of SAA.

B) Differentiate your Products

While this is clearly a motherhood and apple pie type statement once you accept SAA you need to develop a business strategy that makes you different from the others. It could be additional functionality, more performance, more ease, multivendor interaction, strategic alliances, support, price, etc. IBM can not do

Exhibit III-1

SAA -
Recommendations

- Accept SAA
- Differentiate Your Products
- Educate Fulfillment Opportunities
- Investigate working with SBM

everything itself.

c) Evaluate multi vendor opportunities

This recommendation concerns the attempt to find ways to tie multiple hardware vendor platforms together through some cooperative processing technique that will provide a value-added capability that is unlikely to be found in the IBM solutions. It would be extremely aggressive and courageous if IBM itself would attempt multivendor application functionality but INPUT believes this is unlikely. Shifting the IBM Corporation from hardware to ~~[illegible]~~ software product emphasis is a bold enough change to contemplate.

d) Investigate working with IBM

As mentioned earlier in the report IBM has set up ASD to develop applications both through internal programs and through external 3rd party relationships. Since IBM can not be all applications to all industries it seems clear that working with IBM is better than not working with IBM (just ask Hogan Systems). INPUT recommends that vendors explore what meaningful working relationship might mean.

In summary SAA will be a success. Vendors and users need to determine how to participate.

Appendix A

SAA Documentation

SAA was officially announced on ST PATRICK'S DAY 1987 after several months of leaks to the press. At the announcement there was no documentation available. The general reaction in the press and through the IS industry was one of cautious enthusiasm.

An overview manual was available in MAY, 1987 which was updated in September, 1987. It's official IBM document number is GC26-4341-1 and it is entitled "Systems Application Architecture - An Overview"

Other SAA documentation that is available is described in the following manuals:

SAA Component	Document Name	Document #
Common Programming Interface	Application Generator Reference	SC26-4355
	C Reference	SC26-4353
	Cobol Reference	SC26-4354
	Database Reference	SC26-4348
	Dialog Reference	SC26-4356
	Fortran Reference	SC26-4357
	Presentation Reference	SC26-4359
	Procedures Language Reference	SC26-4358
?	Query Reference	SC26-4349
Common User Access	SAA Common User Access: Panel Design and User Interaction	SC26-4351
Common Programming Interface	SAA Writing Applications: A Design Guide	SC26-4362

Appendix C

SAA Products
Common Communications Interfaces

	MVS/XA	VM/CMS	OS/2	S/3X (S.Cure Link)
Data Streams:				
3270 Data Stream	TSO, GDDM	CMS, GDDM	PC 3270 emulation	c
IPDS Printer Data Stream	PSF	PSF	c	c
Document Content Architecture	DW/370	DW/370	DW 4/2	c
Application Services:				
SNADS Distribution	DISOSS	c	c	c
Document Interchange	DISOSS, PS/370	c	PS/PC	c
Network Management Architecture	NETVIEW	NETVIEW	OS/2 1.1E	c
Session Services: APPC LU6.2	ACF/VTAM 3.2	ACF/VTAM 3.2	OS/2 1.1E	c
Networking:				
LEN Low-Entry	ACF/VTAM 3.2-NCP	ACF/VTAM 3.2-NCP	c	c
Data Link Control:				
Synchronous Data Link Control	ACF/VTAM-NCP	ACF/VTAM-NCP	OS/2 1.1E	c
Token-Ring Network	ACF/VTAM-NCP	ACF/VTAM-NCP	OS/2 1.1E	c
X.25	ACF/VTAM-NCP-NPSI	ACF/VTAM-NCP-NPSI	OS/2 1.1E	c

Notes: OS/2 1.1E = OS/2 release 1.1 Extended, Announced but no delivery date
c = SAA Compliance expected in a future enhancement.

Abbreviations
ACF/VTAM : Advanced Communications Facility/Virtual Telecommunications Access Method
DISOSS - Distributed Office System

SAA PRODUCTS
Common Programming Interface

	AS/X4	VM/CMS	OS/2	370
Languages:				
COBOL '85	COBOL II	COBOL II	COBOL/2	C
Fortran '77	VS FORTRAN	VS FORTRAN	FORTRAN/2	C
C	C (o)	C (o)	C/2	C
Applications generator	CSP/AD, CSP/AE	CSP/AD, CSP/AE	EZ-RUN	C
Procedures Language	C	VM/SP (REXX)	C	C
Services:				
Database Interface (SQL)	DB2	SQL/DS	OS/2 1.1 EXTENDED	C
Query Management Interface	GMF	GMF	OS/2 1.1E	C
Dialog Interface	ISPF	ISPF	OS/2 1.0G	C
Presentation Interface	GDDM	GDDM	OS/2 1.1G	C

Notes:

OS/2 1.1E = OS/2 release 1.1 EXTENDED, Announced but no delivery date

C.T.C = SAA Compliance expected in a future announcement

ABBREVIATIONS

CSP/AD = CROSS SYSTEM PRODUCT / APPLICATION DEVELOPMENT

CSP/AE = CROSS SYSTEM PRODUCT / APPLICATION EXECUTION

VM/SP = VIRTUAL MACHINE / SYSTEM PRODUCT

GMF = QUERY MANAGEMENT FACILITY

ISPF = INTERACTIVE SYSTEM PRODUCTIVITY FACILITY

GDDM = GRAPHICAL DATA DISPLAY MANAGER

DB2 = DATA BASE 2

SQL/DS = STRUCTURED QUERY LANGUAGE / DATA SERVICES

DW/370 = DISKWRITE/370
DW 4/2 = DISKWRITE 4/2
NCP = Network Control Program
NPSI = Network Packet Switching Interface
PS/PC = Personal Services/PC
PSF = Print Services Facility