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SNA Perspective

The single source, objective monthly newsletter covering IBM's Systems Network Architecture

SNA in Perspective: 1990

It's time again to weigh the past twelve months of SNA announcements and developments, to perform *SNA Perspective*'s annual rite of winnowing the wheat from the chaff. What sort of harvest was it? No single IBM communications announcement stands out in 1990—enhancements and progress were made in many areas.

IBM surprised many during 1990 with its aggressive strategy in the area of communications products, announcing new releases of VTAM and NetView, new versions of hardware connectivity products such as the 3172 and 3174, new architecture documents for peer communications, as well as another architecture-laden meta-product called SystemView.

It seems appropriate, in a year that started with the fall of the Berlin wall, that IBM continued to march strongly toward more openness in SNA. SNA in the 1990s will not and cannot be confined to traditional SNA technologies. As just two examples of this increasing openness, SNA will run over Ethernet, Token Bus, and FDDI as well as Token-Ring and OSI can be encapsulated within LU 6.2 to run across SNA

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Where Will SNA Go in 1991?

No year end issue would be complete without our scrambling out on a limb to deliver some prognostications on what the next twelve months may bring us. We divide these forecasts into two categories:

- what we think may actually happen
- what we would like to happen

What You See Is What You Get

Before we proceed, however, one expectation needs to be stated. Customers and competitors and, to some extent, government regulation in Europe, have been forcing IBM to announce its intentions and directions further in advance. Therefore, much of what was announced in 1990 has delivery dates in September and December 1991. It is doubtful if IBM will deliver much in 1991 that hasn't already been announced in 1990.

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backbones. IBM has also been aligning support between SAA and AIX and between NetView, SNMP, and CMIP, and began shipping OSI products announced two years earlier.

Crowning its 1990 announcements, IBM lifted the covers off the industry's worst-kept secret, the S/390, a.k.a. Summit, series of mainframes. Overlooked by some in Summit's shadow, IBM made several significant communications announcements in September, including a bow to improved host communications with the unveiling of the long-awaited fiber-optic ESCON channel. IBM also debuted, early in 1990, a major new midrange family, the RS/6000 running AIX, and significantly coordinated SAA and AIX support, elevating the importance of UNIX in the IBM operating system stable.

The following are the hot topics and products in IBM communications for 1990 which *SNA Perspective* has chosen to highlight in this year-end review.

- SNA architectures and protocols
  - SNA over LANs
  - ESCON
  - LU 6.2
  - NT 2.1/APPN
  - LAN/Token-Ring
  - VTAM
  - Telephony
- SNA hardware
  - 3174
  - 3745
  - 3172
- Network management
  - SystemView
  - NetView
  - Multivendor Network Management
- SNA multivendor network integration
  - OSI
  - TCP/IP
  - AIX
- Cooperative processing and SAA

SNA Architectures and Protocols

The best place to start winnowing is with architectures and protocols. People often accuse IBM of causing TLA overload—too many *three-letter acronyms*. This isn't entirely fair. True, IBM has been introducing many miscellaneous architectures for the last several years and continued this in 1990, but most have *four* letters.

This can make it hard to see the forest for the trees. Compared to the relative ease of planting new sapling architectural trees, changing the SNA forest is a slow, incremental, evolutionary process. To see evidence of this, look at how long it has taken IBM itself to implement LU 6.2, which was announced in 1984 and is only, in 1990, making it into MVS and IMS.

SNA Perspective believes IBM has been presenting these architectural tidbits in part to keep up interest, recognizing user disenchantment with SAA and LU 6.2. Further, they serve to prop up subarea SNA in order to buy IBM time to complete the gargantuan task of preparing the new SNA (see Architect's Corner in this issue). They also give us hints at the direction new SNA will take.

SNA Over LANs

1990 saw a major architectural shift when IBM announced a new version of VTAM that will allow SNA over Ethernet, Token Bus, and FDDI as well as Token-Ring. The new release of VTAM, VTAM 3.4, in conjunction with the 3172 interconnect controller, will allow SNA packets to flow over Ethernet, Token Bus, and even FDDI.

With this development, SNA will be able to penetrate the engineering/scientific world, the factory floor, and anywhere that needs the 100 Mbps of FDDI. This was further evidence of IBM's commitment to supporting multivendor networks. *SNA Perspective* believes this represents as profound a development as IBM's announcement that SNA would incorporate Token-Ring LANs.

ESCON

A second architectural change to SNA was the enterprise system connection (ESCON) channel architecture. Everyone knew that IBM was getting ready to replace the cumbersome bus and tag channels and their 1960s technology. As IBM itself put it in its announcement literature, ESCON is "the first major advance in channel architecture since the S/360."

The ESCON product line goes beyond just the channel connection. It also includes a family of matrix switches called the ESCON directors that provide high availability through nondisruptive recovery from failures in the channel or channel-attached devices. An ESCON director can support interconnection of several hosts and 3174 controllers. *SNA Perspective* was pleased to finally see the arrival of ESCON.

LU 6.2

1990 might be called "the greening of LU 6.2." The year brought no major architectural enhancements to LU 6.2, although the LU 6.2 architecture documents (*LU 6.2 Reference: Peer Protocols* and *Transaction Programmer's Reference Manual for LU 6.2*) were updated to reflect prior changes. The principal LU 6.2 events of the year were more about product than architecture:

- IMS/APPC at last gives to IBM's main transaction processing application subsystem an implementation of IBM's main transaction processing architecture.
- APPC/MVS joins APPC/VM.
- Reemergence of APPC's two-phase commit in SAA's common programming interface for communications (CPI-C).
- LU 6.2 for NetView.
- Remote distributed database architectures that rely on LU 6.2 transport.
- Remote procedure interface (RPI) which uses LU 6.2 to communicate between an OSI application on one system and an OSI/Communication Subsystem on another system.
- NetBIOS LAN-to-LAN communication across SNA using LU 6.2.

IMS/APPC—Although IBM promised for most of the latter 1980s that IMS's support for APPC was just around the corner, it must have been the same corner behind which the ESCON channel was hiding. IMS/APPC was originally to have followed shortly after the CICS implementation in the mid-1980s.

Two-Phase Commit—The reemergence of APPC's two-phase commit is even more intriguing than the emergence of IMS/APPC. When IBM originally detailed CPI-C, it explicitly left out user access to the syncpoint option set in the underlying LU. Many analysts speculated on IBM's motivation behind this: Assuming that the LU and its option sets were implemented anyway, was the intent to keep the two-phase commit a proprietary interface so that IBM's application developers would have an advantage over third-party competitors? IBM has laid this concern to rest with the announcement of what it calls the Resource Recovery Interface to the CPI. This was announced for the same release of IMS that has the basic APPC (IMS Version 3 Release 2) and also for VM/ESA, where it is called Coordinated Resource Recovery. Two-phase commit brings LU 6.2 closer in alignment with the emerging OSI distributed transaction processing (DTP) standard.

NT 2.1/APPN

Moving from LUs to PUs, 1990 brought both good news and bad news about Node Type 2.1 (NT 2.1) and advanced peer-to-peer networking (APPN).

The good news is the improved implementation of NT 2.1 in VTAM 3.4. Although VTAM currently supports independent LUs, many restrictions have until now limited the usefulness of the architecture.

Additional good news is that the new release of VTAM, announced in September, will advance SNA's progress toward allowing the interoperation of APPN networks using an intervening SNA backbone. Previously, VTAM had allowed an APPN network a single, static, predefined connection to a subarea network. Now APPN networks

can have multiple, dynamic connections between themselves through an intervening SNA backbone.

The bad news is that, despite this and other advances, the new VTAM still does not incorporate any of APPN's advances in dynamic route definition and selection. Truly dynamic SNA did not materialize in 1990.

IBM is starting to deliver on NT 2.1 and support for independent LUs. We hope for APPN, both as an architecture and as a product, in mainstream SNA. It's important to remember that NT 2.1 and APPN are two different things. NT 2.1 is an architecture that IBM has defined and published. APPN, on the other hand, is a group of option sets for NT 2.1 that IBM has refused to designate as an architecture for reasons that are partly technical and partly legal. SNA's architects are privately assuring major users that future releases of VTAM and NCP will incorporate something very much like APPN's dynamic route selection and directory services. But *SNA Perspective* believes such dramatic revision of SNA will not be announced until 1991 for delivery in the 1992-1993 time frame (see Architect's Corner in this issue).

LAN/Token-Ring

The principal development in IBM's LAN strategy was the announcement that SNA will run over LANs other than Token-Ring.

But IBM was not idle with the Token-Ring itself—it introduced a number of new products in 1990. These include the LAN-LAN Wide Area Network Program which, like the APPN enhancements to VTAM, allows for two LANs to have dynamic sessions over an SNA backbone. This product provides routing of encapsulated IBM NetBIOS packets over LU 6.2 sessions.

IBM also renamed its LAN management products. Everyone knows of the confusion that resulted when IBM called its network operating system LAN Server (which is IBM's version of the Microsoft LAN Manager) and its management product LAN Manager. That's been remedied; in 1990, IBM split it LAN Manager into two components—LAN Network Manager and LAN Station Manager. LAN Network Manager has been enhanced to work more effectively with NetView, including improved security and accounting management, and it now sports a graphical interface that is compliant with SAA's common user access (CUA) standards. It is likely a sign of things to come in IBM's network management that the LAN Station Manager conforms to the OSI protocols for network management, supporting CMIP over LLC (CMOL).

On the hardware side, IBM announced a controlled access unit (CAU), which allows up to eighty devices to be attached to the network. Because it is a powered device with local intelligence, a CAU is capable of executing security tasks and working with NetView. This is less an advance for IBM than a move that brings it to par with other Token-Ring providers. Still, the CAU does have some features its competitors lack. Most notably, it will work with both LAN Network Manager and LAN Station Manager. The CAU supports both copper and fiber and increases maximum distances for the lobes with built-in repeaters.

VTAM

The September announcements brought VTAM 3.4 for MVS and VM, and VTAM 3.3 for DOS/VSE. Most of the major enhancements of VTAM 3.4 are addressed in this article under the categories that the enhancements affect. VTAM 3.4 will bring relief to many users trying to make their mainframes work more effectively in a nonhierarchical SNA environments with its enhanced support for NT 2.1 and for APPN networks. But, to many users, the biggest benefit in the new VTAM is its automation of many of the configuration management tasks of the VTAM systems programmers and operators—its ability to enroll self-identifying devices promises to dramatically cut down on the amount of work such personnel must do. As a further enhancement, IBM increased to sixteen the number of transmission lines supported between VTAM and NCP.

The most significant of the remaining enhancements is dynamic network identification of switched and LAN devices. No one has ever accused VTAM of being easy to change. In fact, the old saw goes that if the phone system were run

the way VTAM was, everyone would have to hang up before a new user could be added. To a considerable degree, that is no longer so. In the new VTAM, new devices will automatically identify themselves to the network and be entered in VTAM's tables without requiring a regeneration. For the MVS version of VTAM 3.4, this will go even further: working with the MVS I/O software, all devices that are channel-attached can identify themselves.

Telephony

An area where IBM took a large step back was its retrenchment in telephony. The sale of ROLM to Siemens muddied considerably IBM's already muddled strategy for voice/data integration, and created a technological exposure that IBM may have difficulty covering with alliances. On the other hand, if it is a sign that IBM is focusing its efforts on doing a few things well, then the ROLM experience may be considered a timely, if expensive, lesson.

SNA Hardware

1990 did not see a lot of new SNA hardware.

3174

We got two new models of the 3174, local and remote controllers called the 21L and 21R in September, and a low-end version called the Tokenway 3174 in March. The 3174 family was also enhanced with support for the ESCON channel. By connecting to an ESCON director, which can also be directly connected to up to eight mainframes, the 3174 can have direct access to multiple hosts.

3745

The 3745 had to be content with increased memory and a new, non-ESCON channel adapter using what IBM calls buffer chaining. The absence of an ESCON adapter for IBM's major communications processor appears strange at first glance, but makes sense since *SNA Perspective* expects the 3745 to be made obsolete soon by a new "3765" family.

3172

The most interesting product from a hardware point of view is the new 3172 interconnect controller, introduced near the end of 1989 and first shipped in 1990. The 3172, IBM's newest communications box, is designed to replace the 8232 LAN channel station. It acts as a LAN-to-host channel gateway for Ethernet, Token-Ring, Token Bus, and FDDI and, alternatively, supports channel-to-channel connection.

The 3172 is so well positioned that it has caused confusion among some users who have speculated that it may supplant the role of 3745s in running SNA networks. The strength of the 3172 lies in its extensive interconnection abilities. It cannot execute the immensely complicated subarea routing and flow control tasks of NCP, nor its boundary function tasks in support of APPN. The two are complementary, not competitors. The 3172 is discussed in detail under Reader's Q&A in this issue.

Network Management

Ordinarily, the main news concerning IBM's management products during 1990 would have been IBM's announcement of two releases of a new version of NetView. But the hottest management news of 1990 was a new IBM initiative called SystemView.

SystemView

SystemView is a *strategy* for integrated total system management of multivendor heterogeneous environments. SystemView is not an architecture, nor does it have an underlying architectural basis. The strategy is defined in terms of three elements referred to as *dimensions*: end-use, application, and data. SystemView is described in more detail in the October 1990 issue of *SNA Perspective*.

NetView

IBM gave us some intimation of its future plans for network management by announcing two releases of a new version of NetView—Version 2 Release 1 (to ship this month) and Release 2 (to ship in September 1991).

Release 1—Release 1 of the new NetView will bring three major innovations:

- Support of NPM performance alerts
- Support for linking NetView to IBM's systems management product, Info/Management, and its extensive databases of local, systems-specific data
- A long-awaited graphics product, the NetView Graphics Monitor Facility (GMF)

Unlike last year's tactical graphics interface, GMF was developed by IBM and is an OS/2-based product that conforms to SAA's CUA.

Release 2—Users will have to wait until September 1991 for NetView Version 2 Release 2 with:

- Support for the new LAN Network Manager
- LU 6.2 transport

Multivendor Network Management

IBM announced enhancements to its TCP/IP and OSI products that allow NetView to act as a focal point for management of TCP/IP, OSI, and SNA networks using NetView interfaces to simple network management protocol (SNMP) and common management interface protocol (CMIP). This meets IBM's statement of direction in this area. *SNA Perspective* sees this as an essential move if NetView is to carve out a niche as a multivendor network manager—NetView/PC was inadequate to the task.

SNA Multivendor Network Integration

OSI

In OSI, IBM prospered as it continued its steady march toward becoming a dominant participant. It announced or rolled out OSI support for the mainframe (MVS, VM, VSE (RPI only)), midrange (AS/400, RS/6000), and desktop (PS/2) platforms. This filled in a crucial piece of connectivity in its SAA puzzle.

IBM's 1990 announcements in OSI expanded its offerings both in breadth across the product line and in depth for the mainframe products in particular. OSI/Communications Subsystem (OSI/CS) is IBM's implementation of OSI layers 3 through 6 along with the association control service element (ACSE) from layer 7. OSI/File System (OSI/FS) is IBM's version of the ISO File Transfer Access and Management (FTAM) standard.

What IBM did in 1990 was ship OSI/CS for MVS and VM, meeting shipment dates set in September 1988, and widen its OSI product line with versions of OSI/CS and OSI/FS products for the OS/2 and the OS/400 environments. At the same time, it deepened the functionality of the mainframe implementations of OSI/CS with Release 1.1 for both VM and MVS. OSI/CS 1.1, available now, adds three new areas of support:

- Direct DTE-DTE connections
- Ethernet attachment via the 3172
- Remote OSI applications

Direct DTE-DTE Connections—The mainframe implementations of OSI/CS (both VM and MVS) require (at least originally—see next bullet) that the lower OSI protocols be provided by the NCP packet switch interface (NPSI) software in a communications controller. This combination allowed the host to function as an X.25 DTE and, as such, to communicate with another OSI host over an X.25 network. With OSI/CS 1.1, NCP 5.2 or higher, and NPSI 3.3 or higher, it is now possible to have two OSI/CS hosts communicate directly over a circuit switched line without any intervening DCE.

Ethernet attachment via the 3172—Perhaps the most important thing about OSI/CS 1.1 is that it can now dispense altogether with using NPSI and the communications controller. By having a channel-attached 3172 connecting the OSI/CS host directly onto an 802.3 Ethernet LAN, very significant savings in cost (no need for a 3745) and execution time should accrue. The latter benefit stems from the fact that the channel to the 3745 is effectively a single-link SNA network, communicating with a "shadow" LU in NPSI, all of which is bypassed

when going to the Ethernet LAN directly. IBM intends to add support for OSI over Token-Ring and Token Bus as well.

Remote OSI applications—An OSI application can now run on an SNA host without OSI communications capability and communicate with an OSI/CS host via an LU 6.2 session. To do this, both hosts must run VTAM with the optional OSI remote programming interface (RPI) feature announced in June 1990. OSI RPI can be considered as a client/server split, with the OSI application on the "client" system making calls, which are intercepted by OSI RPI as remote procedure calls and transported via LU 6.2 across an SNA network to a "server" system which does have OSI/CS.

VSE was one system for which RPI was introduced where OSI/CS is not supported. Now that IBM appears to be making VSE a quasi-SAA platform, the company seems to be saying this is the avenue they will use to provide OSI connectivity for VSE hosts. Undoubtedly, this is to avoid delivering a third mainframe implementation of OSI/CS itself.

In addition to the OSI/CS and OSI/FS products, IBM also announced a reworking of its X.400 store-and-forward messaging software, now called Open Network Distribution Services (ONDS). The new software will have ties through X.400 PROFS Connection and X.400 DISOSS Connection into the messaging systems for OfficeVision as well as DISOSS and PROFS. IBM's X.400 ONDS, in conjunction with OSI/CS, supports two OSI messaging systems communicating with each other over SNA via an LU 6.2 session, or across Ethernet or X.25.

TCP/IP

To most users today, multivendor network integration defaults to TCP/IP and will continue to do so, at least until OSI matures and a variety of OSI products are available, and likely long past that. To capture this market, IBM has implemented TCP/IP protocols on its strategic platforms.

At the beginning of the year came TCP/IP for OS/2, which will allow the PS/2 platforms to interoperate in the engineering/scientific world. In June, TCP/IP Version 2 for VM was introduced, followed in September by TCP/IP Version 2 for MVS. TCP/IP Version 2 is designed to enhance the capabilities of the S/3x0 as a server in an engineering/scientific environment and includes:

- X Windows support
- FDDI connection via the 3172
- Management from NetView Version 2 with the SNMP

An insight into IBM's strategy toward TCP/IP can be gleaned from the emphasis it gave to migration support for moving to OSI. IBM's strategic commitment is to OSI; TCP/IP had been viewed merely an intermediate step along the way. But IBM is realizing that the intermediate step is larger and longer than anticipated, especially with its stepped up participation in the UNIX world with its RS/6000. IBM is thus is forced by customer demand to provide more significant TCP/IP support than it originally expected.

AIX

In February, when IBM introduced the RS/6000 family of RISC-based workstations and servers, it also unveiled a new version of IBM's UNIX operating system for them, AIX Version 3. In addition to the RS/6000, AIX runs on IBM's PS/2 and S/3x0 mainframes.

IBM also took this opportunity to make several statements of direction on communications between its various operating systems and operating environments, its network management protocols and systems, and its distributed files and applications. IBM made it clear that AIX is *not* joining the SAA family. However, IBM called both SAA and AIX its two strategic computing environments and stated that interoperability between SAA and AIX is essential.

Cooperative Processing and SAA

Last, but not least, we come to IBM's announcements in cooperative processing, which IBM has formalized in its Systems Application Architecture

(SAA). If votes were cast in 1990 for the hottest buzzword, the winner would have to be client/server computing, which is one type of cooperative processing.

SAA was the hot topic of 1989, with the announcement of OfficeVision, the first major SAA application. But in 1990 SAA took on a new flavor. IBM's current claim is that cooperative transaction processing rather than application portability is the prime *raison d'être* for SAA. Major delays were announced for OfficeVision, many feature extensions were made to SAA, and VSE and Windows 3.0 appear to be becoming quasi-SAA platforms.

IBM announced a number of SAA's pieces such as the OSI software and assorted compilers. From the communications perspective, the most important news was, of course, that the CPI was enhanced and two-phase commit surfaced as a user-accessible service in the form of the resource recovery interface announced in September.

An unfortunate note was struck over SAA's principal showcase, the Repository Manager, when it was discovered that the entity-relationship model used by the Repository's developers for representing internal data had not been adopted by the SystemView architects. Instead, they chose to implement the OSI standards on object definition as specified in the ISO standard Guideline to the Definition of Managed Objects (GDMO). Undoubtedly IBM will fix this but it is not an auspicious beginning.

One of the sleepers of 1990 was user pressure on IBM to let Windows 3.0 become an SAA environment for the PS/2 platform. This pressure from major users unwilling to move to OS/2 highlights a danger to the SAA effort. The fatal flaw lurking within any effort as expansive as SAA is that the search for the best approach can kill off all the viable alternatives in favor of an unattainable ideal. Whenever SAA is expanded to include more architectures and/or more platforms, the chances of delivering it in an acceptable time frame, or even at all, are diminished.

Distributed Computing

IBM made several moves to lay an architectural groundwork for distributed computing in 1990.

OSF DCE—IBM together with Digital Equipment Corporation and Hewlett-Packard, among others, sponsored a proposal called DEcorum to the Open Systems Foundation (OSF) for a distributed computing environment (DCE). Significant portions of this proposal were accepted by OSF. DCE includes several technologies, among them a remote procedure call, name service, directory service, time service, multithreading, authentication/security, distributed file system, PC integration, and diskless operation.

Supporting Architectures—In July, IBM made five announcements related to remote distributed relational data architectures. These included an extension to its SAA CPI and four extensions to its SAA common communications support (CCS) (see *SNA Perspective* August 1990). In September, IBM had several SAA-related announcements, most of which revolved around distributed relational data, transaction processing, database integrity, and system management. To architecturally formalize these extensions, a new resource recovery service was added to the SAA CPI, and CPI-C and SQL were enhanced. Together with the July announcements, they largely complete the SAA remote distributed relational data scheme, which was originally unveiled in October 1988.

Analysis

Lost in the Rush

In 1990, IBM announced the more products than in any other year in its history. As a result, some of the most significant communication announcements got lost in the rush.

IBM is Listening

SNA Perspective believes that the 1990 announcements show IBM's professed willingness to listen to customer input is more than just a talking point in closing sales. The challenge is to decipher where talk leaves off and products begin. The plethora of

1990 announcements leave IBM's competitors and customers wondering if behind the smoke there is sufficient fire to deliver on the promises, given IBM's lumbering product development cycle. Notwithstanding its prolific announcements, IBM admits it is suffering from long development schedules. Much of what was announced in September 1990, for example, has delivery dates as late as December 27, 1991, and it is doubtful if IBM will deliver much in 1991 that hasn't already been announced in 1990.

On the other hand, IBM is also using long lead times to respond to customer demand to understand where the company is headed so they can take it into account in their long-range planning. And although 1990 was the year of the OfficeVision delay, it was also the year IBM delivered OSI/CS for MVS and VM in the month scheduled at their September 1988 announcement.

Where did SNA Go in 1990?

The most significant IBM communications trend in 1990 was its increased openness to multivendor networking. The two major SNA steps forward were the ESCON channel and SNA over alternate data links. With these two exceptions, the architecture of SNA itself did not move much. But that's alright: far better that IBM produce what it has already architected than produce sweeping new architectures. Whether IBM will be able to meet its ambitious schedules for all the new products is a question that remains. ■

SAA Environments

Transaction-based environments
- OS/2 EE for PS/2
- OS/400 for AS/400
- IMS/ESA TM for S/3x0
- CICS/ESA for S/3x0

Interactive application environments
- OS/2 EE for PS/2
- OS/400 for AS/400
- CMS for S/3x0 using VM/ESA
- TSO/E and APPC/MVS for S/3x0 using MVS/ESA

"VSE/ESA supports SAA transaction processing with CICS/VSE"

(Continued from page 1)

What We Don't Expect

1991 will likely be more quiet than 1990 for IBM communications. For example, VTAM 3.4 will not be released until September 30, 1991, so it is unlikely that IBM will announce yet another release. If there were a release (there have been eight releases of VTAM in the last nine years), it would probably be VTAM 4.0, not VTAM 3.5; IBM has never gone to x.5 in a VTAM release. Still, *SNA Perspective* expects VTAM 4.0 in 1992, which will fundamentally incorporate APPN, as will new SNA, which we expect to be announced in 1991.

What SNA Perspective Expects

Further SNA/OSI Convergence

The clear trend that IBM is pursuing is to enhance SNA while it tracks OSI developments. *SNA Perspective* believes that IBM has clearly made a strategic decision to forego some advantages of a proprietary SNA for the market benefits of producing what an increasing number of its largest consumers want. In other words, IBM is gradually folding OSI into SNA, replacing or at least augmenting SNA protocols with OSI protocols as they become international standards. Two areas in particular stand out as candidates for such change in 1991:

- Full-duplex APPC
- CMIS/CMIP incorporation into NetView

Full-duplex APPC means full-duplex LU 6.2 sessions and conversations. This would support optimizing LU 6.2 for interactive use and real-time applications while it is currently an asynchronous protocol designed for store-and-forward between applications. *SNA Perspective* believes that IBM will announce new implementations of APPC that are full duplex, at least at the session level, to more closely align LU 6.2 with the ISO standard on transaction processing. (See *SNA Perspective* July 1990 for more details on LU 6.2 vs. OSI distributed transaction processing (DTP) protocols). Those who have seen IBM's architecture documents for

LU 6.2 confirm that the capability to have full-duplex sessions and conversations has been in the architecture from its inception. As LU 6.2 has been implemented, however, there is no provision for either, and users are confined to half-duplex flip-flop (HDX FF) sessions and conversations. Since the OSI DTP is likely to become accepted as a full ISO international standard in 1991, IBM may chose to announce that LU 6.2 will move toward compliance with the standard, or it may announce that LU 6.2 will comply with the implementor workshop profiles on which work is proceeding concurrently with the standard ballot process.

CMIS/CMIP support is already part of IBM's open network management strategy. However, *SNA Perspective* believes that IBM is going beyond allowing NetView to manage OSI networks and is moving toward adapting NetView internally to conform more closely to the OSI model. New IBM products to be announced in 1991 will likely use the OSI protocols for exchanging network management data and commands.

"3765"

A "dog that didn't bark" in the September 1990 product announcements was the absence of an ESCON adapter for the 3745 communications controllers (although IBM issued a statement of direction to supply one). The most likely reason for this delay is that the 3745 is destined for replacement in a timeframe that obviates the need to develop an ESCON adapter for it. The expected "3765" replacement, which IBM hinted at during the November GUIDE meeting, will be based on a new hardware architecture that supports much higher performance and is better suited to support the demands of APPN.

More TCP/IP Announcements

If OSI is the new king of multivendor networking, then the old king TCP/IP is a very lively cadaver. It is beginning to look as though the cutover from TCP/IP to OSI may take longer than anyone expected several years ago. Expect IBM to respond to market conditions by augmenting its TCP/IP offering even more, especially in the area of network management. A recent agreement between IBM, MCI, and Merit to develop management tools for the NSFnet may be one motivation.

Performance Management

Automated performance management is the final frontier of network monitoring and control. Performance management is much more complex to address than problem management yet the need for it is rising as networks are under increasing pressure to maximize return on investment. SNA already has an automatic control system in place for managing congestion of virtual routes in a subarea network, namely RPacing.

SNA Perspective believes that IBM will announce in 1991 a performance management tool that will:

- be completely integrated into NetView (unlike the Network Performance Monitor it will supplant)
- allow for automation of many routine operator tasks involved in load balancing and traffic management

The S/390 announcement and the dynamic registration will show the savings in personnel and operating costs that come from task automation. *SNA Perspective* believes that IBM is committed to this direction. We also think that performance management, with its complex decision making and real-time requirements, will be IBM's choice for announcing an automated management package, possibly including expert systems technology.

What SNA Perspective Would Like to See in 1991

Dynamic Alternate Routing in Subarea SNA

If IBM can make VTAM dynamically register devices attached to the host, can't it make SNA routing resemble that of APPN? This will allow SNA, if a path fails, to automatically assign a new session. No one knowledgeable about VTAM would claim that this will be a simple task, but it is nonetheless a vital one if SNA is going advance into the 1990s.

Formalize "Casual Connections"

Casual connections are a quick and dirty kludge to support peer-to-peer networking on a subarea basis. *SNA Perspective* would like to see them formalized and rationalized, which will probably be part of new SNA. Independent LUs are another interim solution to peer communications in an SSCP-LU session the way that casual connections deal with the SSCP-PU session. Enhancements here would also be appreciated.

Application Management

Currently, IBM's management tools use a non-architected protocol boundary to move information from an SSCP-LU session to the SSCP-PU session so that it can be transmitted and therefore managed. Response Time Monitor works this way, for example. With LU 6.2 for NetView, moving to less of a kludge solution to monitor functions of applications would be possible so that information on an SSCP-LU session can be directly monitored.

NT 2.1 Support in 3174

One of the most popular configurations for connecting mainframes to Token-Ring networks is using a local (channel-attached) cluster controller with a Token-Ring interface attachment. This configuration, however, presents users with a dilemma. Because the 3174 lacks the NT 2.1 control point, it is impossible to have APPN sessions up to the host. Why has IBM been so reluctant to implement NT 2.1 in the 3174? Possibly the 3172 decreases the need for this enhancement for local controllers, though this lacking could limit the lifespan of the 3174.

SNA Over SMDS, B-ISDN

Public data networks didn't take off in the United States to the extent they did in Europe, evidenced by the pervasiveness of X.25 in Europe compared to the United States. This is changing somewhat as the regional Bell operating companies aggressively move into value added and public data networking. Two technologies are spearheading their drive: switched multimegabit data service (SMDS) and broadband ISDN. IBM must position SNA to run over these and similar services, such as frame relay and fast-packet. The announcement of SNA over non-SNA LAN technologies is a promising start, but will IBM be able to do it for WANs without ROLM's telephony expertise?

Non-Mainframe Focal Points

SNA networks will be able to be managed from non-IBM systems, including Digital (through its agreement with Systems Center) and Tandem. *SNA Perspective* believes that IBM may even choose to announce a NetView focal point on the RS/6000, which we believe has the technical capability to support it. ■

1990 IBM Communications Announcement Highlights

February	RS/6000 AIX 3.0 SAA/AIX alignment
March	Tokenway 3174 controller
May	OSI/CS ships, as announced in September 1988
June	Multivendor networking barrage Part I OSI position paper OSI RPI OSI for RS/6000 TCP/IP V.2 NetView for SNA, OSI, TCP/IP from one console
July	SAA remote distributed relational data architectures
9/5	System/390 ES/9000 mainframes (Summit) ESCON channel architecture VTAM 3.4 NetView 2.1, 2.2 SystemView APPC for IMS and MVS 3172 enhancements
9/18	Multivendor networking barrage Part II OSI for OS/2, OS/400 TCP/IP MVS and NetView X.400 and ONDS SNA over Ethernet

Reader's Q & A

An SNA Perspective *reader from AT&T recently asked us about the significance of the IBM 3172 interconnect controller. In particular, he wanted to know what it signified for the future of the IBM 3745 communications controller.*

What It Is

The IBM 3172 interconnect controller was designed primarily as an interface between IBM hosts and LANs, particularly with Ethernet/802.3 LANs running TCP/IP and MAP/802.4 LANs running OSI. However, through enhancements announced in September 1990, IBM is increasing the 3172's Token-Ring and SNA support. In addition, the 3172 will support FDDI, host-to-host channel connectivity (via T-1 and the new ESCON architecture), and IBM has said it will later support a T-3 interface.

3745 Limitations

The 3745 is hardware-constrained in performance when interfacing to high-speed LANs and WANs. This constraint was eased somewhat in September with the buffer chaining channel adapter (BCCA), which improves host-controller performance. Also, the memory was increased fifty percent, which helps support the dynamic LU definitions required to support node type 2.1. However, these are patches to a limited hardware architecture.

Further, developing an interface adapter for the 3745 (or any proprietary architecture) is an extensive process involving several person-years of investment. The 3172, on the other hand, is based on IBM's Micro Channel Architecture, so that third-party adapters designed for the PS/2 to connect to all types of LANs can easily be adapted for the 3172. IBM would rather not invest its R&D dollars into commodity hardware development.

Newer protocols today handle many of the functions that communications controllers used to perform. For many years, companies have been replacing SDLC communications locally with LANs and remotely with X.25 and T-1 networks, which can also support other protocols in addition to SNA. These changes significantly affect the role the communications controller will play. The strength of the 3172 lies in its extensive interconnection abilities. It cannot execute the immensely complicated subarea routing and flow control tasks of NCP nor its boundary function tasks. The two are complementary, not competitive.

NT 2.1 for 3174?

Peer communications could be improved by IBM adding NT 2.1 support to the 3174 cluster controller. However, we no longer believe that this will be IBM's strategy to support LAN-to-host communications, although IBM may still eventually so enhance the 3174. It is interesting to note the similarity in numbering of the 3172 and 3174.

3172 Positioning

The 3172, originally intended only to support multivendor LANs (Ethernet with TCP/IP and MAP with OSI), has been elevated as IBM's option of choice for interfacing LANs to hosts. This is part of a pattern SNA Perspective has seen emerging, which it described in May 1990 "SNA Moves from WAN to Extended LAN," which is the extension of networks operating at layer 2 so that an increasing percentage of the physical network is independent of the upper-layer information and protocols it is sending.

"3765" on the Horizon?

SNA Perspective believes that IBM will unveil a replacement for the 3745 in 1991 which will be based on a new hardware architecture that can better support new SNA functionality. This new communications controller family, which IBM hinted at in the November GUIDE meeting, will likely not ship until 1992. Because of this new family, *SNA Perspective* does not expect significant enhancements to the 3745. The new communications controller will likely be based on the Micro Channel Architecture, and may include other architectural similarities to the 3172. ■

IBM 3172 Interconnect Controller

Introduced in October 1989 and first shipped in September 1990, the 3172 is a Micro Channel-backplane gateway based on the 386 (model 1) or 486 (model 2) processor, but with a different BIOS than the PS/2. It replaces the 8232 LAN Channel Station.

The 3172 is run from a PS/2 running OS/2 EE 1.2 and the 3172 operator facility software, which is provided with the 3172 interconnect controller program. This PS/2 can manage up to sixteen 3172s via a Token-Ring LAN. The 3172 can be managed by NetView. It operates as a Node Type 2.1 and supports LU 6.2 communications.

3172 Model 1

At the October 1989 announcement, the 3172 was introduced to support:

- LANs—Token-Ring, Ethernet/802.3, and MAP (broadband and carrierband)
- Host protocols/environments—TCP/IP for VM, MVS, and AIX, and MMS for MAP

The September 1990 announcements added:

- SNA application communications added for Token-Ring, Ethernet and MAP LANs (requires VTAM 3.4)
- Support for the IBM PC Network added for connecting to TCP/IP on VM and MVS (available 12/91)
- Local channel-to-channel (CTC) support via the new ESCON adapter (available 12/91) in addition to the existing parallel channel (requires VTAM 3.4. ESCON adapter does not support LAN-to-host.)
- Remote CTC support via T-1 adapters (available 12/91)
- Support for OSI/CS communications across Ethernet through the 3172

The base price of the 3172 model 1 is $15,450. The LAN adapters are priced from $315 (PC Network baseband) to $2,495 (MAP broadband). The parallel channel adapter costs $7,500 and the ESCON adapter will cost $11,500. The T-1 adapter costs $3,057.

Each 3172 can be used either for CTC communications or for LAN-to-host communications. Each 3172 can support up to four LAN attachments and two channel attachments.

3172 Model 2

The 3172 model 2 uses the 486 processor and supports the 100 Mbps fiber distributed data interface (FDDI) LAN. It supports TCP/IP and SNA data flows between the FDDI LAN and the host. Scheduled availability for the 3172 model 2, priced at $48,500, is December 1991. It currently does not support any other LANs nor the new ESCON channel architecture.

3172 Statement of Direction—September 5, 1990

- Enhance model 2 to support:
  - access to SNA applications through VTAM for Token-Ring and Ethernet LANs as well as FDDI
  - access to TCP/IP VM and TCP/IP MVS for Token-Ring, Ethernet, and PC Network LANs as welll as FDDI
  - host remote CTC support with DS-3 (T-3) links
  - remote CTC for model 2 via ESCON channel adapter
- Add OSI/CS support to Token-Ring, Ethernet, FDDI (model 2 only), and MAP (model 1 only) LANs (OSI/CS support over Ethernet was announced on September 18.)
- Enhance centralized change and configuration management capabilities, supporting NetView Distribution Manager and NetView's Network Asset Management functions

LU 6.2 User Acceptance—Part II

Organizations that have implemented logical unit 6.2 (LU 6.2) in their SNA networks in the last few years have not embraced it wholeheartedly. Many have found it too complex to expand further but most are waiting for applications.

This article is the second part of a two-part series on user acceptance of LU 6.2. *SNA Perspective* followed up with companies that, three years ago, had plans to implement LU 6.2. The first installment, "LU 6.2 Growing More Slowly Than Anticipated" in September 1990 *SNA Perspective*, focused on those organizations that had *not* followed through on their initial plans. This article will examine the experiences of those who *have* implemented LU 6.2.

Where We Looked

In August 1987, *SNA Perspective* did an extensive survey of SNA users to determine the extent of LU 6.2 penetration and the potential market. At that time, less than twenty percent of the survey respondents had implemented LU 6.2. Of the remainder, about one-third had plans to implement it within two to three years, another third intended to start using it in three to four years, and the rest had no plans to use LU 6.2.

That survey concluded, based on respondent enthusiasm, that by 1991 three-quarters of all SNA users would be implementing LU 6.2. Current feedback indicates that the growth curve has been less steep than even the customers themselves expected.

Three years later, *SNA Perspective* followed up with those who indicated that they would implement LU 6.2 within two to three years. Note: This follow-up research was not a statistical survey but, rather, a sampling of the respondents to the first survey. Therefore, the results are given in qualitative rather than in quantitative terms.

Only one-third of those we contacted have followed through on plans to implement LU 6.2. All results in this article (unless otherwise specified) refer to these implementers. The non-implementers were discussed in the previous article in September 1990 *SNA Perspective*.

What We Found

Systems and Environments

Some respondents have implemented LU 6.2 *only* on their midrange systems, either AS/400s or System/36s, even though most also have 3090s on site.

Of those who have LU 6.2 on their mainframes, most have 3090s. None of the mainframe implementers have LU 6.2 also running on IBM midrange systems (though some support LU 6.2 to other vendors' midrange systems). Most of these mainframe systems are running MVS/XA or MVS/ESA. Most are operating at VTAM 3.2 or 3.3 and NCP 4.3 or 5.2.

Most have included personal computers in their LU 6.2 environment, with approximately equal numbers supporting DOS or OS/2 systems. Some use packaged products, for example from Spectrum Concepts or Orion. Others have developed homegrown applications using APPC/PC or OS/2 EE Communications Manager.

About half of the implementers use LU 6.2 in a CICS environment. Some have implemented it under VTAM. Some have developed completely homegrown LU 6.2 environments. Several have done more than one of these.

The majority are using LU 6.2 to communicate with a remote site, with a few using it only for that purpose.

Applications

Most applications relate to the organization's line of business, such as security and loan servicing for banks or inventory for manufacturing. File transfer and database concurrence are the most common types of transactions.

Pilot/Operational

The majority of sites report that their LU 6.2 implementation is operational; the others still consider it a pilot program. Most have had LU 6.2 implemented for a year or two. The length of time it has been installed had no bearing on whether the user still considered it a pilot project.

Expansion Plans

Few sites responded that LU 6.2 was a standard for their network.

Expansion plans include adding:

- LU 6.2 to midrange systems
- PC-to-host LU 6.2 connectivity
- New environments (such as IMS)
- Device-to-device support (in addition to program-to-device support)

Half of the respondents have *no* plans to expand LU 6.2 usage. They reported they could see no justification for increasing LU 6.2 for its own sake, and they saw no applications on their horizon that required it.

Implementation Challenges

Complexity and lack of features, functions, and applications were cited as the most significant challenges faced in adding LU 6.2. Cost was rarely a major concern. Respondents also reported that management was very supportive of their implementation efforts.

Those with multivendor systems reported problems with differences between the vendors' LU 6.2: different terminology, definitions, features, and restrictions.

Several commented on training complexity and the difficulty of the staff in adjusting to the mind-set of a whole new ballgame in peer rather than batch communications. The lack of staff who understand what LU 6.2 really means is decreasing the motivation to increase LU 6.2 usage. One respondent stated that "some off-the-shelf applications are available, but the user still *must* be familiar with LU 6.2 to succeed."

Benefits

Most respondents were able to point to clear benefits from their LU 6.2 implementation, including:

- Balance of resource usage
- Coordination of databases
- Improved performance
- Cost savings
- Well-architected solution
- Transparency
- Portability

However, some of these respondents noted that these benefits could not obviously be leveraged to other applications. Some improvements related to what was used before (LU 0 to LU 6.2), or to the ease of using a commercial product which required no NCP sysgen changes. Finally, the respondents did not indicate that the benefits were significant.

Conclusions

From the results of this research, it seems clear that IBM faces tremendous challenges with LU 6.2 and with moving SNA to peer-to-peer communications. Most users are not convinced that they should make the move. And those who are convinced find it a difficult move.

SNA Perspective believes that LU 6.2 is a significant element for the future of SNA. User acceptance of LU 6.2 as part of a move to peer-to-peer communications is essential to IBM's strategy if SNA is to survive to the end of the century as a strong contender.

However, IBM has been less than successful in promoting LU 6.2 to its SNA user base. Most SNA network planners are aware of LU 6.2 and of how excited IBM is about it, but the excitement has not been contagious.

One respondent summed it up by saying "I haven't implemented LU 6.2 because IBM didn't do what it said it would do (three years ago), though it is just now beginning to follow through. To convince users to implement LU 6.2, IBM needs diverse products, a methodology to implement, and to work with partners to encourage more applications."

Applications Needed

Those who have not yet implemented LU 6.2 repeated over and over that there were no applications they needed that required LU 6.2. Even those who have implemented it are expanding its usage slowly because of the dearth of applications.

In 1990, a year we could refer to as "the greening of LU 6.2," IBM finally announced several environments, products, and architectures based on LU 6.2, including, but not limited to, LU 6.2 for IMS, LU 6.2 for NetView, LU 6.2 as the underpinning for remote distributed relational data architectures (DRDA and CDRA), APPC/MVS, and LU 6.2 for OSI and NetBIOS encapsulation across SNA. Many of these will not be available until late 1991 and off-the-shelf applications taking advantage of them will take us into 1992. So users still find themselves in a holding pattern. However, at least the planning horizon is more definite.

Complexity Hurdle

Many respondents reported disappointment with the complexity of adding LU 6.2. This included problems with vendor support and staff training as well as the architectural and development hurdles, since so much needs to be done in-house.

More off-the-shelf and semi-custom applications will reduce many of these challenges. IBM could also focus on providing more support for those customers who take on the challenge of implementing LU 6.2 by rewarding them for moving down this road less traveled with tools, training, and more TLC than FUD. ■

Internetworking and SNA

In the next decade, most enterprise networks will be based on internetworking. Internetworking is the interconnection of individual networks into an integrated environment—an internet. This technology will be the primary foundation for the delivery of information between networked systems.

This article is the introduction to a series which will discuss SNA and leading multivendor networking protocols, particularly TCP/IP and OSI. The series will examine how each developed from a separate design philosophy and how they are evolving to support internetworking.

The series will be presented over several months of *SNA Perspective* as a debate, comparing costs and benefits of the different approaches. Each installment will note issues that the architectures/protocols must address, changes they must incorporate, and their potential areas of convergence.

The Growth of Internetworking

Internetworking is fueled by two main driving forces. First, cost/performance breakthroughs make it economical to place substantial computing power on the desktop. Second, development of LAN technologies has provided high-speed interconnection of desktops for workgroup computing. The natural next steps for organizations are twofold: to connect these separate department or workgroup networks into enterprise-wide internets and to provide connection to interorganizational networks.

Advantages

The advantages of internetworking include the ability to:

- Partition problems
- Support heterogeneous networks
- Increase sharing of information and resources
- Phase in new technologies

Partition problems—Internetworking allows an organization to take a big, complex problem and break it down into smaller, simpler ones. For most workgroups, the majority of the information they use and share is relevant only to them. Using high-speed LANs and servers gives desktop systems the advantage of local technology. Internetworking handles the small percentage of off-site traffic for full organizational connectivity.

Support heterogeneous networks—An internet is composed of individual networks which become subnets—elements of the larger internet. Many different types of incompatible networks can be combined. Units can choose the appropriate technology for their needs without sacrificing connectivity to other units.

Increase sharing of information and resources—As more networks are interconnected, the ability to share information and resources increases apace.

Phase in new technologies—The modular nature of an internet simplifies technological change. New networks can be added and old networks taken out of service without a severe impact on the rest of an internet.

Internetworking Challenges

Organizations considering internetworking must consider the challenges as well as the advantages. Each area of distinction, highlighted below under Distinctions, presents a significant challenge in its own right. Each must be solved in relation to the others to create an optimum internetworking solution.

Note: In this series, "an internet" is any collection of individual networks into an integrated environment and "the Internet" refers specifically to the Internet network developed by the U.S. Defense Advanced Research Projects Agency.

Battle of the Giants

The Department of Defense Internet, based on the TCP/IP protocol suite, has approximately two thousand interconnected networks supporting 350,000 computer systems and well over a million users. TCP/IP has undergone extensive refinements and enhancements since its development more than fifteen years ago. Many organizations have made extensive investments in TCP/IP, especially universities and companies with extensive UNIX environments.

In this same time frame, SNA has developed along very different lines because it was designed for a different purpose. SNA is used as the enterprise backbone network for two-thirds of companies with such backbones.

The International Standards Organization developed the Open Systems Interconnection (OSI) reference model in 1978–1984 to serve as a basis for developing communications standards within a layered context. These standards have been emerging since the mid-1980s and are referred to as OSI standards. However, there are few commercial products available based on these standards (except that Ethernet and Token-Ring were accepted *ex post facto* as OSI standards). Therefore OSI's impact is measured in terms of potential rather than installations. (Note: the OSI design at the lower four layers evolved more from the TCP/IP model than the SNA model; therefore, we use the OSI model to compare TCP/IP to the SNA layers.)

Philosophical Differences

The development of SNA and TCP/IP was based on two different architectural philosophies. Table 1 shows a qualitative comparison of some of the major design goals.

SNA was developed from IBM's need for *centralized, reliable, secure, manageable* communications for its extensive product line. These capabilities were important for IBM's large *business* customers, which gave SNA a more conservative cast. SNA was also particularly focused on *terminal-to-host* communication. Its design assumed and required reliable data links and was *connection-oriented* at every level.

TCP/IP was developed under government contract to support *system-to-system* communication. The Internet was intended to encourage the sharing of

information by developing an *accessible* network between universities and other research facilities under government contract, which gave it a more *academic* flavor. Because it was intended for *interorganizational* sharing, the network was not designed to provide *security*; each site was assumed to have installed the security features it wanted for access to its systems. TCP/IP was designed so that the *reliability* needed for application communication did not depend on any particular underlying mechanism. Therefore TCP/IP could operate across subnetworks with varying qualities of service. Lower reliability was not determined to be of such critical importance as it was for SNA and business communications. Each site *managed* its own portion of the network, and the common carriers, of course, managed their environments. TCP/IP assumes *connectionless* interaction at each layer and is designed more for file transfer between systems than for interactive communications.

Distinctions

There are several areas of distinction between SNA and the multivendor standards in their approach to internetworking issues:

- Interconnecting subnetworks: bridge, router, or brouter
- Data link layer: spanning tree/transparent bridging or source routing
- Network layer: connectionless or connection-oriented
- Transport layer: where lies the responsibility for reliability
- Network management
- Addressing: internetwork uniqueness
- Routing: intradomain, interdomain, and inter-internet
- Infrastructure: native internetworking services and sharing the backbone
  - Application programming interfaces
  - Remote procedure calls

Each issue will be considered with regard to SNA, TCP/IP, and OSI. The technical differences in the approaches and changes needed in each to support effective internetworking will be addressed.

Summary

Where you stand depends on where you sit. From where the SNA designers sat, the architecture they developed met the design criteria for a centralized, manageable, secure, and reliable network for businesses. For TCP/IP developers, an accessible, independent, decentralized network would meet the requirements presented to them.

The world of information systems has changed significantly since SNA and TCP/IP were developed. Each has changed to meet emerging needs in different areas. With regard to effectively supporting today's internetworking needs, perhaps SNA will have to go through more significant changes since TCP/IP was designed with more internetworking in mind. But TCP/IP, too, has significant room to grow in reliability, manageability, and security.

Now the stage is set for this *SNA Perspective* internetworking series. Next month's installment will focus on interconnecting subnetworks and the data link and network layers. ■

Architect's Corner

SNA 5 or New SNA

by Dr. John R. Pickens

In the first half dozen years of SNA's existence, its architectual releases were informally identified by version numbers. The last release which was given a version number was in 1978, SNA Version 4. Several years ago, anticipating a new architecture update, I queried IBM's Communications Products Division in Raleigh if and when Version 5 was expected. The answer? "We don't talk any longer of version numbers."

In retrospect, the last release of the full *SNA Formats and Protocols* (SC30-3112) was almost exactly ten years ago—at a time when SNA networks were still largely hierarchical in nature. So should we give up the architecture technology search and move on to a more dynamic technology—TCP or OSI?

Actually, SNA has been evolving but in a different direction than was originally perceived in the early 1980s. Driving this evolution is an effort by IBM to "plumb" the network landscape with a new generation of networking technology featuring a common peer-oriented transport substrate and common interface subsystems in hosts, midrange systems, and personal computers. The basis of this new networking substrate? LU 6.2.

1990 Review

Looking back, was 1990 was a significant year from the perspective of "new SNA"? Yes and no.

For applications, yes. In 1990, a plethora of LU 6.2–based applications and interfaces were announced and delivered. If there were any doubt about IBM's commitment to LU 6.2 for applications, 1990 eliminated it. 1990 provided the walls of new SNA's house.

For the SNA backbone foundation, no. Nineteen ninety was yet another year of backfilling and shoring up its rickety SNA transport environment while awaiting the release of new SNA. For example, backbone LU 6.2 continues to operate at the level of low entry networking (LEN), requiring static configuration of just about everything. Furthermore, IBM's backbone networking in 1990 began to be eroded by an intrusion of layer two remote bridging architectures—but that will have to be a topic for a future column. The new SNA foundation has yet to be laid.

Predicting New SNA

Looking back to 1988, I remember predicting that 1992 would be the year of the release of a major upgrade of SNA architecture. This expected upgrade ultimately inherited the name new SNA. Looking ahead to 1992, which is now around the corner, we can ask several questions. What are the important new features of new SNA? Is new SNA really coming?

I claim no insider knowledge of the components of new SNA. But many external requirements and trends provide strong hints at its new components and attributes. Four are especially noteworthy.

- Enhancements to SNA Layers 1–4
- Evolution of the LU naming scheme
- Dynamic name resolution enhancements
- CMIP rework of SNA/MS

SNA Layers 1–4 Enhancements

I expect two key enhancements in SNA's lower layers. First, with the emergence of virtual LAN technology in WANs (i.e., frame relay and SMDS), a need exists for a reworked architecture within SNA's lower layers. This new architecture would provide a greater degree of flexibility toward unified support of both LANs and WANs.

Second, a requirement exists to converge SNA and OSI transport. There are two reasons for this. First, SNA needs to run over OSI connectionless network layer services (CNLS). Second, IBM would like its networking products to offer CNLS transport to

OSI services. In previous Architect's Corner columns, I have discussed IBM's dual stack strategy toward convergence of OSI and SNA at both the bottom and top layers (see November 1989 and July 1990 *SNA Perspective*).

Evolution of the LU Naming Scheme

In original SNA, heavy use was made of SNA logical units (LUs). Since type 2.0 nodes could only support one session per LU, each node was defined with multiple LUs, each with a different name.

With APPN, came the first hint that LU naming was an evolving concept. APPN nodes do not have LU names—they have location names. And, typically, since NT 2.1 architecture supports multiple sessions per LU, only a single location name is defined per node. Architecturally, location names are still considered LU names. But a definite trend can be seen toward use of LU naming for identification of network nodes, one LU per node.

Also, new SNA requires a more flexible naming scheme. The current NETID.LUNAME [8.8] scheme is too restrictive. I've suggested in previous columns a possible convergence here with OSI naming and directory services.

Dynamic Name Resolution Enhancements

Current published NT 2.1 architecture still requires static definition of partner LU Names. In a 10,000 node network, each node would have to define 10,000 LU Names—certainly an unacceptable situation.

APPN provided the first insight into how this restriction might be removed. APPN contains a dynamic registration and discovery protocol. An end node can establish a conversation with a directory server to perform LU name look up.

An interesting issue arises in LANs. How does the end node find the directory server? What is needed is a LAN-level address resolution scheme.

New SNA will likely contain both types of mechanisms—LU name directory server and LAN layer address resolution.

CMIP Rework of SNA/MS

Currently, PU type 5 focal points use the network management vector transport (NMVT) data structure for network management. APPN nodes use an unpublished management services unit (MSU) for network management. LAN Network Manager will use CMIP over LLC (CMOL) for network management. There are too many network management data structure formats.

Under new SNA, I would expect convergence. As discussed in previous columns, this convergence will likely be based on the CMIP model. I would expect new SNA to feature use of the CMIP model for basic network management functions—get, set, action, event, create, and delete.

Summary

I believe new SNA is around the corner, basically on schedule with my original prediction of 1992. I also believe that the announcements will occur mid-1991 with delivery of products in mid- to late-1992. Naturally, as is the normal practice for IBM, architecture documents for new SNA will not be released until the implementing products are released. I still believe (see Architect's Corner in January 1989 SNA Perspective) that IBM's end-system-to-intermediate-system protocols will be published, while its intermediate-system-to-intermediate-system protocols will be unpublished.

The actual functionality remains to be seen. But new SNA or SNA 5 or APPN—or whatever the name—promises to be a breath of fresh air.■

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