SNA Server Fundamentals

Introduction

What is SNA Server?
Microsoft SNA Server is an SNA gateway that connects LAN-based PCs with IBM host systems running SNA (Systems Network Architecture) protocols. SNA Server accomplishes this with excellent ease of use, economy, performance, reliability, security and flexibility.

SNA Server delivers these broad benefits through an equally broad set of features that include:

- Complete compatibility with existing Novell® Network protocols, cards, and drivers.
- Familiar and easy-to-use GUI for installation, administration, and troubleshooting.
- Complete SNA coverage (APIs, LU and PU protocols, datalink protocols).
- The highest capacity of any SNA gateway (for sessions and clients and for servers per domain).
- Centralized and remote administration, including administration via IBM NetView® and RAS (Remote Access Service).
- Support for centralized and branch configurations.
- The greatest security of any SNA gateway (SNA Server is designed to meet C2-level security).
- Load balancing, hot backup and other fault-tolerant features.
- Support for every key corporate desktop system and LAN protocol (including IPX/SPX and TCP/IP).
- Open, modular, extensible architecture.
- A design that is scalable, multiplatform, and compatible with symmetric multiprocessing (SMP).
- Complete context-sensitive help and online documentation.
- Complete functionality provided in one package.

SNA Server is a server process that runs on the Microsoft Windows NT™ Server operating system. SNA Server utilizes both the native Microsoft Windows NT™ communications protocol (such as TCP/IP or IPX) and IBM SNA protocols, acting as a high-speed gateway between the PC and IBM networks. SNA Server's bidirectional communication provides terminal emulation, printer emulation, file transfer, and program-to-program communications. SNA Server supports client functions on all the popular PC operating systems including Windows NT, Microsoft Windows®, MS-DOS®, OS/2®, UNIX®, and Macintosh®.

By supporting software such as 3270 or 5250 emulators, SNA Server makes data and applications residing on IBM hosts available to PCs for use with desktop productivity software such as Microsoft Excel. For LAN-based PCs, SNA Server acts as a server node to the IBM, allowing 3270 or 5250 screens to be displayed on the PC for seamless two-way communication. In addition, 3270 and 5250 printer emulation and file transfer is supported. Because SNA Server runs on the Windows NT Server, IBM NetView console operators can monitor and control activity on the server and also maintain secure access to corporate data. SNA Server also provides remote access over a RAS connection. This enables remote system
monitoring and management for the administrator, and seamless dial-up support for remote users to access the IBM host for normal sessions over phone-line connections (modem, ISDN, or X.25).

**SNA Server: Network Overview**
Using advanced client-server architecture to distribute the communications processing, SNA Server maximizes the power of your host computers and desktop PCs by offloading each. The PC uses standard LAN protocols to connect to one or more SNA servers. The servers then provide shared links to host computers using SNA protocols. SNA Server carries the bulk of the communications workload, reducing the storage and processing requirements on desktop PCs.

Why SNA Server?
It is estimated that more than 80 percent of all information on computers is available only through an IBM SNA network. SNA Server gives PC users the most reliable, fast, and secure access to this data.

**SNA Connectivity, PCs, and LANs**
IBM SNA connectivity has gone through four phases. Initially, terminals were connected through terminal controllers (for example, 3274s) to mainframes. In the second phase, terminals were replaced by PCs, each of which had a coax card (for example, an IRMA card) to connect to the controller. In the third phase, PCs began being connected to each other on LANs. In most cases, the LANs were just used for file sharing—the PCs still kept their coax-card connections to the mainframe. In the fourth phase, PC gateways made it possible to use LANs for host connectivity and to more easily link the IBM and PC worlds. With the fourth phase comes a change in the role of mainframes from stand-alone systems to application servers and data repositories integrated with the enterprise inter-network and LAN-connected PCs.
As the value of LAN-connected PCs and client-server architecture has grown, it has come to play an important role in running organizations, a role is so important that integrating PCs with host computers is critical to the effective operation of enterprises with legacy systems.

The Problems
While PCs offer many benefits over mainframes (for example, productivity software, GUIs, rapid development and implementation tools, and low cost), and many organizations are in the process of migrating to LAN-connected PCs, the majority of organizations will continue to run their mission-critical applications on IBM hosts, not on LAN-connected PCs, for a long time to come. These organizations will go through a long period during which they have multiple systems in use simultaneously. Employees will require information from a variety of different sources. For example, a human resources analyst may access payroll information residing on the host, and integrate that information with Peoplesoft's client-server HR package to determine pay scales for the upcoming year. Other workers, while in the process of migrating from PROFS® mail on the host to a LAN-based mail program such as Microsoft Mail, may require access to PROFS, either from their desktops or through a gateway integrated with their LAN mail package.

So the issue becomes how to make legacy data and applications accessible to heterogeneous collections of PCs and networks without sacrificing the capabilities of IBM hosts or PCs during the migration process. Several conditions must be met if organizations with legacy and PC systems are to implement new technologies in a way that is meaningful to the operation of their businesses. One is the MIS challenge of managing this integrated host/PC environment. MIS wants to make sure that access to sensitive information like payroll data is strictly monitored. So while many MIS managers want to put the information as close to the users as possible with distributed client-server applications, they want to manage access to that information in a secure and highly centralized fashion. Another condition is the desire of the LAN administrator to manage and control the PC desktops across the entire enterprise.

The Solution
That's where Microsoft SNA Server for Windows NT Server comes in. SNA Server is a high-end enterprise SNA gateway that combines advanced client-server architecture with the power and productivity of Windows NT Server to deliver advanced connectivity between LANs and SNA networks. Microsoft SNA Server makes enterprise-wide connectivity easy and economical. SNA Server offers PC users reliable and secure access to IBM host computing with the familiar user interface of desktop PCs and the flexibility of modern LAN systems. By employing advanced client-server architecture to distribute the communications processing, SNA Server maximizes the power of your host computers and desktop PCs. Each PC uses standard LAN protocols to connect to one or more SNA servers. The servers then provide shared links to host computers using SNA protocols; the servers carry the bulk of the communications workload, thus reducing the storage and processing requirements on desktop PCs. SNA Server offers advanced tools for easy system setup and centralized graphical administration, regardless of the desktop PC operating system, LAN operating system, SNA connection type, or host type.

SNA Server's extensive capabilities, client-server architecture, robust security, integration with existing information systems, capabilities for maximizing uptime and minimizing response time, and wide availability of emulators enable any organization to seamlessly deliver line-of-business applications on corporate networks.
With SNA Server, MIS gets the tools to centrally manage and control the host environment, LAN administrators get the tools they want to manage PCs through the enterprise, and PC users get easy access to the host data and applications they need.

**Benefits of SNA Server**

**Benefits to the Desktop User**
SNA Server reduces complexity, increases stability, and saves memory by allowing you to use only one protocol. In contrast, when connecting directly, you will need the DLC protocol to connect to the host, plus your favorite LAN protocol, such as TCP/IP or IPX/SPX, to connect to the file/database/mail server. In many cases, the DLC protocol simply will not work or coexist with certain types of adapters and/or other protocols. Connecting PCs through SNA Server allows you to get rid of this problem. It can improve the stability of the desktop—operation of Windows is much smoother with decreased interaction between real and protected modes.

**Benefits to the LAN Administrator**
SNA Server provides easier administration. When connecting direct, each desktop must be configured individually with the host's network address, LU name, and so on. Whenever there's a change on the host side, such as the host's network address, all desktops must be reconfigured. With SNA Server, there's nothing to configure at the client; all host changes can be tracked centrally by the LAN administrator.

SNA Server provides integrated security for all users. The LAN administrator can control access to the host by using the combined security features of Windows NT Server and SNA Server. In contrast, direct connection allows each desktop user to access the host by simply knowing the applicable host parameters. A gateway adds another level of flexible security.

Performance and troubleshooting tools are available. When all host-bound traffic is concentrated through SNA Server, the LAN administrator can use the performance monitoring, event logging, and tracing/sniffing capabilities of the server platform. An individual desktop problem is easier to work around by simply assigning a new LU, and tracing and debugging can be done at the server without interrupting the work of desktop users.

**Benefits to the Host Administrator**
SNA Server dramatically reduces (re)definition work on the host. You can support hundreds of users by defining a single PU or controller, instead of having to define one for each user. Less definition work also means fewer definition errors, each of which can be costly. SNA Server also reduces host memory requirements. All these hundreds of definitions are typically stored in resident memory on the host system, consuming excessive amounts. Memory savings can result in hardware savings and in improved host performance.

SNA Server reserves host CPU cycles for what the hosts are intended for—running applications. If you have direct connections to the host, each of these connections must be managed individually by the host's control software, consuming many CPU cycles. SNA Server saves network bandwidth. Instead of the host having to poll all desktops individually to maintain direct connections (even when there's no activity), the host has to maintain only one connection when using a gateway. This can dramatically reduce network noise and allow better network performance as well as reduce session time-out problems.
How Can SNA Server Be Used?

SNA Server is being used in several different ways to connect PCs and host computers:

1. It provides large-scale and fault-tolerant connectivity for users on LAN-connected PCs to run interactive host applications. Using powerful automation tools of today's terminal emulators, this access can be re-engineered, presenting the user with a forgiving and intuitive graphical interface.

2. It can provide connectivity for TN3720 users without complicating the mainframe configuration with the requirement to support TCP/IP.

3. It can act as a database gateway, allowing secure access to SNA host databases via ODBC, directly from workstations on the LAN.

4. In an enterprise whose wide-area backbone is still based on SNA protocols, SNA Server can be used to integrate LANs across branch offices as well as with corporate data and applications (both uses are shown below). SNA Server also provides the means to administer such a network. Using RAS over SNA, a workstation in a remote office on an SNA backbone can access any resource across the SNA link, as long as necessary permissions are granted for the resources. Using RAS over SNA is most suitable for remote administration because of the typically slow SNA links. In these ways, each remote site in the enterprise can transparently share files, printing, electronic mail, and databases.

Uses of SNA Server in the enterprise network
SNA Server 2.1: Features

SNA Server connects IBM's Systems Network Architecture and LANs and does so in ways that greatly simplify the tasks of the SNA/LAN administrator. This section will give you a detailed understanding of the features and benefits that make SNA Server the best SNA gateway available today.

1. Graphical User Interface

SNA Server's tools are designed to make SNA Server extremely easy to install, configure, manage, and use. These benefits may significantly reduce training and support costs. SNA Server uses the latest in graphical user interface design and usability testing to make the administrator's task as easy as possible.

**Setup** - A series of simple dialog boxes allows you to configure SNA link services (SDLC, 802.2, and so on) for installed adapters. Select one or more client-server protocols (Named Pipes, IPX/SPX, TCP/IP, Banyan VINES, AppleTalk, and/or RAS), specify the server role (primary, backup, member), and cleanly remove SNA Server.

**Admin** - The Admin display contains three windows (Servers and Connections, LU Pools, and Users and Groups) that are similar to the File Manager in structure and functionality, making the administration of SNA Server intuitive. Beyond standard Windows functionality, Admin allows you to resize individual columns within a window or filter the listings in the display to fit your needs. Drag and drop allows you to quickly set up LU pools and assign users to them. Icon-based visual feedback allows an administrator to readily identify servers, connections, LU pools, and users, as well as the type of connection (SDLC, 802.2, and so on) and the type of LU pool (3270, LUA, downstream). SNA Server Admin dynamically displays all information contained in the three windows. This means that whenever the status of any object changes, the administrator can view the change immediately.
SNA Server Admin windows

**Dialog Boxes** - Easy-to-understand dialog boxes help you map parameters from the VTAM Gen or AS/400 configuration to settings within SNA Server. Regardless of whether the administrator has a LAN background or has experience working with the host, SNA Server is designed to make it easy to manage the PC-to-host connectivity. Automatic configuring of several host parameters also saves time and reduces configuration errors.

2. **SNA Trace**
A simple dialog box allows you to record messages to and from SNA Server, as well as activity into and out of SNA APIs and activity within the software components of SNA Server.
3. Windows NT Tools
These include User Manager, Performance Monitor, Event Viewer, and Control Panel applets. Integration with Windows NT is tight, so that the tools appear as seamless extensions of SNA Server.

4. Centralized Monitoring and Control
SNA Server's tight integration with the Windows NT Server allows administrators to manage all of the SNA servers from a single location. This allows MIS organizations to utilize SNA servers as part of their distributed client-server systems while maintaining centralized security and control.

SNA Server provides centralized comprehensive monitoring and administration of routine operations and problem diagnosis through the SNA Server Admin program and tools, Windows NT graphical tools, and host-based NetView. The Admin program runs on any Windows NT platform and provides the tools the LAN administrator needs to manage day-to-day SNA/LAN interaction. NetView capability provides communications between SNA servers and host operators. Windows NT graphical tools are tightly integrated with SNA Server and provide a broad range of capabilities for controlling, diagnosing difficulties, and monitoring.

5. Enterprise Configuration Flexibility
SNA Server has the advantage of being able to be set up in a centralized configuration or a distributed configuration, depending on customer needs. It functions equally well in either configuration.

Branch Configuration - SNA servers can be located in branch offices on server systems that are also used for printing, databases, electronic mail, and fax. This configuration reduces traffic on the WAN and increases responsiveness to user needs through local management of connections, LUs, and security. A distributed configuration would be a good choice for low-bandwidth WAN links (for example, X.25 or low-speed leased line backbones) using multiprotocol routers, or when only an SNA backbone is in place. SNA Server's graphical tools and remote administration capabilities over RAS or NetView decrease the necessity of having trained SNA personnel on site.
Centralized Configuration - Alternatively, SNA servers can be located at the data center to maximize reliability and security. This configuration makes it easy to arrange load balancing and hot backup, makes it easier for MIS personnel to manage the servers, and reduces the need for SNA expertise at remote sites. Centralized configurations are good when you have high-bandwidth WAN links (for example, high-speed leased line or frame-relay backbones). Centralization allows you to use a single, routable protocol (for example, TCP/IP or IPX) on all WAN links in the enterprise. You can route TCP/IP or IPX from clients over the WAN to SNA servers at the central site; in turn, the SNA servers can be connected to the FEP or AS/400 via token ring, or directly attached to the mainframe channel.

6. Network Security
Many MIS managers are used to having security programs on the mainframe (such as RACF and Top Secret) to guard access to the host. Traditionally they have been reluctant to move applications to LANs because of the lack of robust security.

7. SNA Gateway Reliability
High reliability is another benefit that comes from the tight integration of Windows NT Server and SNA Server. Within a Windows NT Server domain, SNA servers are able to recognize each other transparently and are able to dynamically back each other up or route traffic to the least-loaded server to increase throughput. These SNA Server features are known as hot backup (dynamic session fault-tolerance) and load balancing. With them, SNA Server provides high reliability to mission-critical data and applications. These two benefits are also a consequence of SNA Server’s advanced LU pooling feature, which allows administrators to group multiple LUs on a single server or across several servers.

8. Load Balancing
Automatic load balancing across multiple servers automatically routes new LU sessions to the least-busy SNA server to deliver maximum availability of corporate data and minimum response time. SNA Server’s ability to dynamically route traffic across multiple servers minimizes response time between the desktop and the host, making users more productive.

9. 3270 and 5250 Emulator Support
SNA Server provides open interfaces: both the open 3270 EIS interface for 3270 emulators and the open APPC interface for 5250 emulators. With these interfaces, independent software
vendors can develop 3270 or 5250 emulators that work reliably with Microsoft SNA Server. The *3270 Emulator Interface Specification* and the *SNA Server APPC Programmer's Guide* provide:

- Explanations of the internal concepts of SNA Server those are required to produce 3270 or 5250 client software.
- Definitions of the interfaces used by the client software when communicating with SNA Server components.
- Information about using SNA Server's configuration and diagnostics features.
- Instructions for compiling and linking the client software with the necessary SNA Server supplied files.

3270 and 5250 emulation is supported on all SNA Server clients to maximize flexibility of your existing client platforms (Windows, MS-DOS, and so on). Full-function 3270 and 5250 emulators are provided by the leading 3270 emulator vendors, including Andrew, Attachmate, DCA, Eicon Technology, IBM, NetSoft, and Wall Data.

### 10. TN3270 Client Support

SNA Server provides support for connecting any client that runs TN3270 emulation to an IBM host computer. This extends SNA Server support for networks of heterogeneous clients. The TN3270 server software was developed by Open Connect Systems, and is a good example of the extensibility of SNA Server architecture.

### 11. Complete SNA Protocol Coverage

SNA Server provides support for all SNA APIs, LU protocols, PU protocols, and data link protocols. SNA Server's SNA API support provides very flexible development options. SNA Server APIs, supported by 20 leading SNA vendors, have gained broad industry support from established emulator, adapter, and gateway vendors. The SNA APIs support both synchronous and asynchronous calls. Handling the client-server I/O using asynchronous calls improves performance by improving pipelining of I/O operations. Asynchronous calls also return control to the application immediately so that it can perform other tasks while the requested I/O operation proceeds independently. This is particularly important in the non-preemptive environment of Windows 3.x.

The APIs included with SNA Server are as follows:

- **APPC**: For developing 5250 emulators, as well as applications that communicate peer-to-peer with other APPC applications using the LU 6.2 protocol. Management verbs are also supported.
- **CPI-C**: For developing applications that communicate peer-to-peer with other applications using the LU 6.2 protocol.
- **CSV**: For developing applications that include tracing of API calls, communication with NetView, and EBCDIC to ASCII conversion.
- **LUA**: For developing applications (using LUA/RUI or LUA/SLI APIs) that need direct access to the LU 0, 1, 2, 3 data streams. Supports ISV 3270 emulators via the open 3270 EIS API.
- **EHLLAPI**: For developing applications that interface with existing 3270 or 5250 applications. Note that EHLLAPI is offered by ISVs, but not by Microsoft. (EHLLAPI is not included in the 3270 and 5250 applets in SNA Server.)
12. Complete SNA PU and LU Protocol Support
SNA Server provides transparent PC-to-host connectivity in a wide range of customer environments. In addition, SNA Server allows you to mix any LU, PU, and data-link protocols concurrently in the same server.

LU Protocols - SNA Server supports LU 0, LU 1, LU 2, LU 3, and LU 6.2.

PU Protocols - SNA Server supports PU 2.0, PU 2.1, APPN LEN Node, and DSPU (downstream PU). Note that Low-Entry Networking (LEN) support is what allows SNA Server to participate in an APPN network. (SNA Server does not have to support APPN Network Node or APPN End Node to be able to gain full connectivity into an APPN network.)

13. Data Link Protocols
SNA Server supports 802.2/LLC, SDLC, X.25/QLLC, DFT, Twinax, and Channel attachment. For a complete list of compatible third-party data-link products from ISVs/IHVs, see the Companion Product Catalog.

14. Integration with Windows NT
SNA Server is tightly integrated with Windows NT Server in ways that provide an easy, flexible, efficient, reliable, scalable, and secure platform for MIS and LAN administrators to manage the host/PC interconnection. Windows NT Server provides the administrator with consistent and easy-to-use graphical tools to perform all administrative tasks on SNA Server and the Windows NT Server. The primary tools offered are the Control Panel applets, User Manager, Performance Monitor, and Event Viewer.

Control Panel - The Control Panel on the Windows NT Program Manager contains many useful tools for controlling different components of SNA Server.

Services applet - The Services applet controls Windows NT Networking services individually. Services can be started, stopped, paused, and continued. For example, you can stop the NVRunCmd service if you don't want a NetView operator to run commands on the SNA server.

Network applet - The Network applet is the tool you use to install and configure your network cards, and to install and configure network protocol stacks. This is also the tool you would use to join a workgroup or a domain. The networking architecture within Windows NT Server lets you support multiple simultaneous network cards and multiple simultaneous protocols in a single machine. You can have one card and multiple protocol stacks, or one protocol stack and multiple cards.

Devices applet - With the Devices applet, you can stop, start, and set the startup value for system drivers, adapter drivers, and network protocols. This applet also reports the status of devices.

Server applet -
The Server applet allows you to monitor who is connected to your machine and what shared resources are in use. This tool is also used for setup, directory replication, and administrative alerts.
**Event Viewer** - This utility allows you to record and view significant events generated by the Windows NT Server system or Windows NT-based applications such as SNA Server. Event Viewer can notify administrators of critical events with pop-up messages, or add event information to log files. The information allows you to better understand the sequence and type of events that led up to a particular state or situation.

Event Viewer is very flexible. Through SNA Server Admin, you can set the type (severity) of events to be recorded for SNA Server. Through the Event Viewer, you can set the log size, and choose between storage and overwrite options for when the log is full. In addition, Event Viewer supports filtering by event types, date and time of events, source, category, user, computer, or event ID. Event logs can be also be saved as text or comma-delimited text for later analysis (on a spreadsheet, for example). As with many of the administrative tools, the Event Viewer can be used to view events on remote Windows NT Servers.

**Performance Monitor** - Performance Monitor is a graphical tool which can be used to measure the performance of any SNA server accessible over the network. It allows you to monitor several aspects of your server's performance in real time in the form of charting, triggers (causing alerts to be sent or programs to be started), tables of values, and logs. Performance Monitor is very useful for system tuning and diagnosis. The parameters that can be monitored for SNA servers include throughput and transmission volume (in bytes, or in some instances, frames), and can be measured for connections, LUs, or adapters.

**User Manager** - All user and group accounts are managed with the User Manager. The accounts established through User Manager are also used by SNA Server, so that you need only create an account once for use by Windows NT Server or SNA Server. A simple dialog box in SNA Server Admin allows you to specify which users and groups defined in the domain will be SNA Server users and groups.

**Account Management and Domains** - Windows NT supports managing accounts by logical groups of servers, called domains. While the primary server holds the user account database, users can log on to other servers in the domain that have a copy of that database. Requiring only a single account in the entire domain is an effective way to manage an enterprise that includes hundreds of servers and thousands of users.