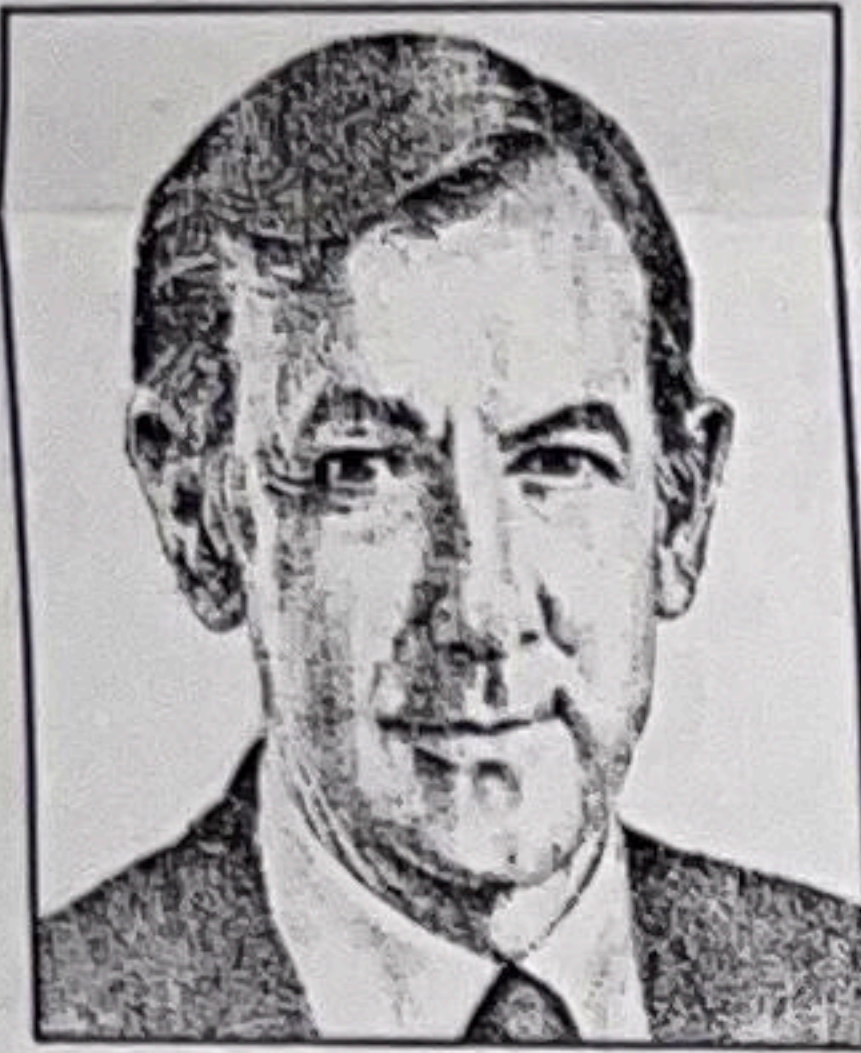## APPLIED INTELLIGENCE

The AS/400 Is Justifiably Popular—but It Has Its Limits

JAMES MARTIN

This is the second part of a series on IBM's AS/400 mid-range family of computers. The AS/400 is an important component of IBM's strategy to provide greatly enhanced consistency and connectivity across multiple supported environments.

The AS/400 has been an immediate market success, even though its full capability is just beginning to be understood. This week, I'll examine the keys to its success, as well as its limits.

Some reasons why the AS/400 is so popular include the following:

● **System/3X compatibility.** IBM stopped most of its development work on the System/36 and System/38 in the summer of 1986 and focused on the AS/400. By mid-1988, many of the 350,000 System/3X users were ready for *something newer and better.* The AS/400's ability to run System/3X applications with a limited conversion effort ensured it an initial surge of orders from System/3X users primed for an upgrade.

● **Database capability.** The AS/400 is a database computer, not a general-purpose computer to which database-management software has been added. As a result, it offers advanced relational database features without the performance degradation normally associated with relational processing.

● **Cost of ownership.** The combination of AS/400 architecture and features makes it a very affordable computer, particularly when the cost of support functions (systems programming, database support, network management, operations and software) are considered.

● **Downsizing option.** Some organizations, particularly those faced with an expensive conversion from IBM's DOS/VSE to the MVS operating system, are switching to networked AS/400s.

● **Advanced architecture.** The AS/400 incorporates all of the innovative features of the System/38 architecture, including a high-level machine interface, object orientation, single-level addressability, a large address space, integrated system software and a machine-integrated relational database-management system (DBMS).

● **Ease of use.** The AS/400 offers a great deal of capability without the need for numerous complex interfaces.

● **Availability of applications.** System/3X compatibility allowed the more than 8,000 application packages available for System/3X to be rapidly available on the AS/400.

● **Connectivity.** The AS/400 is easy to connect to other IBM computers and to a wide variety of non-IBM computers and devices. Connectivity with IBM-compatible PCs is especially strong. Support for Systems Network Architecture (SNA) LU 6.2 is provided by Advanced

Program-to-Program Communications, which gives AS/400 users a flexible and simple-to-use method for building networks of computers.

● **First major implementation of SAA.** IBM has made it clear that the set of standards called Systems Application Architecture (SAA) will form the foundation for future software products.

The AS/400 provides more SAA capabilities than any other computer environment, and its advanced architecture offers a more practical and workable approach to relational processing. Although the current relational database lacks some important features (such as relational integrity), the DBMS more

Problems and Limitations

Overall, the AS/400 has met or exceeded its original design objectives; however, a few problems have yet to be resolved satisfactorily. The AS/400's current limits include the following:

● **Missing SAA languages.** Not available yet are C, FORTRAN, SAA Control Language (REXX), Cross System Product (CSP) and SAA Query (QMF). Support for C and an execution-only version

system matures during the 1990s. The design also provides for the introduction of new technology such as optical storage and large solid-state memories without affecting applications design.

of CSP are likely to be available in 1989, and the remaining languages no later than mid-1990.

● **Tape-backup devices.** The fastest backup tape currently offered is the IBM 2440, which isn't fast enough to back up very large disk configurations (more than 10 gigabytes) in a reasonable time. The faster 3422 has been announced for the AS/400, but it won't be available until the fourth quarter.

● **Recovery.** The recovery from complete failure of a disk drive can be complex and slow. This is caused by the way in which single-level addressability is implemented. If a disk drive fails and cannot be read, it's necessary to recon-

struct the contents of all disk drives.

A number of optional facilities are available to reduce the risk of needing to completely rebuild all disk files. For example, the option of Checksum Protection offers significant protection, but there's an associated overhead, and recovery time is often a matter of hours.

● **On-line transaction processing.** The recovery limitations of the AS/400 make it impractical now for certain critical transaction-processing applications that require high availability.

● **Fault tolerance.** The AS/400 is currently impractical to use in certain situations where either fault tolerance or very high availability is required.

● **Technical computing.** The AS/400 currently lacks hardware floating-point capability, so it can't be used for number-intensive computing. This limitation may be resolved by IBM during 1989.

● **System/36 mode performance.** Although the facility that allows the AS/400 to run System/36 applications after a simple migration is generally quite effective, it does require more computer resources than if System/36 applications had been written to take full advantage of the AS/400.

● **Entry price.** The cost of owning even a small AS/400 is well over $50,000 (in most cases this includes hardware, system software, applications software, training and so on). A lower entry price is needed to bridge the gap between PC solutions and the current low end of the AS/400 line.
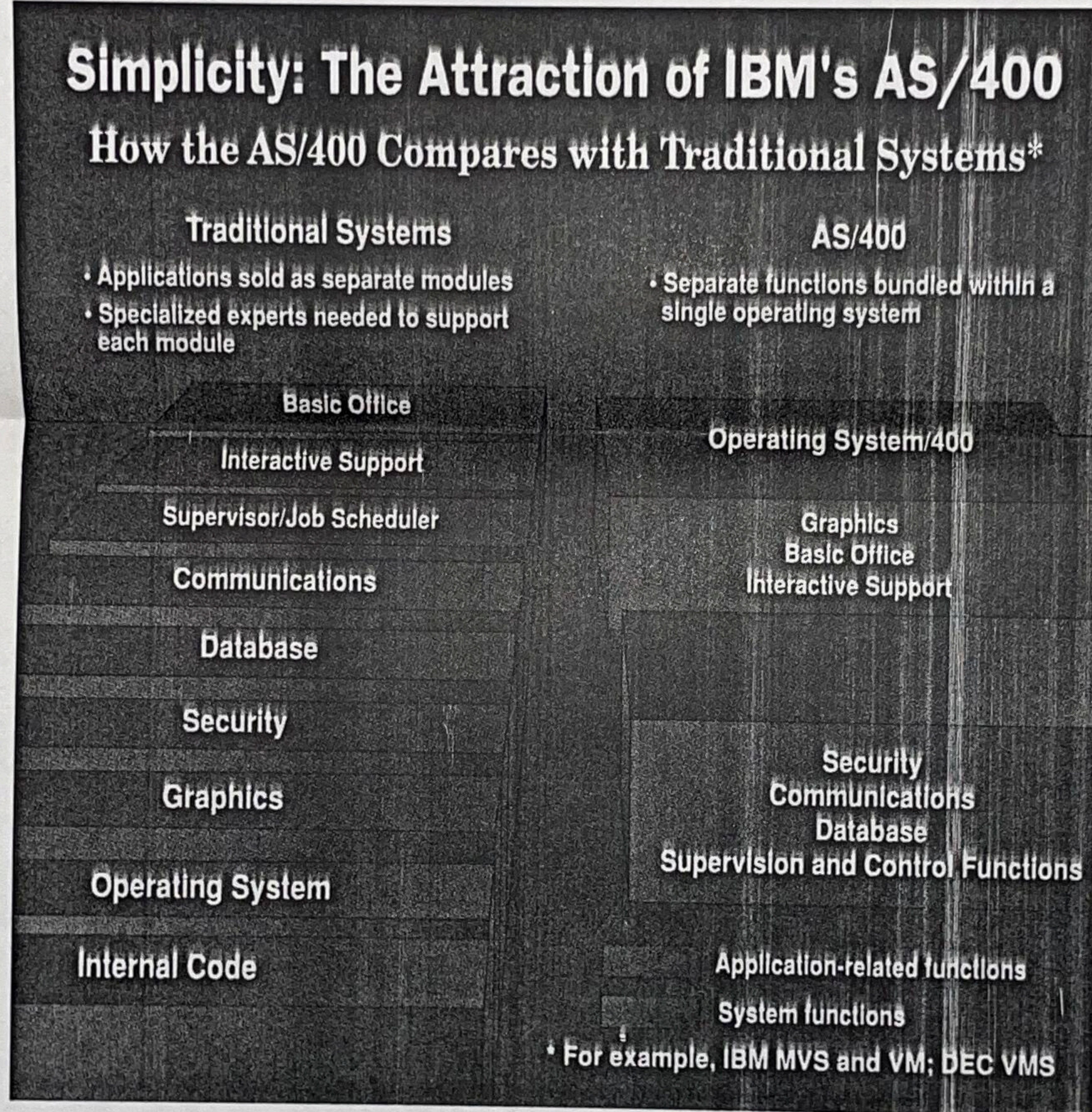
● **Application-development tools.** There are relatively few good tools available for application development on the AS/400.

● **Connectivity with 3270 workstations.** It can be difficult to create networks with both AS/400 and System/370 systems if the workstations on the System/370 systems include older 3270-type workstations. Often, the most significant problem is the limitation of the 3270's keyboard.

● **Support of non-SNA devices.** The AS/400 currently lacks connectivity to many non-SNA devices, such as certain Unix workstations, Macintosh computers or other devices that use the TCP/IP protocols.

● **Office automation.** The AS/400 was announced with an adequate—but not superior—office-automation capability. The AS/400 Office functions will be enhanced through the availability of the IBM OfficeVision Family of office products announced last week. However, these new office products will not likely be fully available until mid-1990.

Next week, I'll evaluate the AS/400 as an alternative to the widely used IBM System/370 architecture. ∎

Simplicity: The Attraction of IBM's AS/400
How the AS/400 Compares with Traditional Systems*

Traditional Systems	AS/400
• Applications sold as separate modules	• Separate functions bundled within a single operating system
• Specialized experts needed to support each module	
Basic Office	Operating System/400
Interactive Support	
Supervisor/Job Scheduler	Graphics
Communications	Basic Office Interactive Support
Database	
Security	Security
Graphics	Communications
	Database
Operating System	Supervision and Control Functions
Internal Code	Application-related functions
	System functions

* For example, IBM MVS and VM; DEC VMS

John Avakian

The AS/400 provides the most SAA capabilities, and its advanced architecture offers a means of relational processing—but the relational database lacks features.

than makes up for this by being affordable and easy to use.

Compared with traditional systems, the AS/400 provides an integrated system-software structure. As illustrated, traditional systems provide separate system-software packages for graphics, basic office, security, communications, database and so on. The AS/400 combines these software layers into one comprehensive system-software module identical for all models, which makes it possible to offer high functionality without unnecessary complexity.

The AS/400's design makes it unlikely that its users will face operating-system conversions or similar problems as the