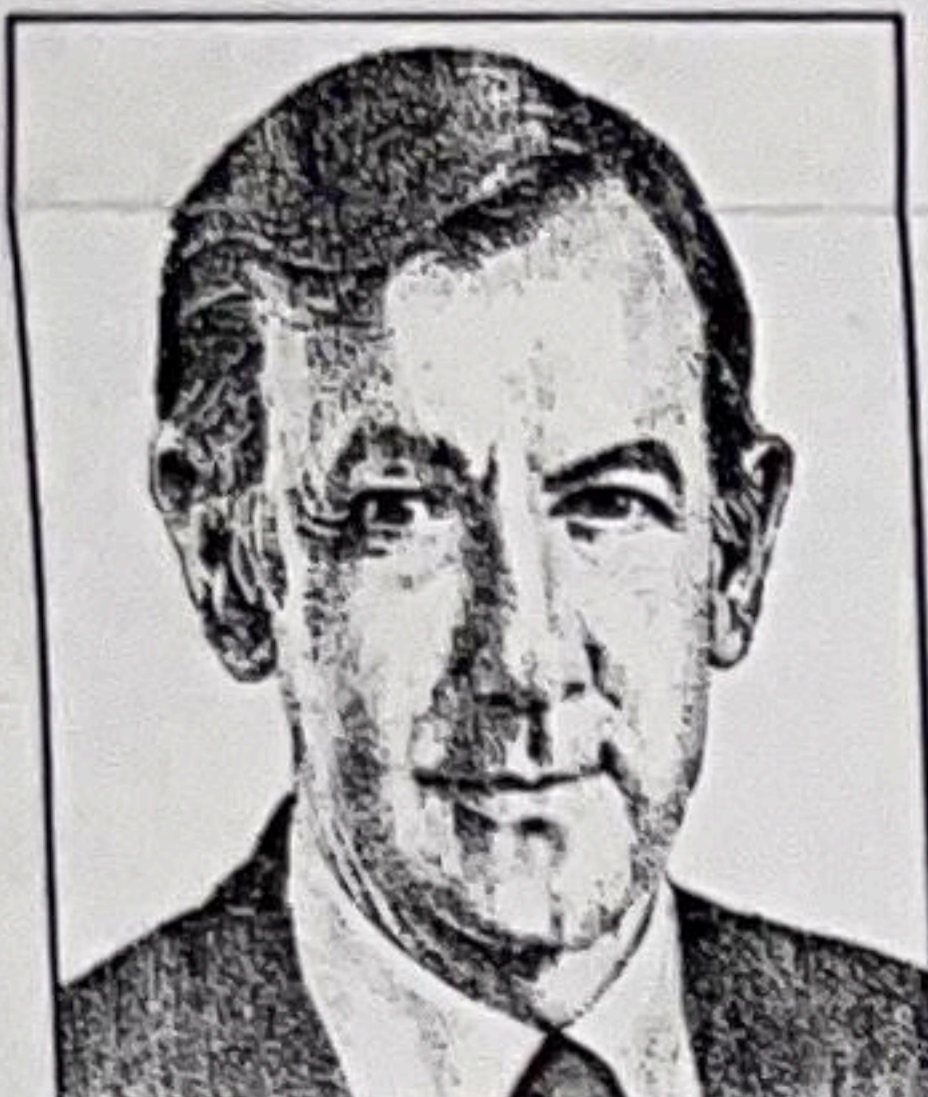


APPLIED INTELLIGENCE

# AS/400's Integration Provides 4th-Generation Platform



JAMES MARTIN

This is the sixth part of a series on IBM's midrange computer family, the AS/400, a pivotal part of IBM's strategy to provide enhanced consistency and connectivity across multiple environments.

The integrated architecture of the AS/400 is the key to its application-enabling environment. The major system functions are integrated as part of the machine, rather than being implemented as layers of software. These functions include database management, object addressing, security and device-independence. The high degree of integration isolates the applications developer from physical implementation details, and provides support for the major application functions. In effect, much of the groundwork traditionally associated with an application is already provided by the system.

The high-level interface of the AS/400 provides access to the machine through a single set of operations incorporated into the operating system. The interface is implemented by a single command language. There are no separate control languages for programmers, operators or job control.

### No Conversion Process Needed

The high-level interface isolates applications developers from machine implementations; this approach accommodates changes in the machine's underlying technology without any impact on applications. In effect, applications developed on current models of the AS/400 will be able to take advantage of new technologies without requiring a conversion process.

A single, integrated operating system, OS/400, follows the design concepts of the machine and provides a simple interface to its underlying functions. The operating system accommodates three distinct operating environments: System/36, System/38 and AS/400. These environments present a different interface to system functions, but for the most part they share a common implementation. This allows applications programmers with differing System/3X backgrounds to be productive immediately.

Similarly, the AS/400 command language provides a single consistent interface to the operating system's facilities. It's simple to learn, employing a familiar structure based on a "verb, object, modifier" syntax, and it has a very powerful prompting facility.

Applications developers can write their own commands to perform specific functions. These user-written commands use the same command-processing facilities as operating-system commands. The ability to create commands provides an enormous benefit to applications programmers. Commands can be integrated

with application programs by executing them directly from within a program.

The AS/400 provides a high level of integration of system features, as illustrated in the diagram. The necessary functions for an integrated applications-development environment are available on the machine; to date they haven't been integrated at the developer level.

The central element of any application is its data. As shown in the diagram, all database management is integrated with the AS/400 architecture. This provides efficient performance for the information system because the operations are performed below the machine-interface level in a combination of

TRAN, Pascal, PL/I, BASIC and RPG to define individual application programs. All the utilities needed to create screen and report definitions and to define the database are integrated into a single IBM product, Application Development Tools.

The variety of comprehensive end-user tools available from both IBM and third-party vendors is growing, building on a base first established for the S/38. These include information-retrieval systems and decision-support systems, in addition to IBM's OfficeVision product for the AS/400. Many of the available products provide some basic file-maintenance capability and the ability to inter-

a devotion by midrange users (particularly System/36 and System/38) to IBM products, which have so far not addressed fourth-generation development concepts.

The more advanced AS/400 installations and first-time users are adopting a more pragmatic approach to applications development. This approach focuses on the use of generic application packages, applications generators, end-user computing and adherence to SAA standards.

Generic application packages provide a customized application. There are more than 8,000 application packages already available for the AS/400.

A growing number of integrated development tools are becoming available for the AS/400, including Synon from Synon Ltd., Genesis V from Sofbro Ltd., Geode from SPS International, Lansa from Aspect Computing Pty. Ltd. and Metaview System Software from Metafile Information Systems. All of these are developed outside IBM. Synon recently announced that IBM will market the Synon product under the IBM Cooperative Software Program.

### Development Strategy

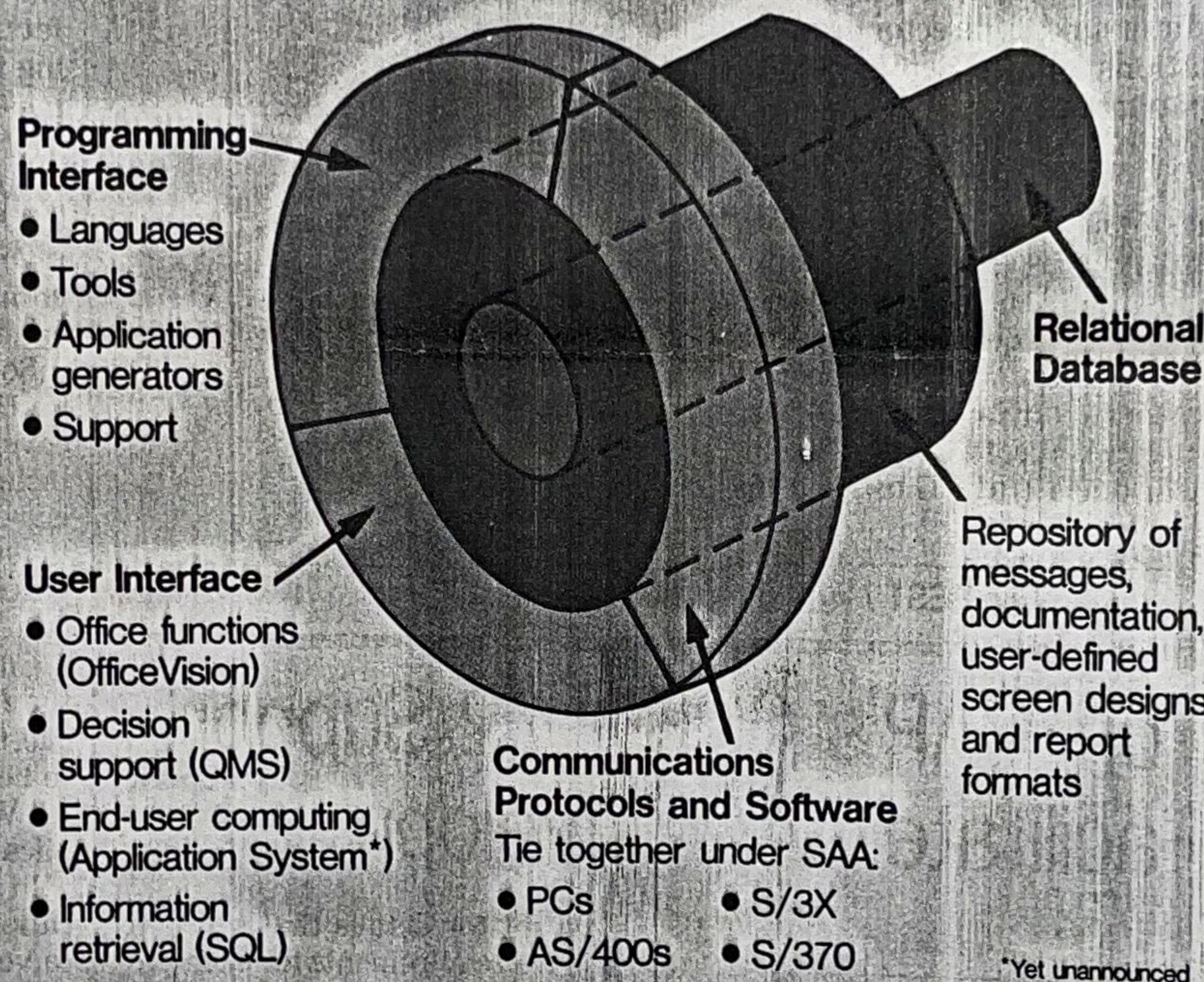
Future applications will be developed independently of the target platform. The implementation of distributed applications and cooperative-processing applications, exploiting the capabilities of various architectures, will become increasingly important. For example, the use of a network of intelligent workstations attached to a host database server will provide additional processing power while maintaining central control of the data. The availability of the integrated relational database on the AS/400 provides strong support for a data-oriented approach to design.

As a result of its integrated functions, the AS/400 provides a fourth-generation platform for applications developers today. We can expect to see this philosophy extended beyond the hardware level with the evolution of more integrated applications-development tools that will address all aspects of the application life cycle. Most likely, SAA-compliant computer-aided software engineering tools, utilizing a common design repository, will be implemented on desktop workstations attached to distributed networks of computers. These tools may be used to develop applications that support common user interfaces, common programming interfaces, connectivity, cooperative processing and distributed data across multiple environments.

Next week, I'll review applications-development tools that are available for the AS/400 environment. ■

The James Martin Productivity Series, an information service updated quarterly, is available through High Productivity Software Inc., of Marblehead, Mass. (800) 242-1240. For information on seminars, please contact (in the United States and Canada) Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402 (213) 394-8305. In Europe, contact Savant, 2 New St., Carnforth, Lancs., LA5 9BX United Kingdom (0524) 734 505.

## The AS/400's Application Development Environment Three Integrated Layers of Software



The applications developer interacts only with the outer layers, all components of which IBM plans to make SAA-compliant. Applications that work with the outer layer will then be assured access to the database, even if changes to the inner layers are made.

Maryellen Zawatski

The AS/400 command language provides a single interface to the operating system's facilities. It's simple to learn, employing a structure based on a "verb, object, modifier" syntax.

microcode and hardware. In addition, the integrity of data is guaranteed by the integration of security at the object level.

The database implementation supports the relational data model. The two major components of the database are physical and logical files. A physical file contains the actual data in records or tables, each having the same field attributes and record length. Logical files provide alternative views of the database and can be created dynamically.

### Programming Interface

The AS/400 provides support for such procedural languages as COBOL, FOR-

face to such popular PC programs as Lotus 1-2-3.

IBM has identified CSP as the primary fourth-generation applications-development language to be supported within Systems Application Architecture (SAA). An execution-only version of CSP is expected to be available for the AS/400 sometime this year.

The applications-development approach used in most AS/400 environments consists largely of third-generation techniques, with consideration paid to some of the integration facilities provided as part of the operating system. This is largely the result of a need to maintain older application systems and