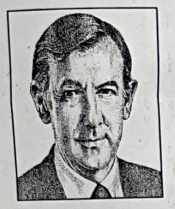
APPLIED INTELLIGENCE

A Distributed Architecture Helps Integrate CASE Tools



JAMES MARTIN

This, the fourth of a six-column series on integrated computer-aided systems engineering (I-CASE) technology, examines the architecture of an I-CASE tool.

As discussed in last week's column, I-CASE tools can support the full life-cycle process of a computer system, from planning, analysis and design to code generation and maintenance.

The architecture of I-CASE tools typically consists of PC-based, front-end workstations tightly coupled to mainframe-based, back-end code and database generators. The front-end workstations are used for planning, analysis and design functions. The back-end system supports automatic code generation, documentation generation, database generation and project-management aids.

Analysts using front-end CASE tools must be able to get a fast response from their own workstation, and, to provide local completeness and consistency checking, there should be an encyclopedia and knowledge coordinator in that workstation.

Coordinating the computerized knowledge base across a large development or information-engineering effort requires substantial computing power and is likely to be done on the machine that controls the central encyclopedia. A distributed architecture is thus desirable.

The accompanying illustration shows the architecture of a typical multitiered system consisting of PCs organized in local area networks, departmental minicomputers and corporate mainframes.

Each PC workstation contains a local encyclopedia and knowledge coordinator, thereby ensuring consistency among the information provided by different tools used by the developer. The departmental minicomputer or mainframe contains a central encyclopedia with a knowledge coordinator that in turn ensures consistency among the work of different developers.

From the central encyclopedia, the developer can check out a hyperview, or a set of objects, duplicating them into his or her own encyclopedia. From that point, the developer can work with the duplicate set and create new information that's coordinated in the workstation.

When satisfied with the new information, the developer then checks it back into the central encyclopedia, where it is coordinated with central information. That's how consistency is achieved across a large project or multiple projects in an information-engineering environment.

The figure shows the different levels of encyclopedias that can be supported in a multitiered architecture. Local encyclopedias at the PC level are used to store and analyze specifications developed by individual analysts.

An encyclopedia at the minicomputer level can be used to accumulate and analyze design specifications for an entire project. Design information that is to be shared across an entire organization, such as enterprise models, data models and process models, can be stored in a corporate encyclopedia at the mainframe level.

Building and integrating the information systems needed in an enterprise are achieved by synthesizing the models and designs of many people throughout the enterprise.

CASE tools with a central encyclopedia make this possible. The amount and complexity of information in an enterprise is so great that synthesis is almost impossible unless computerized tools are used.

Normally, any individual or design team is unfamiliar with the entire set of designs in the project-level or central encyclopedia.

When the individual starts to create a design, he or she will extract whatever information in the central encyclopedia relates to the design. For example, someone designing the detail of a process that's already shown in a higher-level representation may extract a portion of a data model. The individual then works on the design. When the design is ready for review, it can be coordinated, with computerized help, with the knowledge already in the encyclopedia.

The designer thus extracts information from the central encyclopedia into his local encyclopedia, works on it in the local environment and then integrates it with the knowledge in the central encyclopedia.

When the design is coordinated and approved, it will reside in the central encyclopedia and may affect the work of other designers. There may be many local encyclopedias all being used in conjunction with the central encyclopedia.

The central encyclopedia contains many hyperviews that may overlap. In other words, they use many common objects and employ data derived from a common data model.

The objective is to achieve as much internal consistency as possible in the knowledge stored in the encyclopedia. In a large organization, complete consistency is unlikely to be achieved, especially early in the evolution of CASE-built systems.

The methodology and CASE tools need to be designed to enable an enterprise to work toward consistency, but also to operate with different versions of objects and zones of internal consistency and, possibly, interfaces between zones that are agreed to be inconsistent.

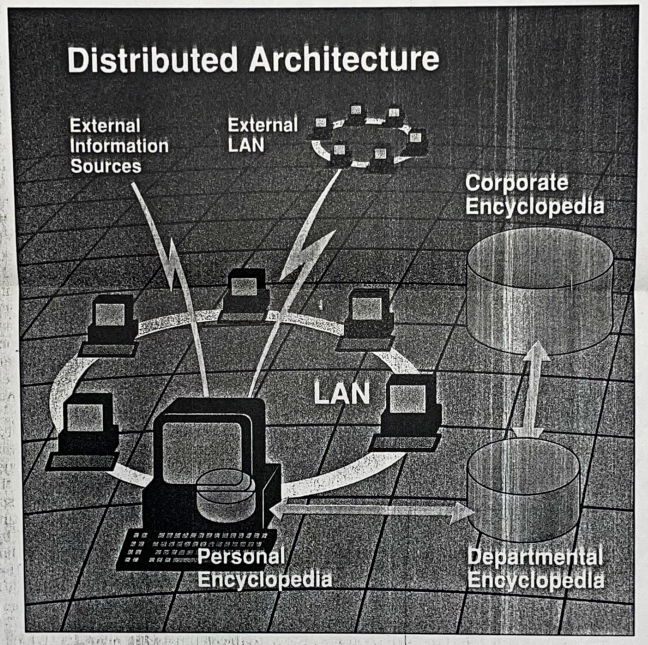
There are usually multiple versions of a design. The workbench should enable multiple versions of designs to be stored and archived. The graphics representations on the screen should be able to show all inconsistencies between two hyperviews or between versions of the same hyperview. This can be done with highlighting, reverse video or color.

Different designs are often worked on simultaneously by independent teams. Because of this independent development, hyperviews may contain conflicting information. They may contain incompatible descriptions of the same objects.

A goal of development with CASE systems should be to remove such incompatibility. Incompatibility is minimized by using the descriptions of data and other objects that are already in the central encyclopedia, whenever possible.

Sometimes a design cannot be changed, however; at least, not quickly. Often, a design is frozen while the programming of that system is done. The objects are software modules or packages that cannot be modified. The encyclopedia should have knowledge about what can and cannot be modified.

Often a bridge is needed between subsystems that are incompatible. Good design has uncomplicated interfaces. The bridge ought to be no more than the conversion of data that passes from one subsystem to another. The encyclopedia should make clear the different incompatible versions of data, and the diagrams should show the data conversions necessary to build bridges between separate systems or different hyperviews.



David Hannum

Coordinating the computerized knowledge base across a large development or information-engineering effort is best done with a distributed architecture.

Coordinating Development

A data administrator has the task of coordinating the logical representations of the corporation's data. An extension of this task is the general coordination of what is in the encyclopedia. I will refer to the person responsible for this task as the development coordinator.

Like the data administrator, the development coordinator needs computerized tools to help him analyze and coordinate the knowledge. He or she will examine many perspectives, helping to synthesize them into as consistent a whole as possible. He may be regarded as the custodian of the central encyclopedia.

The development coordinator ought to report at a suitably high level, typically to the vice president of information services. He has a dotted-line link to the information center, development center and the project managers, and is responsible for ensuring that they use the encyclopedia and link into the data model, and that the best possible coordination of systems is achieved.

Next's week's column will discuss the functional characteristics you should look for in a CASE tool. ■

The James Martin Productivity Series, an information service updated quarterly, is available through High Productivity Software Inc., of Marblehead, Mass. 1-800-242-1240. 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.