Retrofit Technology: Innovation Around Obsolescence

There's been much talk lately about the uselessness of personal computers, the futility of automation, and the unlikelihood of ever getting value from all the computers installed in the last few years of boom -- a halcyon time many vendors foolishly considered normal. Enough innovation! goes the cry. How do we get value out of all this stuff? How can we render existing data accessible to our own users or to third parties? In an increasingly automated world, the links among the automated parts are still clumsy, rudimentary, low-bandwidth, unautomated. Those links are people.

Last month we looked at Language Technology's Recoder, which improves the quality of some of those automated pieces by structuring their code; this month we'll look at some attempts to put webbing around such pieces of code to get them to work together and to communicate more meaningfully with end-users. These solutions aren't technologically elegant; elegance would require that everything be rebuilt from the ground up, carefully optimized for the operations in mind. But real-world optimization takes history into account: The question is not, What would be the most elegant system? but rather, How can we most elegantly incorporate what we've got and add the minimum in order to get what we want?

The design time for truly elegant systems is generally infinite, since no one ever gets around to it. That's the reason for the success of PCs: Users didn't have to worry about tying into a corporate system or find someone to do it for them; they just built the little piece they needed. Now, however, we are trying to get all those incremental pieces -- on micros, minis, mainframes -- hooked up together. IBM's LU 6.2, among others, addresses this problem, but it merely offers specifications for how applications can converse; the specifics of the conversation must still be designed into each application under LU 6.2 protocols. In business terms there's great interest in reusing existing data in order to offer it for resale or as a marketing tool to third parties.

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With the advent of voice technology and push-button phones, for example, we can now build systems that will answer the phone and give a customer information on his account or sell him whatever his heart desires -- midnight or not. But the thought of selectively integrating such a system with the mainframe holding the information is fear-inspiring -- and probably accounts for the relative lack of success of Exxon’s Periphonics, which tried it. Two new companies, both founded by executives from Periphonics, are finding more success with a less invasive approach...

Or perhaps you have an order-entry system and an inventory system, on different hardware. You’d like to link them together so your clerks can work with both as they take orders and tell customers what’s in stock. Or you may have bought a new standalone system from a specialty software house -- Cambar, say. How do you fit it in with what you’ve already got? One simple, lazy, but effective answer is, You don’t; you simply give the clerk instant access to both on the same terminal, and he or she provides the link. As intellectual, we shudder; as pragmatist, we applaud.

We see such approaches proliferating, since most discrete tasks have already been automated. As far as the user is concerned, what is an application but a series of screens? If you can somehow manipulate the screens to provide the integration that users need, why mess with the underlying applications? (As metaphysically minded users of Dan Bricklin’s Demo Program have begun to joke, Why bother with applications if you can automatically generate the appropriate screens with appropriate data?)

**ROBOT OPERATORS: SANELY SENSIBLE**

Most large data banks are managed by mainframes and talked to by 3270-type terminals, of which there are some 4.5 million in the United States. Sitting at 10 percent of these terminals is a semi-skilled phone operator who provides remote access to the system for phone callers and who costs from $15,000 to $25,000 per year, 35 hours a week. An entire week consists of 168 hours, so to keep one of those terminals in continuous operation costs more like $60,000 to $100,000 (allowing for vacations, overtime, etc.).

Many of these terminal operators are doing little more than typing into a keyboard, and reading the information that pops up onto their screens back to a customer at the other end of a phone line. Give the folks at the far end a computer and a modem and you’ve got a great opportunity for home banking/shopping/communications! the visionary might say. In the long run, the visionary may be right. But the businessperson sees a closer, if transient, opportunity: Replace those operators with robots. It’s about as transient an opportunity as Federal Express’s business carrying documents: Sure, in the long run we’ll all be using electronic mail, but society’s habits and inertia being what they are, we’ll still be using paper and communicating by voice for many years to come.

Most such telephone transactions are relatively low-bandwidth: You call a different number for banking, Slinky Software lingerie-by-mail, even Federal Express itself. You need an account or credit card number, an item to be ordered or a transaction to be effected, an amount or two. Try to engage a 3270 operator in conversation or ask tough questions, and you’ll probably be referred to a supervisor. In a word, there isn’t all that much for these robot operators to do.
First cut

Periphonics of Bohemia, NY, took the first cut at this problem, back in 1970 before pcs existed. Periphonics's idea was to trade on emerging voice-digitization technology. With the right programming, you could get your mainframe to drive a voice-output device instead of a terminal, and to accept Touch-Tone\textsuperscript{R} input instead of an operator's commands. The mainframe programmers would come in and reconfigure the system to accommodate this new input/output scheme. Although Periphonics can sell low-end systems, the company's orientation is to expensive, custom jobs. Such systems are cost-effective for large vendors, including Periphonics customer Pacific Southwest Airlines. Periphonics has sold over 900 systems over the past 14 years. It was acquired by Exxon in 1980, and announced last week that management had purchased the company back from Exxon in a leveraged buyout.

The cuttings sprout

During the period several top managers left, including Allen Fleener, now coo and evp of InterVoice Inc. of Richardson, TX; Tom Emerson, founder and later president of Periphonics and now president and ceo of Syntellect Inc. of Phoenix, AZ; and two other Syntellect co-founders. InterVoice was founded in 1983, hired Fleener in January 1985 and went public in May 1985, raising $3.2 million; Syntellect was founded in 1984 and has $8.7 million in funding from Hambrecht & Quist; Welsh, Carson, Anderson & Stowe; and other VCs. InterVoice has been shipping for two years and has almost 100 systems installed, 38 of them at Southland's 7 Eleven chain. Syntellect is just installing its first few systems this month, after showing the product at the National Operations & Automation Conference.

Both companies benefited from these men's experience at Periphonics and from their later start. While Periphonics was tied to the mainframe world and its cost structure, InterVoice and Syntellect saw the new micro technology as an opportunity. Both companies, starting from scratch, made the architectural choice of developing a front-end, micro-based system that would adjust to the mainframe application as it stood, obviating the need for mainframe programmers. Indeed, in one case, EDS Employees Federal Credit Union, InterVoice's customer doesn't even own the mainframes it is talking to, and needed no support from EDS CUNADATA, which does. EDS Credit Union simply replaced one of its 3270 operators, who normally dialed up the CUNADATA mainframe, with a RobotOperator that does the same thing.

Both companies program their micros to intercept the stream of data that a mainframe sends to the 3270, and send appropriate mimic-3270 input back. Each pseudo-operator (like a real one) must carefully analyze the screens an application generates. Normally, for example, a crt operator will type in certain commands plus, say, a customer's account number, and get a screen back. The screen may display several headings, followed by the account name and address, followed by the account balance, the five most recent transactions, and a message. A human operator can easily enough pick out the item to read back to the customer. For a robot operator, it's not so easy. Which of the strings of characters is the account balance? Which is the most recent deposit credited? Is 703 a check number, or an amount credited to the account?
How to read a screen

But figuring all this out is still easier for a non-programmer than an attempt to interface to the mainframe directly. (By limiting the phone-in customer's option of Touch-ToneR choices and the robot's input, the system designer automatically limits the complexity of what might appear on the screen.) At this point the approaches of InterVoice and Syntellect diverge slightly. InterVoice's RobotOperator is more flexible and can replace crts other than 3270s, but looks a little harder to set up. Basically, the system designer looks at the screen in front of him, and tells the RobotOperator what to look for. As long as the screens aren't too numerous or complicated, this approach works fairly well, and InterVoice provides a lot of installation support. You can, for example, tell the system to look for the string of numbers following the string "balance:" or to search only in the column that begins 60 spaces to the right (which the human operator can easily identify as the debits column).

Syntellect's Infobot's "programming" routines are a little more friendly, prompting the designer to outline the structure of the phone dialogue, and then to specify the details of each step, essentially leading him through the creation of a coherent, complete session. The company calls part of this procedure "artificial intelligence." We guess it is, because there are little heuristics that translate the user's high-level specs into code... Anyway, it works, so why quibble?

The voice of...

Once the system has figured out what to read back, it activates its digitized voice, selecting appropriate chunks of pre-recorded text. Snatches to be pieced together might include "Your balance is...", "Your order will be delivered on...", "Your account is overdrawn by...", plus a wide range of numbers. To fill the dead space while the host is getting a response, most customers also insert a pre-recorded messages, such as "Starting next month, Last Bank of Silicon Valley will be offering a new line of ten-year mortgages on parking spaces. For further information, press number 7 on your phone when your current transaction is completed." Or, "Local Express now provides door-to-door delivery service for portable computers, manuals, and other hard-to-carry items. Don't get backstrain from working at home!" Or, "Hi! I'm Friendly Fred, president of your bank. You may have been reading about us in the paper lately, and I'd like to explain things from our point of view..."

As far as the computer is concerned, these messages are simply addresses in a file of digitized voice triggered by the PC's or micro's software, and they can be changed easily, even daily. One user suggests care in choosing the person to record the messages, since the departure of that person may mean that all the messages must be re-recorded to maintain consistency. He used the wife of his boss.

The box beneath

If Syntellect stresses low hassle and plug-in operation, InterVoice stresses low cost. Its RobotOperator runs on a PC, supporting 2 to 24 (soon 32) lines per PC for $18,900 to $54,000 or more. Moreover, RobotOperator can replace a 3274 controller, not just that 3270s that attach to it. (That's
low-cost, of course, only if you can resell your existing 3274 and don't need it for real 3270s attended by human operators, but it does demonstrate the system's flexibility.) Syntellect, claiming that a PC's performance degrades in busy conditions, has chosen to OEM a Masscomp 68000-based system, at $11,000 for two lines. Infobot's costs don't drop as sharply as RobotOperator's, however, since each Infobot can support only four lines, although with discounts the price eventually will approach $3000 for two incremental lines, says Syntellect's Emerson.

At present, InterVoice, with revenues of $1.25 million last year, and three quarters of losses capped by a $60,000 profit the company expects will be recurring, has just set up a licensing agreement with Voice Control Systems of nearby Dallas to let its system respond to customers' voices as well as their button-pushing. That sounds nice, but we suspect that there may be problems with customers trying to tell the system more than it can handle. The appeal of the touch-tone systems is that they enforce simplicity. Once you let a customer believe you can understand him, he may start talking normally -- generally not a good idea!!

Voices for the people

The great advantage of these systems is that they make the provision of such data services possible and cost-effective for small organizations such as bank branches and local service firms, and the let the service-providers cede limited control and access to the ultimate end-users. They are able to update messages by themselves, decide which services to offer, etc. Creativity abounds. One of InterVoice's customers, Empire of America Realty Credit Corp. in Buffalo, NY, uses the system to provide rate quotes to its wholesale-bank customers, with a service called RateLock. If they like a rate, they can lock in a mortgage commitment, and, by voice, specify the name and address of the designated property. That specific information is recorded by the system and then keyed in during working hours by an Empire employee. But the mortgage broker can commit to a rate even on a Saturday afternoon -- a good time to close deals with house-hunting couples.

One flaw: A selling point is that the robot operators can work around the clock without tiring, taking breaks, or charging overtime. True. But many of the mainframes they're attached to are taken offline every night for batch updating. And we were blaming it on the people!!

NETWORK MEDIATOR: PANORAMIC INC.

A three-year-old software start-up with fifteen employees and cumulative revenues of about $260,000 from four customers must have had a little trouble starting up. Panoramic Inc. of San Jose had plenty. Founded by several former Tandem employees at a time when Tandem itself was having troubles and backed with $5 million primarily from Adler & Co. and to a lesser extent from Alex. Brown, Panoramic was an excellent software design house left rudderless with no business management when the Adler partner/employees involved left Adler to form their own partnerships. Panoramic finally found a president last fall in Rich Currier, 40. Currier was formerly president of accounting-software firm Walker Interactive and vp marketing for dbms vendor Software AG, two companies well-versed in selling to operating management rather than simply to MIS managers.

Release 1.0              29 May 1986
With Currier’s arrival Panoramic finally announced its product NetWork, a vaguely defined and loosely positioned collection of Tandem-based network management tools. What does NetWork do? So much that the company could never position it properly. It manages network operations, controls access, automates backup and restart, handles e-mail, and so forth. And, as limned above, NetWork lets users integrate existing applications. Most dp people would rather design elegant applications, but Panoramic’s pitch is to the operating manager who’s hit a brick wall and can’t seem to get moved up on dp’s to-do list: Show us what you’ve got, and we’ll get it to work together somehow. NetWork doesn’t require them to redo the applications or create fancy links; it simply builds a front-end to help users navigate through and among existing applications.

Traffic cop and navigator

NetWork, naturally enough, runs on Tandem equipment, but front-ends comfortably to most IBM mainframe environments. It mediates between users and applications, running on mainframes, minis, whatever. That’s the generic part, expected of any smart network or even a dumb switching system. NetWork’s Connect and OnGuard modules also let a systems designer create a profile for each user on the system, regulating which parts of which applications he has access to.

During a normal day, NetWork will maintain open connections with all a site’s applications, delivering them to users as required without the effort and delay of logging in, and suspending rather than closing them as users switch or are sequenced by the system from one to another. Working on the theory that an application is really no more than a sequence of screens, NetWork’s Connect module uses stored routines to navigate through the applications to get each user to the appropriate screens -- and prevent him from seeing screens outside his assigned area. For example, one user might need inventory query, but not inventory update; or order dispatch for Moscow but not for Kiev. Connect can also automatically switch him from one screen in one application to another screen deep in another application, creating a meta-application out of existing applications. Using network buffer space, the user can even accomplish some low-level data transfer from one application to another -- saving a customer name, for instance, rather than retyping it.

While Panoramic had been selling the system for internal use, Currier is finding that customers are far more eager to adopt it for the the same sorts of applications other companies are handling with RobotOperators. In other words, customers are saying, I know I’ve got the data somewhere; now if I could only provide it to my customers as a marketing tool or service ...cheaply. While the phone robot customers’ customers tend to be consumers, Panoramic’s customers’ customers are generally other businesses. Those businesses are loath to let their customers have direct access to the mainframes; NetWork provides both security and an easy way of building a path of screens that the customers can use to get to selected information and that information only. Security Pacific Automation, for example, has started up a service bureau by using NetWork to provide carefully controlled access to its dp facilities to third-party customers.

So far, Panoramic has nine installations; so far four have accepted the system at around $70,000 apiece -- Tandem hardware extra. They are Chase
Manhattan, Security Pacific, PetroCanada, and Tandem itself. Currier expects to add to the customer list rapidly now that the company has refined its pitch. Without careful positioning NetWork lacks allure because it's not a new system, but it enables a very small investment to recoup an extremely large return.

NETWORK MEDIATOR: NETWORK INNOVATIONS

Operating on a much lower level -- and a much lower price, starting at $695 per host -- is a micro-host product called Multiplex from Network Innovations of Cupertino. Multiplex doesn't manage users and applications the way NetWork does, but rather provides rich data-base access facilities from specific PC tools to a variety of SQL-type dbmses. NI's founders, Jim Groff and Paul Weinberg, are published experts on UNIX who worked together at Plexus Computer designing a file-transfer product for Plexus's 68000-based UNIX system. But the lure of solving that problem more globally was too great to resist, and in 1984 they founded Network Innovations.

Multiplex is essentially an SQL-query generator with a 1-2-3-like feel to it. It brings back file extracts ready to use in 1-2-3, dBASE, Multiplan (SYLK), DIF, or plain ASCII. The queries can be stored for reuse, just like 1-2-3 templates, so as to load updated data again and again. Multiplex also offers macros that operate across the PC tools, so that a typist could, for example, upload certain PC files, execute a query template on the updated host files, and automatically load the data into a WordStar form letter to send out to the company's anxious venture capitalists.

Multiplex is notable not for its genius but for its practicality and unobtrusiveness. To the user it looks just like 1-2-3, offering a familiar, negotiable interface in which to build his queries. To the data base, it looks just like SQL, asking the right questions to get the answers. Multiplex makes the connection between two sets of standards -- PC productivity tools and SQL dbmses -- neither of which is likely soon to go away or to accommodate all the others directly. Indeed SQL interfaces are becoming more and more common on host data bases with IBM's increasing support of DB2, an SQL mainframe dbms.

ALPHA SOFTWARE'S ALPHA/THREE: MAKING dBASE ACCESSIBLE

Alpha Software, Burlington, has learned a lesson about data bases from its Massachusetts neighbors, among them Infocom (with Cornerstone), and Concentric Data Systems (originally with C.I.P and now with 1-2-3 ReportWriter, a 1-2-3-specific version selling successfully through Lotus). The company's design team built a user-friendly, powerful dbms, but the company's founders, the canny brothers Richard and Selwyn Rabins, knew that the product they could sell was a dBASE III complement. Called Alpha/three (yes, the III is spelled out to show it's not totally dependent on dBASE III), it can indeed function as a flexible dbms all by itself or import files from dBASE II, 1-2-3, pfs:file, MultiMate, Multiplan, etc. But its greatest commercial value is as a tool for users of dBASE III data who are not trained users of dBASE itself. (Fox & Geller's dBASE add-ons, by contrast, are positioned more as enhancements for programmers.)
Working on the theory that most of those users are probably generators of simple reports or people wishing to move information from dBASE into letters or onto checks and mailing labels, Alpha/three has modules tailored for those tasks. Without programming, you can merge different selections of text into a form letter based on information in different fields. That is, folks with overdue balances above $500 get one letter; those with better records get another. And their mailing labels look good: Empty fields don't look empty on the label (below, left); they look non-existent. The label itself remains the proper length, so you don't get the problem shown below on the right. (But not even Alpha/three can do much about improper data entry!)

Esther Dyson
EDventure Holdups
375 Park Avenue
New York, NY 10152

Mr. Shepherd
Technology Painters

There's not much else to add about Alpha/three. It's a simple, no-brainer product that should sell quickly to the huge installed base of dBASE sites, where the dBASE hackers don't want to be bothered by the support demands of their less dBASE-literate colleagues. At $395, it's almost worth buying for its mailing-list features alone. At $25 an hour, all it needs to do is save two days' work. (Fox & Geller's QuickReport lists for $295.)
We hear it again and again: Software prices are going down. Corporate customers want site-licenses or at least volume-purchase agreements. 1-2-3 is being cloned. Borland has spoiled the market for everyone. Autodesk has lowered the price of AutoCAD from $1000 to $300. Even high-end companies such as Interleaf and Cadre Technologies (see page 11) are slashing prices from high-thousands to low-thousands.

But the prices only of commodity products are going down. Autodesk's primary product, accounting for 70 percent of unit volume and more of revenues, still sells for $2500. Market segmentation and market positioning do work. Just as the prices of last year's pcs, in last year's configurations, are dropping, so are the prices of last year's software. But canny vendors are keeping their products up to date and differentiated, and even, in the notable case of Borland, raising prices.

Value-added and value-subtracted

"Value-added" is on everyone's lips. What does it signify? In part, it means the service and support third-party vendors can add to a product. It also means the product differentiation and enhancements that enable a company such as Lotus to maintain the price of 1-2-3 at $495 year after year. Value-added also lies in the infrastructure: The years of training, macro-writing and other sunk investment in 1-2-3 that make customers so loath to throw it over for another product. The reverse of that is value-subtracted -- the need for retraining, rewriting applications and converting files that is keeping customers from switching to Javelin, which many feel is for now intrinsically a better product. But value-subtracted is real; it is not just customer perception. Value-subtracted incurs real costs, just as value-added provides genuine benefits.

Another fine product suffering from value-subtracted was Reflex. No one was sure what it was or what it did. No one was around to teach it to anyone. There were few templates, books, or other materials to support users who wanted to try the product. (Yet another candidate is Xanaro's $495 Ability "integrated package," which new owner Migent will be selling for $100. But we suspect that those who try it out at $100 won't be as enchanted as users of Reflex, who are getting something genuinely special.)

Lotus power-steering: The performance end of price/performance

Lotus is preparing (with deliberate speed) to launch HAL next fall. HAL, under a new name, will show once and for all why it pays to buy the name brand. As we've noted before, HAL is not just a "natural-language interface" (Release 1.0, 32 December 1985). HAL not only understands, say, the word "graph" in the command "graph that:" it also makes a good guess as to what the user means by the word "that," depending on the data, labels and structures on the screen. Since its acquisition by Lotus, the product has grown to include some nifty new features that will eventually find their way into a subsequent release of 1-2-3 itself -- but for now, says one Lotus marketeer, "People are tired of upgrades! The new version, some of which was shown at a recently at the Boston Computer Society, includes powerful auditing capabilities and application/model development features. Lotus is taking the same approach as Microsoft with Windows/DOS 5, saying
in effect: "This is an extension which has some neat features that belong here, and also some that by rights belong in the anchor product. But we didn't want to wait for the next release, so we're offering them in this add-on." In the case of Windows the features are multi-tasking and memory management; in the case of HAL, auditing, searching, and the like....

Most impressive, perhaps, is HAL's "show relations" command, a fitting cap to the demo sequence that begins with "show dependencies," which highlights all cells depending on a given cell, and "show precedents," which highlights all cells that determine the value of a given cell. (You can also list these out, with formulas, if you prefer.)

"Show relations" runs through the entire spreadsheet and derives the underlying formulas -- not just a list of all the formulas, but rather a summarization of them. Compare this with Javelin, where you use the underlying formulas to build the spreadsheet: Here, you can build the spreadsheet the same old ad hoc way -- or find one left behind by a departed employee -- and derive the formulas afterwords. That also enables you to discover mistakes: For example, all the values in the righthand column may be of the form "current - prior year - cancels - non-renews + new sales," except for cell 24F, which somehow got to be "current - prior year - cancels." Given today's slow-growth economy, the number in 24F may not look inaccurate, but it is. "Show rel" will highlight the inconsistency. Better yet, you can save the show-rel files, edit them, and use them to create a similar or modified spreadsheet by executing them in HAL.

The software can also find strings, both in formulas and visible data, change them globally, and so forth. The power of these facilities, and others, isn't immediately apparent, but they give the user -- both expert or apprentice -- a far greater sense of control. You can't ask it to do everything, but you can maneuver around more easily. With the undo feature, the software loses the aura of fragility that has scared away so many users who felt too clumsy to handle such a powerful tool. Even Ashton-Tate's Ed Esber, who waxed intriguingly eloquent about Javelin's prowess in recent comments at the Hammer Forum West, also called HAL a powerful response to Javelin. (Lotus, of course, contends it was thinking of these things all along; perhaps Javelin simply spurred it to action.)

Borland's Reflex: Vanquishing value-subtracted

When Borland bought Reflex last fall and reintroduced the $495 product at a "temporary" price of $100, no one believed its price would ever rise again. We've heard that line before: We're giving it away at this price temporarily just to attract attention. In this case it was true. Indeed the product, which had been a slug at $495, went quickly (72,000 copies since last fall) at $100. The only problem, we suspect, is that support costs were wiping out any profits. Now priced at $150, the product may not sell quite so fast, but the sales will be profitable. (Borland will also soon be offering added revenue-generating support in the form of Reflex Workshop, a set of 20 Reflex templates for $69.)

At $495, few took the risk of finding out what Reflex could do. At $99, many did. In essence, Borland paid its first 72,000 customers approximately $50 apiece (off an estimated but unknowable "default" price of $150) for their help in removing the product's value-subtracted.

Release 1.0	 29 May 1986
In the midst of all the retrofitting, or as part of it, software development is becoming an increasingly complex and expensive task. As the cost of hardware and even much packaged software declines, the relative cost of programming time and talent soars. Moreover, systems themselves are becoming more complex and, as noted above, it's also increasingly necessary to tie together applications that were originally developed separately.

The systems analysis & design job itself is just about the last to be automated. Systems designers began by building huge batch systems, and they built them in a batch way, writing code and then compiling. Later, they designed interactive systems for end-users, and watched in disdain and then horror as end-users themselves began "programming," using interactive end-user tools such as 1-2-3 to create interactive applications for themselves. Designer/programmers were expected to use the 3270 PC, a terminal that looked like a PC, or worse yet, the 370 PC, a mainframe that looked like a PC, rather than the real thing.

In recent years, automation and interactivity have crept into the design process, as fourth-generation languages and code generators came along to bypass coding or to translate high-level queries and report specs into lower-level code, usually COBOL. These are primarily for the end-user with a simple query, or the programmer who already knows the structure of the program he wants. Yet the complexity of many applications and especially of the links among them is becoming too great for any single designer to comprehend, let alone remember, and inconsistencies abound (cf. Star Wars).

The designer's design tools

Overall, computer-aided software engineering (CASE) is still in rudimentary form. There are numerous unlinked packages floating around that handle discrete parts of the process of turning an idea into a complete, coherent application, but no single system that accomplishes the whole process. Their interactivity, widely touted as an improvement over batch operation, nonetheless implies that the system can't do the work all by itself and needs constant human guidance.

The two parts of the process under discussion here are analysis and design. Analysis in essence is the statement of the problem: What must be accomplished? What outputs are desired, etc.? It will be a long time before analysis itself can be automated; CASE simply brings to the task tools to make it easier for the user to describe the process consistently, and to make sure all issues are addressed. Design concerns the implementation of the system specified by the analysis, and governs the use and allocation of resources in an environment bounded by constraints. What specific data and processing capabilities are available? Which modules of old code can be reused, and which should be rewritten? Should we use a mini or networked micros? Should a function be handled by an expert system or by procedural routines? Design should be a low-level problem subject to solution by an automated system as long as the analysis (specifications) is clearly iterated and the resources and rules governing their use are clearly defined.
Making software follow the rules

Most of the CASE systems reflect specific development methodologies. Methodologies are like religions: collections of beliefs, rules, and procedures. One system uses boxes where another uses ovals; one decrees that a design should have three levels where another might specify five. Some prescribe the order in which different parts of a system might be specified. Altogether, they're appropriate attempts to enforce consistency and completeness in the design process. They are more concerned with form and method, and auditability and documentation, than with content, but their ultimate aim is to produce quality in content.

The story that follows is how the designers got automated. Still to be told -- and implemented -- is the automatic conversion of designs into code; there are some feints in this direction, but generally the systems described below provide an environment for building consistent systems designs rather than for producing output that can serve as input directly into a code generator or fourth-generation language.

The products of the four companies discussed here superficially all perform the same functions. The systems deal with data and processes (nouns and verbs), in an object-oriented way familiar to any AI hacker. There are static relationships and hierarchies among data, and then there are flows, processes, and functions that manipulate the data or other processes. Each CASE system uses an underlying dictionary (KnowledgeWare calls it an encyclopedia) created more or less automatically as the user draws his system with boxes, circles, arrows, and the like. Each entity -- data elements, data stores, data flows, functions, external entities (dei ex machina?) -- in the dictionary can be tracked for its occurrences and relationships to other entities. To varying degrees, each system applies a set of design rules to check for structural consistency as the user builds his model, reusing or modifying existing entities and adding new ones. InTech boasts of more than 100 different kinds of relationships between entities; KnowledgeWare of more than 1000 design rules; Nastec of seven methodologies.

For example, rules may provide that no box or circle in a diagram can be unconnected, that arrows have to go from somewhere to somewhere else, etc. Different kinds of lines and boxes are defined, and governed by different rules. Of course, the system has no idea what they "mean," but it can monitor the diagrams' adherence to these rules. Next, the boxes and flows can be given names in the dictionary and stored textually, giving the programmer of the system a structure around which to write the code.

In addition to horizontal relationships, there is decomposition, also known as explosion or leveling. (KnowledgeWare once found the term "ultimate decomposition" translated into Swedish and back as "final rot.") It means the ability to move from the general to the specific (or more globally from analysis to design to implementation), and back. That is, once you've decided on the system you want, how do you divide it into little chunks that can be handled by an individual? This is a hierarchical structure that reminds one of outlines, trees, and -- yes! -- structured code. A process such as "Produce newsletter," for example, might be exploded into "Collect information," "Synthesize information," "Write first draft," "Find missing facts," etc. Each of those processes could be further refined: "Collect Nastec info," "Collect InTech info," "Collect Cadre info," "Collect Know-
Some data elements invisible at the top occur repeatedly at the lower levels: "Collect Cadre info," "Write first draft on Cadre," and so forth. Each system offers nine or more levels of decomposition.

**Automatic management**

Such systems are perforce multi-user. In basic form, they simply enable several users to check modules in and out as they work on them, and to duplicate (and modify) a central library of routines -- i.e., the mythical reusable code. A supervisor would oversee the process, assigning high-level modules for each user to decompose into detailed structures.

An impressive step beyond this is Nastec's LifeCycle Manager. LifeCycle Manager is an integration of a project manager with the actual work to be done, a reasonable enough idea but one possible only when the work is automated. (After all, how could a computer properly monitor the activities of a construction crew, or a trade-show booth task force? You could designate a staffer to key in a progress report each day, but odds are that person could be better used fitting pipe or painting banners.) LCM operates very simply: It gets the overall system layout from the systems analyst/project manager, determines the tasks to be done, and assigns them in light of resources designated by the project manager.

**Who's naughty? Who's nice?**

From then on, the computer manages the "life cycle" of the project. When Juan signs on in the morning, he's greeted with news of his tasks for the day: Design the data-entry module. Design the receivable-posting module. Etc. (It all reminds us of the cartoon where two scientists are gazing at a bulletin board filled with equations, except for one gap before the final result. Here is scrawled the scientist's solution: "And then a miracle occurs.") When Juan selects a module, DesignAid automatically appears to help him through the task. When (he thinks) he's done, LifeCycle Manager stores the file and hands Juan another.

Juan's finished effort goes into the queue of Alice in quality assurance. She checks Juan's work for what DesignAid can't find -- broader inconsistencies, whether or not the module actually accomplishes the function designated, and general elegance of coding -- and annotates it. Juan gets the annotated version back to fix -- or to plead his case with Alice. The human project manager, at will, can find out what each designer is doing, and check on the overall progress of the system or any of its pieces.

**Tools for thinking, not building**

But the coding, which should be merely the translation of flowcharts, data descriptions, and the like into code, still requires a human programmer, even though these systems turn the task almost into a rote chore. But the rote code generators don't accept the automated design systems' output as their input. Now Nastec is working -- not exclusively -- with Tarkenton Software and its Gamma code generator. (Fran Tarkenton is the former football star who joined the MSA board mostly in the capacity of inspirational figure, and then discovered he liked the software business.) However, the link works only if the user conscientiously follows the Gamma syntax in developing his system. All four CASE companies are exploring such links with code-generator vendors. Meanwhile, users are building links ad hoc.

*Release 1.0*

29 May 1986
What CASE offers now is like an earlier stage of CAD/CAM -- pretty drawings, but with tenuous linkage to the machinery that's supposed to build the items underlying the models. In CAD/CAM that's changing: The electronic engineering "drawings" can be used to drive a numerically controlled machine tool, or to simulate the operation of a part. But the current CASE systems are mostly good thinking tools; they help the analyst/designer define and lay out his system. That's no mean advantage. A small inventory system may require only a couple of boxes, but larger, complex systems may need the mental agility of a Seymour Cray to keep all their component flows, data objects, and routines coherently and consistently organized.

THE PLAYERS

<table>
<thead>
<tr>
<th>Company/product</th>
<th>Basic price</th>
<th>Runs on...</th>
<th>Installed base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadre (teamwork)</td>
<td>$8900*</td>
<td>Apollo, Sun, RT PC soon</td>
<td>200</td>
</tr>
<tr>
<td>InTech (Excelerator)</td>
<td>8400</td>
<td>IBM PC; VAX back-end</td>
<td>2600</td>
</tr>
<tr>
<td>KnowledgeWare (IEW)</td>
<td>7500</td>
<td>IBM PC; host file servers</td>
<td>300**</td>
</tr>
<tr>
<td>Nastec (DesignAid)</td>
<td>6900***</td>
<td>PC, CT (disc.), VAX soon</td>
<td>1000</td>
</tr>
</tbody>
</table>

*for either teamwork SA or teamwork SD; both together cost $13,500;

** includes 150 at beta sites

***plus $2700 for LifeCycle Manager

Source: companies named; informed estimates

For all their common concerns, the flavors of the four major automated software engineering contenders vary: CASE 2000, from Nastec of Southfield, MI, focuses on the process (or methodology) of systems design. It leads the user through the appropriate steps to create a designated system, and prevents him from straying too far afield. CASE 2000 leaves most of the quality control to the user, and merely points out inconsistencies.

By contrast KnowledgeWare, based only a cab ride away in Ann Arbor, concentrates on the underlying relationships between the user's data, data flows, processes, etc., but doesn't limit how the user gets there. "We consider the road merely a suggestion," designer Al Hershey quips.

While KnowledgeWare is primarily an analysis tool, InTech's strengths lie on the design and especially communications side -- for the designer to comprehend his own system, as well as to communicate it to user, manager, customer, etc. Excelerator does a fair amount of consistency checking and produces sumptuous reports, but a differentiating feature is the tools it provides for building screens and the like -- components of demonstrable prototypes. (One of InTech's "success stories" reads: "[Excelerator] has enhanced the MIS group's visibility with senior management...".) InTech is also assembling a large stable of ancillary products such as project-cost estimators and links to screen designers and other programming tools.

Finally, Cadre Technologies' teamwork addresses (for now) a different market altogether, as it runs on Sun and Apollo workstations in contrast to
the PC-based products of the other three companies. Cadre has the richest design (as opposed to analysis) tool, and has just announced a new module, teamwork/RT (real-time), to assist in development of embedded systems.

Nastec: Helping people follow their own religion

Nastec was the first company to commercialize the concept of CASE, and indeed used the acronym for its product line, CASE 2000. Founded in 1981 as a spin-off of MTC, a contract programming house, Nastec is run by MTC chairman Ken Hill and three men he worked with at Control Data in the seventies. Started with $2.5 million from Hill, the company now has about $17.5 million in funding from investors including Northwest Growth Fund, Morgenthaler, and Oxford Partners.

Nastec originally developed its DesignAid, a major component of CASE 2000, as a documentation editor, which provided integrated text and graphics so that you could annotate your flow-charts on the screen and transfer that directly into a manual. Then came the idea of editing not just the text but also the diagrams.

While Nastec is an excellent "methodology" company, and offers a variety of methodology-specific modules such as DocumentOrr (incorporating Data Structured Systems Development from Ken Orr & Associates), JaDesign (IBM's Joint Application Design) and even PSL/PSA (a methodology developed in part by KnowledgeWare's Al Hershey in an earlier, academic life), its DesignAid offers limited "typing" of the entities in its dictionary. Rather than detect errors itself, it generally leads the user through the proper procedures according to his preferred methodology for checking his own work.

Nastec suffered from its early start: It first put DesignAid up on a Convergent workstation, one of the few 16-bit, networkable systems around at the time. (The IBM PC was still just a rumor.) That early system gained some adherents, including about 50 users at Ernst & Whinney, Nastec's biggest CT customer. Overall, its largest customers are EDS and Coopers & Lybrand, which also resells the system. Nastec has a salesforce of 10 in six locations, and expects to expand mail and telephone marketing this year.

All told, Nastec has an installed base of about 350 Convergent systems, and about twice that on the IBM PC. It is also working with RCA on building a version for the VAXstation 2/RC, DEC's new reduced-cost version of the VAX-station, compatible with the rest of the VAX line. RCA is funding the development and buying the first few systems, but after that Nastec will have entree into the engineering world where Cadre already holds sway. There is mounting pressure to put CASE 2000, currently in Pascal, into C under UNIX.

InTech: Making things perfectly clear

Next into the market was InTech of Cambridge, MA, similarly a spin-off from a consulting firm, Index Systems (which also gave us Applied Expert Systems, Release 1.0, October 2, 1985). Index principal and co-founder Rich Carpenter, now InTech president and ceo, saw interactive PCs springing up in his clients' offices and decided there was an opportunity there somewhere. In 1983 he pulled together a team and came up with Excelerator, a monochrome product that looks terrific on a high-resolution screen. Funding came from Morgan Holland, Greylock, Fidelity, Sutter Hill, and H&Q.
While Nastec's parent MTC was a computer services firm, InTech's parent Index Systems was a more business-oriented management consulting firm: Hence its product's orientation towards communication rather than strict dp concerns. InTech's greater familiarity with the world at large has also governed its sales strategy; the firm sells not just direct through 17 salespeople in 17 sales offices, but also by telephone and direct mail, and has a heavy PR program targeted at the mass market. (It's the only one of the companies here to garner a product review -- fairly complimentary -- in PC Week.) Finally, InTech sells through OEMs, VARs, and international distributors, and through IBM as a logo product. All this works: Since Excelerator was shipped in August 1984, InTech has sold almost 2700 copies.

The company recently announced interfaces to C language environments and to a number of IBM mainframe screen generators, so that screen-design efforts need not be wasted when a project moves from analysis and design into implementation. From a base on PCs, Excelerator also runs in cooperative-processing mode on any kind of VAX, with the VAX providing back-end data management and doing heavy-duty verification and analysis, while attached PCs handle data-entry, display, and lower-level editing functions.

Indeed, from a single product InTech has suddenly blossomed into an array of products to help the design process, with yet more promised... The latest is SPQR/20, a PC-based expert system for $5000 sold under license from Software Productivity Research, also in Cambridge. SPQR/20 stands for Software Productivity, Quality, and Reliability, and the 20 variables used by the system to derive various parameters of timing, optimum development languages and environments, allocation of resources, costs, etc. SPQR/20 has no data linkage directly to any of Excelerator's other products, but they certainly can be used productively by the same customer set. (And no, Excelerator does not always come out as the ideal design environment...)

KnowledgeWare: James Martin in a box

KnowledgeWare is the oldest of the companies mentioned here, but its automated software engineering product, Information Engineering Workbench, is the newest; it started shipping early this month. Noted consultant/lecturer James Martin left Dixon Doll's DMW Group in 1979 to start predecessor company Database Design Inc. In 1982 Al Hershey joined the company as chief architect to take it from consulting to products, capitalizing on Martin's widely followed theories on data modeling and data base design. Hershey himself was a noted authority on systems analysis and data structures, based at the University of Michigan. The company developed and still sells two mainframe products: DataDesigner, $40,000, and Information Planner, $35,000, a thinking tool for modeling an enterprise's information needs, business strategies, and overall allocation of resources.

Late last year Terry McGowan, with the company two years and before that in marketing at Amdahl, became president; James Martin remains chairman and Al Hershey is chief technical officer. Most of KnowledgeWare's funding comes from Martin and a Bermuda-based investment group he's involved with. The company works mostly on direct sales, with a salesforce of 10 in six locations supplemented by a tight relationship with development partner Arthur Young, which uses the Workbench to build systems for customer and counsels them on its use.

Release 1.0 29 May 1986
Database Design changed its name last year to KnowledgeWare in preparation for marketing the new product, which is an implementation of Martin’s current ideas on systems design, implemented on a PC in glorious color. ("It demos well," sniff his competitors.) But Information Engineering Workbench has the strongest underlying structural analysis and verification routines, and the potential to provide the closest thing to automatic systems design -- as opposed to automatically leading the user through the process.

KnowledgeWare offers the best sense of context for its product, although the company suffers from a tendency not to distinguish clearly between what is implemented and what is still in vapor form. The entire KnowledgeWare routine begins with the user (typically a department executive) considering corporate goals and what affects them, using a methodology developed by Arthur Young. From that, he determines what functions need (improved) automation, and how.

For the moment, the Workbench’s functions stop at systems analysis, supported by a multi-user library of modules and routines. Although the mainframe products assist in systems design, and provide ample evidence of the company’s strengths in data modeling, there’s no link yet between them and the PC-based Workbench.

Cadre Technologies: Real programmers prefer power workstations

Cadre Technologies of Providence, RI, sells to a different market -- users with Sun or Apollo workstations on their desks. This fall, it will be shipping an RT PC version. The company was founded in late 1982 by Lou Mazzucchelli, who designed communications systems for International Data Sciences and then turned around and automated the company’s business and accounting functions. From there he joined Yourdon inc., a well-known “methodology” consulting firm, as a senior staff consultant.

Cadre’s teamwork comes in two basic parts: teamwork/SA (structured analysis), shipping since last June, and teamwork/SD (structured design), out this July. Together, running on power hardware, these systems provide strong analysis and design consistency verification -- by far the most powerful design tools around. The product’s name betokens its strength in supporting multi-user operation beyond mere data base access control. Cadre can treat any set of elements in its system as a discrete object and insulate it from all others so that user can modify it independently and reintegrate it smoothly afterwards.

A related feature is model configuration management, which automatically realigns a model when pieces of it are reconfigured. The different versions are stored and catalogued (at the user’s option), which encourages experimentation with little risk.

The company’s latest announcement is teamwork/RT, for real-time system design. Here the external environment is subject to change, creating a need for an extra dimension as the system must be designed to detect external events and modifies itself during operation in response.

The company has seven salespeople in five locations. Funding comes from American Research & Development, Burr, Egan, Deleage; Fairfield Venture; General Electric; Narragansett; Weiss, Peck & Greer; and Ramallah (local).

Release 1.0  29 May 1986
SPECIFIC WISDOM: ARTIFICIAL EXPERIENCE

As computers become more useful in dealing with specific problems, they'll be sold directly to users/using departments, not to dp managers. Last week we attended the American Bankers Association National Operations & Automation Conference in New Orleans. We saw Syntellect's Infobot and InterVoice's RobotOperator, as well as Opex, a 20-year-old company whose sole product is automatic envelope openers. And we saw Judgment Exerciser.

Ask any bank manager what he'd most like to hire, and the answer would be "people with experience." Unfortunately, experience is time-consuming and expensive -- especially experience with mistakes, which is probably the single best way to learn. Computers can easily learn rules, while people generally learn best from experience: It helps to give the rules meaning and resonance.

Judgment Exerciser is simply a mostly-text PC-based simulation of 60 situations commonly encountered by bank tellers ($2495) and platform personnel ($2995). As they work their way through the simulations (which include numerous options and branches), they can learn quickly and costlessly from (simulated) mistakes. A few months ago we reviewed a product called Business Simulator rather savagely, complaining it lacked the flavor of real life (Release 1.0, 16 January 1986). Judgment Exerciser has all the flavor we could want...

Artificial tension

We tried the system out briefly at the show, and felt our blood pressure rising quickly. Before we had finished handling one customer's case, the irate man or the overdressed lady from the previous scenario came back, claiming we had miscounted the money or otherwise mishandled a transaction. And there wasn't in fact a clear path to follow. Did we need ID? Or did we need to check an account balance? Either would do; the experience was uncomfortably unstructured (like life?). Should you try to explain again why you can't cash a check dated 1972 even if the presenter was the bank president's cousin, or should you call the supervisor? What do you do if the guy waves hello to your superior before he asks you to cash an out-of-state check? What about the well-dressed woman who divides her above-limits deposit in two? Must you be polite to a slob who calls you sweetie, or the businessman who smirks, "I read about your losses in the Journal."

When we first heard of Wisdom Simulator Software (Cambridge, MA), we expected an on-line system that would give bank tellers advice. But in fact rules are simple enough...the issue is getting tellers to observe them, regardless of distractions. Long run, we see AI as the key to greater flexibility in bureaucracies: With a capacious expert system you could build in rules covering all sorts of rare eventualities. But in the short run there's a simple rule that handles any out-of-the-ordinary situation: Check with your supervisor.

Release 1.0

29 May 1986
Replacing trainers, not people

We were surprised to find that Wisdom Simulator seems to have little direct competition -- perhaps because computer-based training is typically a "structured learning experience" rather than Wisdom's simulated free-for-all. Computer types who develop training material tend to like order and structured experiences, we guess. But Wisdom certainly does encounter sales resistance. The resistance comes not from the dp department -- the trick is to bypass them entirely -- but from the training managers. Aside from threatening their role, Judgment Exerciser may strike them as insufficiently rigorous, and too arbitrary. Imagine a person being uncomfortable with the -- well, humanness -- of a computer. It's starting to happen...

Your rules, my rules

Founded in 1984 by former Kurzweil Computer development manager Marc Abrahams, Wisdom Simulator has just hired a heavy-duty marketing type in the person of Carol Brown, a former national account manager with Xerox. Wisdom's system is generic, but the company will customize it for volume customers -- both with a bank's own logo and with its own policies. The generic version, for example, says "a valid ID," while a custom version might specify "an Iowa state driver's license, or a valid credit card and a legitimate photo ID."

Abrahams has spent hours in banks watching tellers go about their jobs, and collecting horror stories from bankers. But the idea's potential doesn't stop with banks. "With banks you're losing money; with us, you're talking about saving lives," says a sheriff who's talking with Wisdom about a similar system for police applications (designer David Eppers is an avid mystery reader). We can see use for it in offices around the world. Think what it could do for the secretary's/AA's job (or for the respect accorded them if executives were forced to endure a session or two):

"Tell him I'm in a meeting. Please call Juan and Alice to see if they're free for dinner Tuesday night in Palo Alto. You can find the number in the subscriber files. If not, try Sunday morning. Fred who? ...wants what? Call him back to find out who he is and what he wants.

"Tell him I'm out to lunch. Confirm the noon meeting with Network Nodes tomorrow at the Branch Cafe. Call the travel agent and book me on the 6 pm flight from New Orleans to New York on Monday, and get me a reservation at the Hyatt Regency the night before.

"Tell him I'm out for the day. Did you get those letters typed yet? What about xeroxing the photos for the transcript? What, no 6 pm flight? Well, find out what else is nonstop. And call Art's secretary to find out his wife's name and plug it in this letter right here.

"Tell him I'm out of town this week. Can you find out how to get from the Branch Cafe to 1491 Canada Lane? And arrange for them to send the conference schedule to me at Rickeys by Federal Express, Saturday delivery.

"Tell him...tell him I've moved to 375 Park and you've lost my new number!"

Release 1.0 29 May 1986
IBM SHOES ITS AI CHILDREN

Conventional wisdom has it that the cobbler's children go shoeless, the newsdesk is the last to know when its own staff is laid off, and the best California wines are sold out-of-state. But in fact the best sellers of a technology are those who use it effectively themselves.

This is perhaps why IBM seems so reluctant yet to market its few AI products vigorously. IBM management clearly believes in the importance of this vaguely defined set of techniques and technologies; Dave Belotte, manager of knowledge-based systems marketing, calls it "potentially as strategic an industry-changer as dbms." The company has taken the unusual step of creating a project office, headed by group director Herbert Schorr, to coordinate internal schooling and applications development efforts, product development, and relations with third-party vendors in the field.

So far the company doesn't quite know what to do with AI. Now that the word is out to sell solutions, IBM is discovering (along with many other vendors) that AI is not a solution; it's a set of programming techniques. So, the company is making a point of using "AI" internally. At the moment, Schorr estimated at the recent Gartner Group AI conference, IBM has 70-odd AI applications for internal use in the works, but no one is really sure, and others in the company quote other numbers. (It goes to show just how grass-roots and decentralized this swell of interest is.) Of those, six or seven are actually in operation. One is a branch-manager system, which manages branch resources -- sales and support people, demo machines, travel budgets and the like. Another does hard-disk system testing and diagnosis at the company's San Jose production facilities. A third helps price bids by estimating costs for relocating customer facilities, and yet another helps IBMers follow proper procedures to move capital goods -- physically and by paperwork -- within the company. All these are implemented with IBM's own tools.

Preliminary products

Clearly, IBM is just beginning to swing into action. At the moment, the company sells its own expert system development and delivery systems, Expert Systems Development Environment and Expert Systems Consultation Environment, selling for $35,000 and $25,000 respectively on IBM mainframes (for either VM or MVS environments). It also offers LISP/VM and VM/Prolog.

In addition, IntelliCorp has announced KEE and Inference has announced ART to run on the RT PC, sometime later this year. Lucid's Common LISP will appear on the RT in due course. We also hear rumblings of closer (marketing) ties between IBM and certain AI tools vendors. Wisely, IBM does not see this "market" as an opportunity to launch the "AI" version of the PC. Instead, it views it as yet another opportunity to sell hardware -- physically and by paperwork -- within the company. All these are implemented with IBM's own tools.
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<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 8-11</td>
<td>World Computing Services Industry Congress - Toronto. Call Phyllis Cockerham at ADAPSO, (703) 522-5055.</td>
</tr>
<tr>
<td>June 10</td>
<td>EDventure Holdings Open House - New York City. To celebrate our move back to our old quarters at 375 Park Avenue, 25th floor, from 5 to 7 pm. If you're in the neighborhood (East Coast), please stop by. But do warn us you're coming! Call Laurin Henchey at (212) 758-3434. (Note our new number. For your records: ZIP is 10152.)</td>
</tr>
<tr>
<td>June 10</td>
<td>Computer Associates at the analysts' - New York City. Sponsored by NYSSA. Call Terry Earle, (212) 344-8450.</td>
</tr>
<tr>
<td>June 10-12</td>
<td>Nastec/Tarkenton seminars - New York City (Tuesday), Hartford, CT (Wednesday), Boston (Thursday). If our coverage of CASE caught your interest... Contact: Sharon Brown at Tarkenton Software, (800) 241-8015.</td>
</tr>
<tr>
<td>June 10-12</td>
<td>Comdex International - Nice, France. Contact: Pete Young at Interface Group, (800) 325-3330, or Charles Vervoord, Amsterdam, (31) 20-6219 41.</td>
</tr>
<tr>
<td>June 18</td>
<td>Artificial Intelligence in Financial &amp; Insurance Services - New York City. Sponsored by LISP machine vendor Symbolics. Contact: seminar coordinator at (215) 572-7555.</td>
</tr>
<tr>
<td>June 24-26</td>
<td>Westex-86 - Anaheim. The first IEEE WESTern EXPert systems conference, heavy on tutorials and light on sales pitches. Call Russell Bennett at (714) 768-3506.</td>
</tr>
<tr>
<td>June 25</td>
<td>Second AI Satellite Symposium - Your place. &quot;Knowledge-based systems...getting started.&quot; Sponsored by Texas Instruments. For details on locations or how to hook yourself up, contact: Bill Keever, (214) 997-3857.</td>
</tr>
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<td>Date</td>
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<tr>
<td>July 9-11</td>
<td>PC Expo - New York City. Contact: Steve Gross at PC Expo, (800) 922-0324 or (201) 569-8542.</td>
</tr>
<tr>
<td>July 21-25</td>
<td>European Conference on Artificial Intelligence '86 - Brighton, UK. Contact: Luc Steels, Vrije Universiteit Brussel, AI Lab, Pleinlaan 2, 1050 Brussels, Belgium; telephone: (011 320) 2-641 2971.</td>
</tr>
<tr>
<td>August 4-6</td>
<td>IIA Conference - Cambridge, MA. &quot;Beyond databases: Knowledge delivery systems.&quot; Call Linda Cunningham at the Information Industry Association, (202) 639-8260.</td>
</tr>
<tr>
<td>August 11-15</td>
<td>AAAI-86 - Philadelphia. Call Claudia Mazzetti, American Association for Artificial Intelligence, (415) 328-3123.</td>
</tr>
<tr>
<td>August 14-16</td>
<td>Macworld Expo - Boston. Call M. Hallal, Mitch Hall Assoc., (617) 329-7466.</td>
</tr>
<tr>
<td>August 18-22</td>
<td>SIGGRAPH '86 - Dallas. Contact Cindy Stark at Siggraph, (312) 644-6610.</td>
</tr>
<tr>
<td>September 2-5</td>
<td>Comdex/Australia - Sydney. Yet another Comdex. Call Linda Yogel at the Interface Group, (800) 325-3330.</td>
</tr>
<tr>
<td>September 7-10</td>
<td>ABCD Breakaway '86 - Lake Buena Vista (Orlando), FL. Third annual convention of the Association of Better Computer Dealers. Contact: Terri Rojas at (312) 693-ABCD.</td>
</tr>
<tr>
<td>September 8-10</td>
<td>NCC Telecommunications '86 - Philadelphia. Sponsored by AFIPS. Contact: (800) NCC-1986.</td>
</tr>
</tbody>
</table>

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September 18-21  SPA Annual Meeting - Alexandria, VA. Sponsored by the Software Publishers' Association, a worthwhile group. Contact: Ken Wasch at (202) 452-1600.

October 7-9   PC Expo - Chicago. Sponsored by PC Expo. Contact: Steve Gross at PC Expo, (800) 922-0324 or (201) 569-8542.

October 20-22  UNIX Expo - New York City. Contact: Don Brey or Bob Birkfield at National Exposition Co., (212) 391-9111.


November 2-5  ADAPSO Management Conference - Phoenix. 25th anniversary extravaganza. Call Phyllis Cockerham at ADAPSO, (703) 522-5055.


Please let us know of any other significant events we should include.

-- Laurin Henchey

PHONE NUMBERS

Richard Rabins, Alpha Software, (617) 229-2924, (800) 451-1018
Philippe Kahn, Borland International, (408) 438-8400
Lou Mazzucchelli, Cadre Technologies, (401) 351-5950
Jake Geller, Fox & Geller, (201) 794-8883
Dave Belotte, IBM, (914) 765-3126
Rich Carpenter, InTech, (617) 491-2100
Allen Fleener, InterVoice, (214) 669-3988
Terry McGowan, KnowledgeWare, (313) 971-5363
Janet Logan, Lotus, (617) 577-8500
Jim McGuire, Nastec, (313) 353-3300
Paul Weinberg, Network Innovations, (408) 257-6800
Rich Currier, Panoramic, (408) 973-9700
George Cole, Periphonics, (516) 467-0500 (for demo, Tom Emerson, Syntellect, (602) 264-5900
Carol Brown, Wisdom Simulator Software, (617) 491-4437

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