

Digital Consulting Inc.



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presents

Digital Consulting, Inc.

**SUNDAY
FEBRUARY 27, 1994**

Seminar Workbook



**digital
consulting
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presents

SOFTWARE WORLD USA Presenting...

**CASE WORLD, OBJEX &
APPLICATION DEVELOPMENT WORLD**

Sunday, February 27, 1994

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Section B

9:00 am - 12:00 Noon

DIGITAL CONSULTING, INC
Seminar Evaluation
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Name: _____

Instructor Carl Argila

Company: _____

City San Francisco

Date February 27, 1994

We are constantly striving to improve our course content and presentation. Please help us by completing the following questionnaire.

Please give us your overall evaluation of the various seminar elements by circling the appropriate point on the scale.

	EXCELLENT			GOOD			FAIR			POOR		
Instructor	10	9	8	7	6	5	4	3	2	1	0	
Presentation materials (slides, workbook)	10	9	8	7	6	5	4	3	2	1	0	
Seminar Facility	10	9	8	7	6	5	4	3	2	1	0	
DCI On-site Staff	10	9	8	7	6	5	4	3	2	1	0	

COMMENTS: _____

Which publications do you receive? Read regularly? List all that apply.

<u>Publication</u>	<u>Rec'd</u>	<u>Read Req.</u>	<u>User Groups you belong to:</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

To better service our customers, DCI maintains a Customer Advisory Board of attendees who speak with prospective registrants about class content. Participation involves about one phone call a month and provides Board Members with the chance to network with other MIS professionals. In addition, Board Members will receive quarterly marketing surveys about current and future trends in the software and data processing fields. If you would be willing to serve on the Customer Advisory Board for a period of two years please sign here:

Name: _____ Company: _____

Would you like more information about bringing this seminar to your site?

Yes ()

No ()

Please check here if you would allow us to quote you. _____

PLEASE TURN TO PAGE TWO

HB:SemEval.1

DIGITAL CONSULTING, INC
Seminar Evaluation
(Page 2)

Name: _____

Class Building Software Systems An Intro.
to CASE

Company: _____

City San Francisco

Date February, 27, 1994

1. Please list the 3 major needs that you came to this seminar to answer:

1. _____

2. _____

3. _____

Were they answered to your satisfaction? Y N

If you received other important benefits, please list them:

2. Does the title of this seminar accurately reflect the content? Y N

If not, what would you suggest? _____

3. As an MIS professional, what are your three most pressing problems right now?

a. _____

b. _____

c. _____

In which area would you attend a DCI seminar: a b c

4. In the area of Customer Service, are there any areas where we could improve?

5. If you have attended another seminar or conference within the last 6 months, please list:

Title or	Seminar
Topic: _____	Vendor: _____

Digital Consulting, Inc. offers a broad line of events designed to solve the problems of MIS professionals. We would be glad to send information about the programs to any colleagues you feel may benefit:

Colleague's Name: _____ Colleague's Name: _____

Title: _____ Title: _____

Company: _____ Company: _____

Address: _____ Address: _____

Phone: _____ Phone: _____

Building Software Systems
An Introduction to CASE
(Tutorial)

SOFTWARE WORLD / USA

27 February 1994

Carl A. Argila, Ph.D., Inc.
SOFTWARE ENGINEERING CONSULTANT
P. O. Box 1219-B
Pico Rivera, CA 90660-1219
310-699-3196
carl@acm.org

Building Software Systems with CASE

This demonstration course presents the fundamentals of Computer Aided Software Engineering (CASE). Students learn how this technology will help them build large, complex software systems, on budget, on schedule which meet user requirements and expectations. Topics include: *The Repository, CASE Facilities, Supporting ReUse, Supporting Project Management, Using CASE to Improve Software Quality, Automating Methodology and Process, Automating Documentation, Automating Code Generation, Evaluation and Selection of CASE Products*, and more. This course is intended for software managers, analysts, designers and implementors who are currently using CASE or who are considering the purchase of CASE products.

Acknowledgements

Thanks to innumerable great students who have reviewed, critiqued, criticized, enhanced, and in some cases slept through this material! Thanks also to Meilir Page-Jones (Wayland Systems, Inc.) for providing some excellent background material. Finally, thanks to Ed Yourdon whose comments, observations and insight I have unashamedly borrowed.

Course Themes

- ▼ WHAT is CASE? What's it good for? What does it do? What's good CASE? What's bad CASE? What will CASE do for me???
- ▼ HOW can CASE be applied most effectively within my organization? How will I know if it's any good?

Course Benefits

- ▼ Understand what CASE is -- and is not
- ▼ Learn how CASE technology can benefit your organization
- ▼ Receive advice about successful CASE implementation
- ▼ Learn how to evaluate CASE products
- ▼ Become familiar with some commercially available CASE products

SCHEDULE

- ▶ Session 1 -- Introduction and Fundamentals
- ▶ Session 2 -- The Repository
- ▶ Session 3 -- Exploring Facilities
- ▶ Session 4 -- CASE Issues
- ▶ Session 5 -- Products Overview

SESSION 1

Introduction & Fundamentals

Introduction & Fundamentals

- ▼ Introduction
- ▼ The Motivation for CASE
- ▼ Software Engineering Process and Method
- ▼ The Four Generations of CASE Technology
- ▼ The Repository
- ▼ CASE Facilities

The Motivation for CASE

- ▼ There is a "Software Crisis"
- ▼ Both "outsourcing" and the availability of off-shore services represent considerable challenges to how we build large, complex software systems.
- ▼ The \$1,000,000,000 I.T. Market (Growing to \$10,000,000,000,000!)
- ▼ Our Prime Objective

THE "SOFTWARE CRISIS"

- the crash...
- Pilot training to...
- Instrument which has been...
- Design of instrument panels, and...
- The factors in the design of the cabin which meant...

Throttle Hitch Hits 747-400 (From Robert Dorsett)
From FLIGHT INTERNATIONAL, 11 April 1990:
"British Airways (BA) Boeing 747-400's have experienced unco on six separate flights between 6 October, 1989, and 10 February according to formal reports. Several other airlines have also first. Boeing believes that its bested property by the 'c' suffe were made available. It is certainly very different from, and at airplane, and the secondary effects (such as selecting a target altitude leading to the initial mo itie, and needing several seconds to develop full power again) need to be well under' lation wi ity, assoc

A320 crashes show similarities (From Martyn Thomas)
"Cockpit voice recorder (CVR) and digital flight data recorder (DFDR) info accident made available to A320 operators indicates that the cause was rema Investigation Commission found for the A320 accident at Habsheim, France, clear that the right-hand-seat pilot intentionally selected 'idle' on the air through 500ft (150m) on Bangalore final approach. This increased the but reapplication of power came too late to arrest the vertical speed short of the runway. According to the DFDR, full power was made as the aircraft passed 135 ft. This inni... needed, but at low in...

Roller Coaster Accident Blamed on Computer (From G...)
ACE News is the official newsletter of The American Co...
The 1990 season began auspiciously co...
The 1990 season began auspiciously co...
The 1990 season began auspiciously co...

London Underground wrong-way train in rush-hour (From Brian Randall)
An empty London underground train was driven along a tunnel in the wrong dir...
passengers during last Monday evening's rush-hour at 6pm in an incident...
giving the priority of a major disaster. The driver of the empty train became disa...
the train to a cross-over point. The signalling system was unable to cope...
of south on the Piccadilly Line from Kings Cross.

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of south on the Piccadilly Line from Kings Cross.

"London tube train leaves... without its driver" (From Stephen Page)

The Ramesay train went down the track -- leaving an embarrassed Victoria Line Tube driver standing behind on the platform. He had broken a golden rule and left the cab of his fully-automated train to check a door which had failed to close properly. When the door did shut an electrical circuit was completed... with 20 passengers on board, moved off before the driver had time to react. A... ground spokesman, stressing that there was i... automatic-mode switch before leav... standard, 12 April 1990. Reader... was so astonished to b...

Stanford CT 18-hour telephone switch outage affects 27,000 phone customers

At 2:42pm on Thursday, 17 May 90, a Number 1A ESS switch (Vintage 1973) in Stamford, Conn... down and for 18 hours blocked all residential and most business local calls (affecting 27,000... exchanges 324, 326, 348, 351, 356, 358, 896, 964, 965, 969, 971, 979). (The same switch had br... 19-20 December 1985 for five hours, affecting 34,000 subscribers. Two such outages on the... very rare occurrence indeed.)

The outage occurred while technicians were doing routine maintenance to

served by that switch (12 of Stamford's 17 exchanges). The switch comp... itself down. The backup system also failed. The eventual return to up... unknown as from the AT&T Technology Center in Indian Hill, Ill... 18 and 19 May 1990, plus phone conversations.] (Source: three articles... AT&T announced on 25 May 1990 that they had manually reset the lights at the site. Apparently 10,000 subscribers were being man... there is apparently a brief atomic-action in... lost altogether. Processor problems... incorrectly connected last sum... well, diagnostics could n... conversation with Se...

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Traffic light outages in Austin (From King Ables)

Rick Neider (SEN 15 2) wrote about Lakewood, Colorado, where the computer controlling the town's light system lost a disk and all the traffic lights in town went to blink. I said then I couldn't believe only did they not have a duplicate machine they could quickly pull in for use, but that when the tr got confused, they di... to some "sane" cycle of green-yellow-red even if it wasn't tim should be for variou

I spoke too soon. The same thing he without the pro information to here gets confi depending on okay. But w traffic groun they were st

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not seem to have thought before of disaster was avoided is also of mind. Brian Ran...

Kiss U.S. coders good-bye

Foreign competition will put American programmers out of work unless our development quality and productivity go up and costs come down

BY EDWARD YOURDON

The American programmer is about to share the fate of the dodo bird. By the end of this decade, I foresee massive unemployment among the ranks of American programmers, systems analysts and software engineers. Not because fifth-generation computers will eliminate the need for programming or because users will begin writing their own programs. No, the reason will be far simpler: Low-cost, highly productive, quality international competition will put American programmers out of work.

From my visits to data processing organizations in the U.S. and around the world, I am firmly convinced that most American programmers (and their managers) do not yet fully understand, deep in their psyches, that every product and every service provided by today's society depends on productive, high-quality information systems.

An increasing number of manufactured products contain one or more embedded computer systems — systems that are software-intensive and that have 100,000 or more lines of code.

So it's not just the EDSs, the Microsofts

Yourdon is an independent management consultant, author and developer of the Yourdon method of structured systems analysis and design. This is an excerpt from his book *Decline and Fall of the American Programmer*. Copyright 1992 by Prentice Hall. Reprinted by permission of Prentice Hall.

OPINION POLL

Irv Wendel, consultant, Oakland, Calif.:

Yourdon "blames U.S. programmers for rotten systems, crap code and not having a decent data processing education. Bull. Blame the people who control the situation: management. Management sets the tone and determines strategic goals.

"Management is responsible for a company's (or division's or project's) success or failure. Management sets deadlines, dress codes, corporate educational policies and even determines if incompetents stay in the company."



Freel Linea

and the IBMs that are at risk; all the Blatzco Widget companies with embedded computers in their widget products are at risk, too. The companies that face up to this risk will be the ones with world-class software.

More critical than not

The average company spends a minuscule 1% to 3% of its revenue on data processing. But this paltry figure fails to emphasize the point that a firm's information technology is its Achilles' heel. As a project manager at the Jet Propulsion Laboratories remarked to me a few years ago, "Software represents only 10% to 15% of the money we spend around here, but it's 'in series' with 90% of what we do. If the software fails, the mission fails."

Thus, the people who build information systems — the programmers, systems analysts, database designers, telecommunications specialists and others — play an increasingly crucial role in the fiscal health, the very survival, of their employers.

The key comparisons between the world-class software organization and the run-of-the-mill software organization will be these:

- Cost of the staff: salaries and benefits.
- Staff productivity.

► Quality of the systems developed.

American software engineers are blissfully unaware that their foreign counterparts in Manila, Singapore, India, Brazil and other parts of the world typically earn five to six times less than they do. For an even more dramatic comparison, consider the People's Republic of China: As of June 1990, Hong Kong newspapers reported job openings for a programmer at a salary of \$180 per month — and this is for a programmer with a college engineering degree and two years' experience in Unix and C!

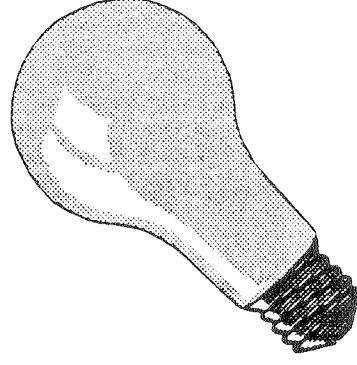
If you ask the data processing manager in a typical company in middle America whether he is doing anything about the situation, you're likely to get a blank look or a loud guffaw. "Why should I care if there are programmers in Bangladesh who make \$1 a day?" he'll ask. "They're not here, and *here* is where I need my programs written. Besides, they don't speak English, and they're probably illiterate. They don't understand the business issues that concern my users."

Unfortunately, the fact that programmers are "there" rather than "here" is increasingly irrelevant. Today, there is no

Continued on page 112

There is Some Light at the End of the Tunnel!

- ▶ Some credible data are emerging (see, for example Miyoshi's study)
- ▶ Full I-CASE offers one of the highest returns on investment of any software technology (per Capers Jones study)
- ▶ Re-use and object technology are other components of the solution



Application Development

QUICK CODE GENERATION, 90
SOFTWARE ENGINEERING
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Portable code develops

Liant tool enables crossover among PC, Mac, other systems

By Melinda-Carol Ballou

Liant Software Corp. recently announced C++/Views 3.0, a tool that will allow users to develop code that is portable across various environments.

The environments include Windows, the Macintosh, IBM's Presentation Manager and the Open Software Foundation's Motif, company officials said.

New with this version is C++/Views Constructor, a visual development tool that generates portable resources such as dialog boxes.

No code rewriting

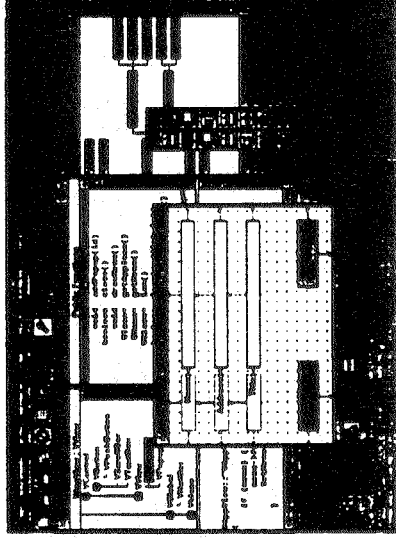
The resources are called from an application at runtime. The same resource file can then be called from a Windows, Motif, Presentation Manager, Macintosh or DOS application and can offer a look-and-feel that is consistent with the targeted host environment, officials said. This makes it easier for developers to create applications for multiple graphical user interface (GUI) platforms without rewriting code.

"We take the Windows bitmap format and write code for the other systems that will read that [information] into your program and do the porting for you," said Joe DeSantis, vice president of research and development at Liant.

C++/Views Constructor lets developers

work visually with the Views class library to create the applications. Users can cut and paste across multiple C++ applications using the tool. An enhanced Browser lets users draw and archive their resources and edit code that calls those resources.

C++/Views offers a class library that is similar to but extends Microsoft Corp.'s Microsoft Foundation Classes and Borland International, Inc.'s Object Windows Library (OWL). While the



Liant's C++/Views Constructor lets developers work visually with the Views class library to create the applications

Microsoft and Borland class libraries primarily target Windows development and presuppose a thorough knowledge of Windows, Liant provides the cross-platform flexibility required by most corporate users.

"Even though Windows may be their most important platform, it's a No. 1 concern not to be locked in," DeSantis said.

Tim Albright, a senior consultant at Ameri-

Portable, page 90

When smaller really is better

Using CASE instead of Cobol brings savings

By Thomas Hoffman

The cost savings and productivity gains many user companies experience when downsizing from centralized information systems to distributed architectures are well-documented. But many of these shops do not realize some of the biggest downsizing benefits until they transform their application development approaches.

One vendor that has carved a niche for itself in this market is FourGen Software, Inc., a 10-year-old Seattle-based developer.

FourGen has developed "main-frame-replacement" financial and distributed applications with Unix, fourth-generation language (4GL), SQL, and computer-aided software engineering (CASE) software.

Savings over Cobol

Several FourGen users have made substantial time and development cost savings by developing applications using FourGen's CASE tool sets instead of Cobol.

Take, for example, Paging Network, Inc. or PageNet. The \$221 million Plano, Texas-based paging services provider has grown at an impressive 35% to 50% clip in each

of the past 10 years. But the company's centralized information systems operations and customized financial software applications have held the company back from further expansion.

PageNet, with 60 offices across the U.S., had until recently run its operations on a network of 11 Datapoint Corp. minicomputers that ran customized Cobol financial applications. When the company decided to replace the minis with a suite of 100 Motorola, Inc. reduced instruction set computing servers 18 months ago, a faster, more flexible development environment was required, according to Craig Franklin, PageNet's director of IS and planning.

90 days

PageNet decided on FourGen's Enterprise general ledger, accounts payable and CASE software products. The applications, which use Informix, Inc.'s Online relational database management engine and 4GL, were used to customize eight general ledger and 45 accounts payable applications within 90 days.

Franklin said PageNet paid approximately \$500,000 for the Four-

FourGen, page 86

An Empirical Study of Evaluating Software Development Environment Quality

Takeshige Miyoshi and Motoei Azuma, Member, IEEE

Abstract—Evaluating software development environments has become an important concern in recent years. We have performed a study that evaluates new-paradigm-oriented software development environments which have been developed in a five-year R&D project. (This project is the FASET (Formal Approach to Software Environment Technology) plan at JSD (Joint System Development Corporation), which was supported by MITI (the Ministry of International Trade and Industry) and IPA (Information-Technology Promotion Agency).) For this study, we have developed a software environment evaluation technology based on a software quality evaluation process model defined in ISO/IEC 9126 [1]. The evaluation technology has been applied to the R&D project at the middle and final phase of development. The evaluation results provide useful information to develop a widely acceptable evaluation technology, and to improve those new-paradigm-oriented software development environments which are based on various specification methods: the algebraic specification method, function-oriented specification method, declarative specification method, natural-language-oriented specification method, diagrammatic specification method, state-transition-oriented specification method, and model-based specification method.

Index Terms—Evaluation technology, formal specification method, quality characteristics, quality evaluation process, quality model, software development environment, software quality evaluation.

As software engineering tools are also a form of software, the technology for evaluating software should also be applicable to the evaluation of software tools or environments. Boehm [2] and MacCall *et al.* [3] proposed quality models. Murine [4] developed software quality metrics based on the MacCall model. Azuma *et al.* [5], [6] developed SQMAT (software quality measurement and assurance technology) as a quantitative software quality assessment technology. In the field of software development technology evaluation, Peters [7] tried to evaluate and compare software design methodologies, and Basili [8], [9] evaluated software engineering methodology. Moreover, international workshops focused on software quality [10]–[12] have been held in recent years.

The software development environment evaluation described in this paper took place as part of a five-year software environment project carried out at JSD between 1985 and 1990. The primary objective of this project was to improve productivity and reliability by establishing basic technologies for new-paradigm-oriented software development environments based on formal specification techniques. According to this objective, seven software development environments have been developed by independent teams. They are the algebraic

"Model-based specification tool -- This tool supports the specification method based on data and control flow using the knowledge base. A user describes a specification by using the event image model, process model, and data model. These specification languages can be mastered and memorized very easily. The tool's concept and operation can also be understood very easily. Almost all of the characteristics are highly achieved by this environment."

Our Prime Objective:

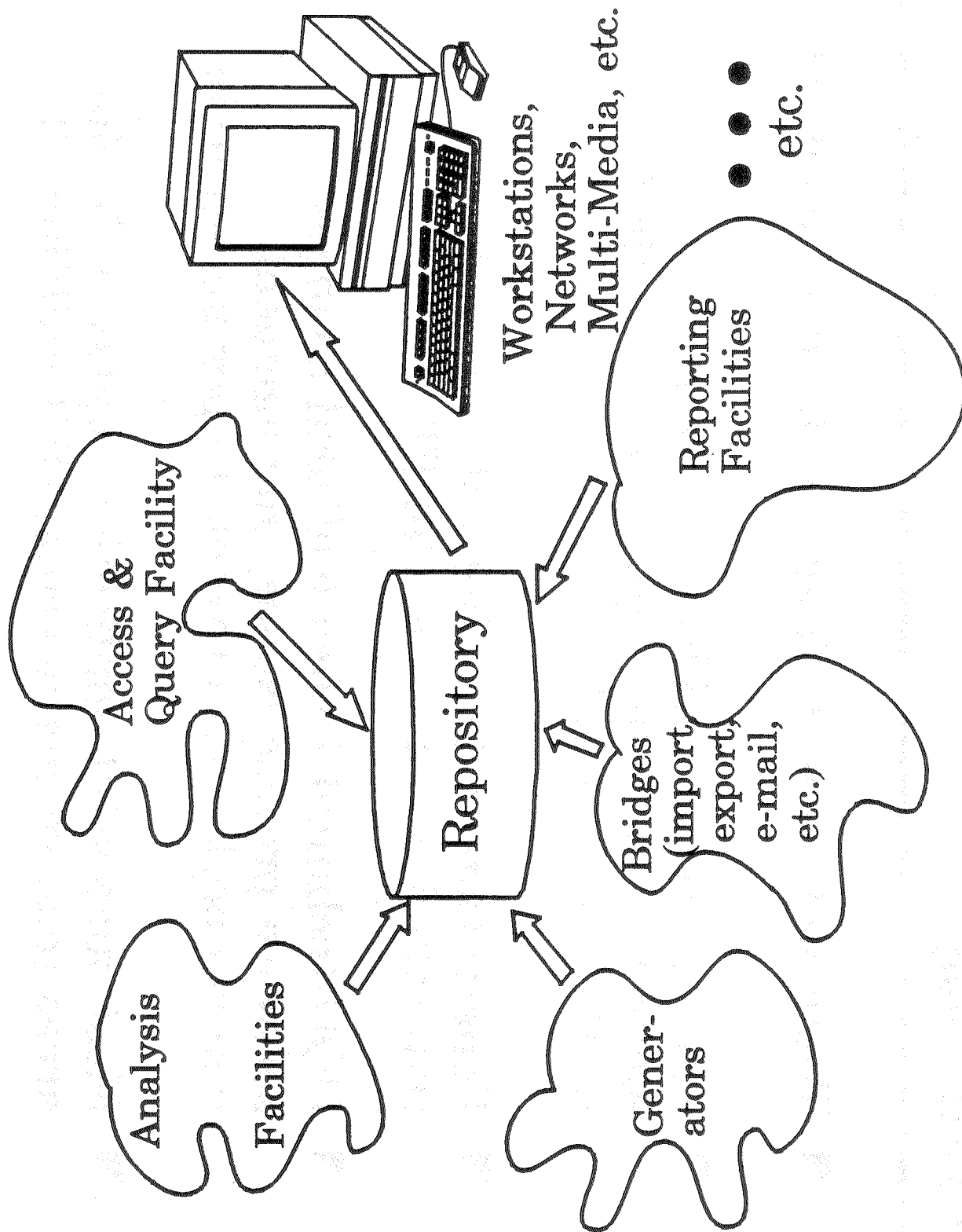
We Introduce CASE Technology so that...

WE CAN BUILD LARGE,
COMPLEX SOFTWARE SYSTEMS,
WITHIN BUDGET AND ON
SCHEDULE WHICH MEET, OR
EXCEED, USER REQUIREMENTS
AND EXPECTATIONS.

What is CASE?

- ▶ Computer Aided Software Engineering (CASE) is an umbrella term for a collection of products which automate some phase of, or activity within, the software engineering process.
- ▶ *Upper CASE* tools automate requirements definition and analysis activities. Tools may automate or facilitate document production, requirements tracing, prototyping, project management, metrics gathering, etc.
- ▶ *Lower CASE* tools may automate or facilitate design, implementation, testing and/or integration activities. This includes automatic generation of some, most or all program code.
- ▶ CASE is automation of the software engineering process.
- ▶ CASE is to software engineering as compilers are to computer programming.

A Conceptual View of CASE



CASE Today

- ▶ Thousands of tools from hundreds of vendors!
- ▶ The market is divided by cultures, as well as along technical lines (languages, methods, platforms, and alliances).
- ▶ Penetration is deep, but not thorough.
(Everybody's got some CASE!)
- ▶ NON-technical issues (cultural changes, software process issues, management non-support, etc.) prevent deeper penetration.
- ▶ Most successful applications today in "niche" areas (e.g. re-engineering, GUI building, etc.)
- ▶ MUCH user disillusionment.

CASE Benefits

- ▼ Improved productivity due to numerous factors such as: automation of work product production, requiring a more disciplined software engineering process, ready availability of all work products, better project management, etc.
- ▼ Improved product quality due to numerous factors such as: establishing a more disciplined software engineering process, use of formal methods, support for formal testing, support for metrics gathering, better project management, etc.
- ▼ Better support for large group development.
- ▼ Better support for maintenance.

How Relevant is CASE to Systems Development???

Systems development critical issues for 1992

Timely response to systems requests has always been a high priority; this year it's No. 1

Top 10 Issues - North America	1992	1991	1990
Rapidly responding to system requests	1	3	4
Increasing developer productivity	2	1	5
Identifying and developing strategic information systems	3	2	3
Developing an information architecture	4	4	1
Dealing with maintenance, systems obsolescence and migration to new systems	5	5	8
Demonstrating the value of development projects to senior executives	6	8	11
Instituting a formal total quality management program in systems development	7	7	NR
Achieving support for cross-functional systems	8	6	2
Developing and implementing metrics for systems development	9	13	17
Managing end-user systems development	10	10	19

Survey of 216 systems development executives

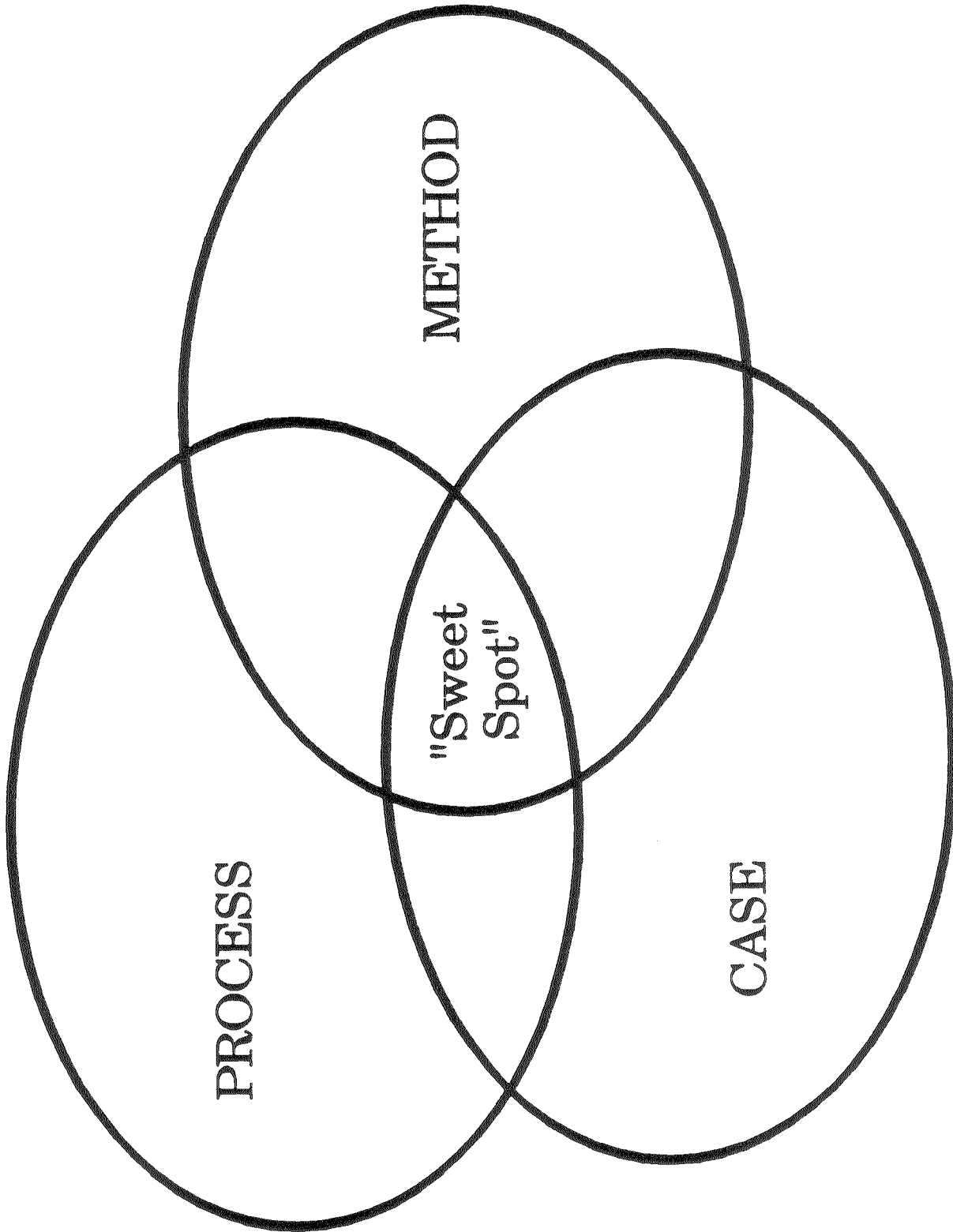
Source: C.A. Arella, Inc.

(From *Computerworld*, 9/17/92)

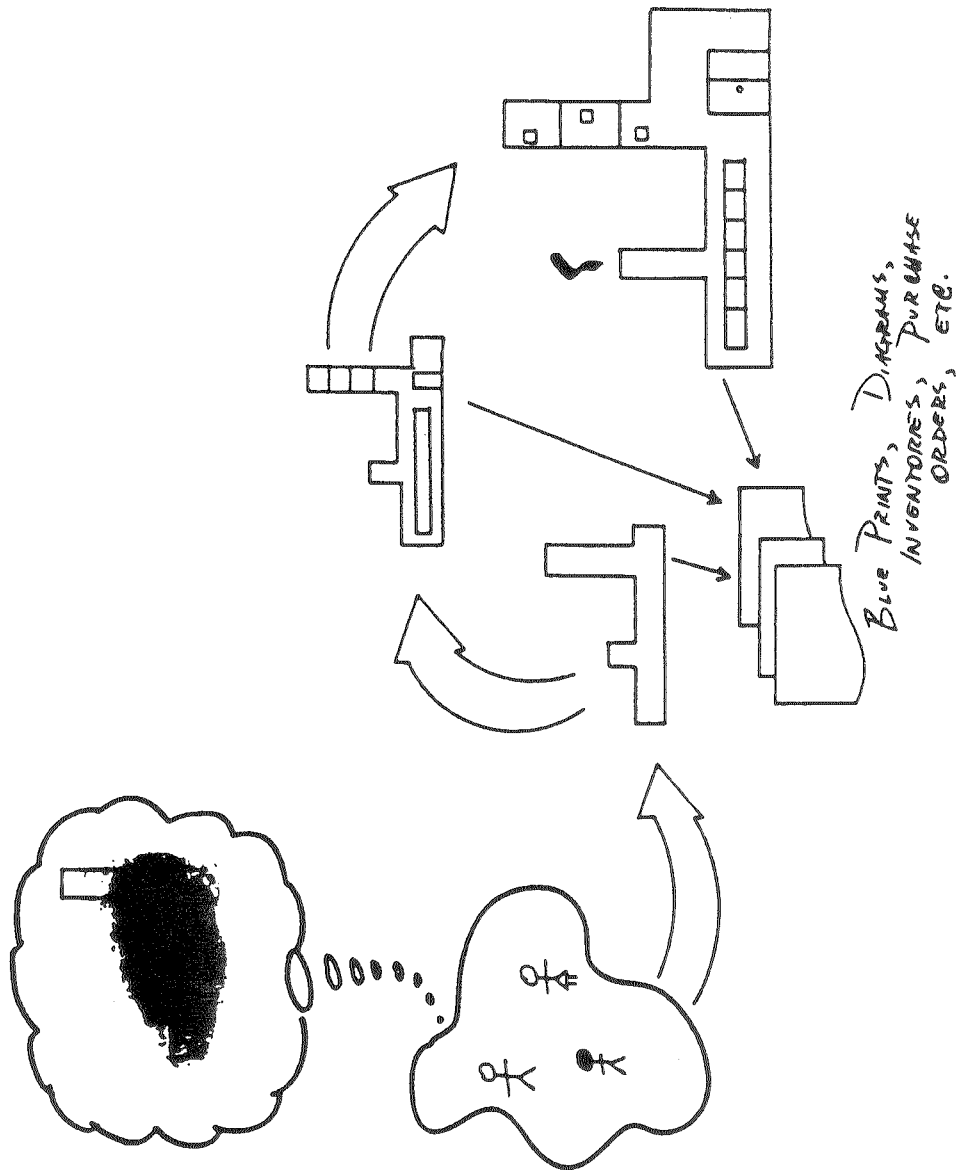
Software Engineering Process and Method

- ▶ Building Models of Software Systems
- ▶ Tools are not Everything
- ▶ An Overall Modeling Life-Cycle
- ▶ A clear understanding of **your** software engineering process and **your** software development method are essential for **your** effective utilization of CASE.
- ▶ Waterfall vs. Iterative
- ▶ Structured vs. Information Engineering vs. Object-Oriented vs. ????
- ▶ The DeMarco Methodology as an Example

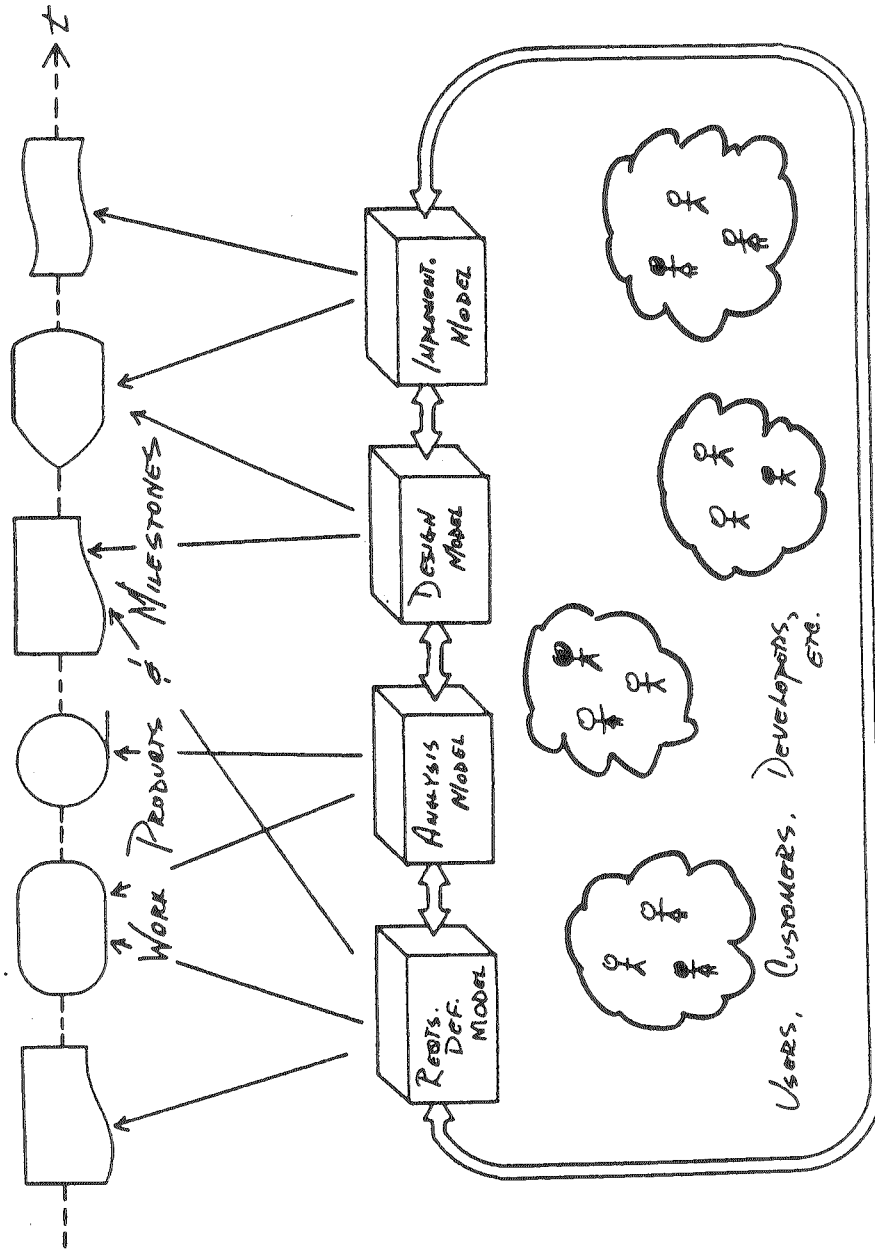
The "Sweet Spot"



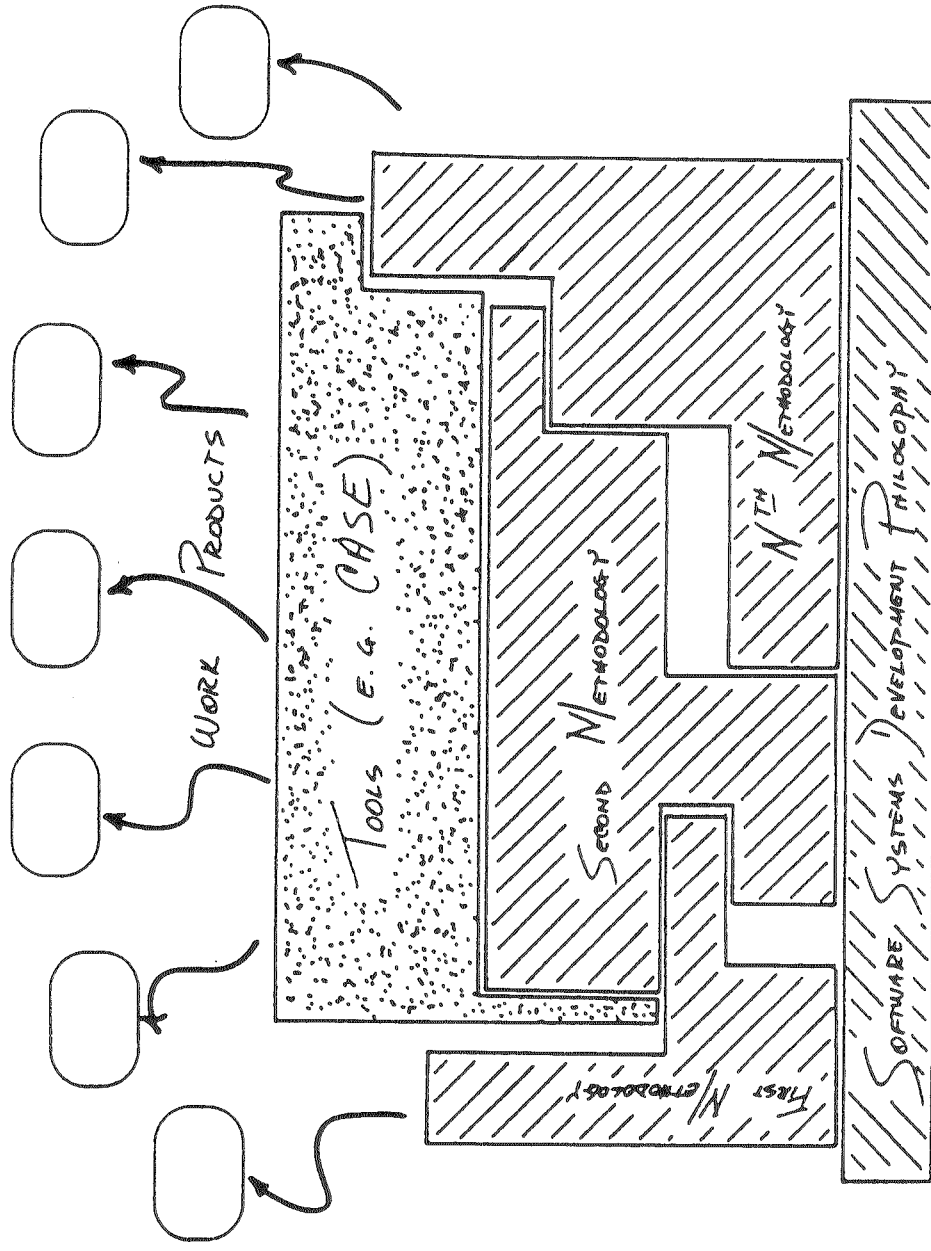
Building Models of Software Systems



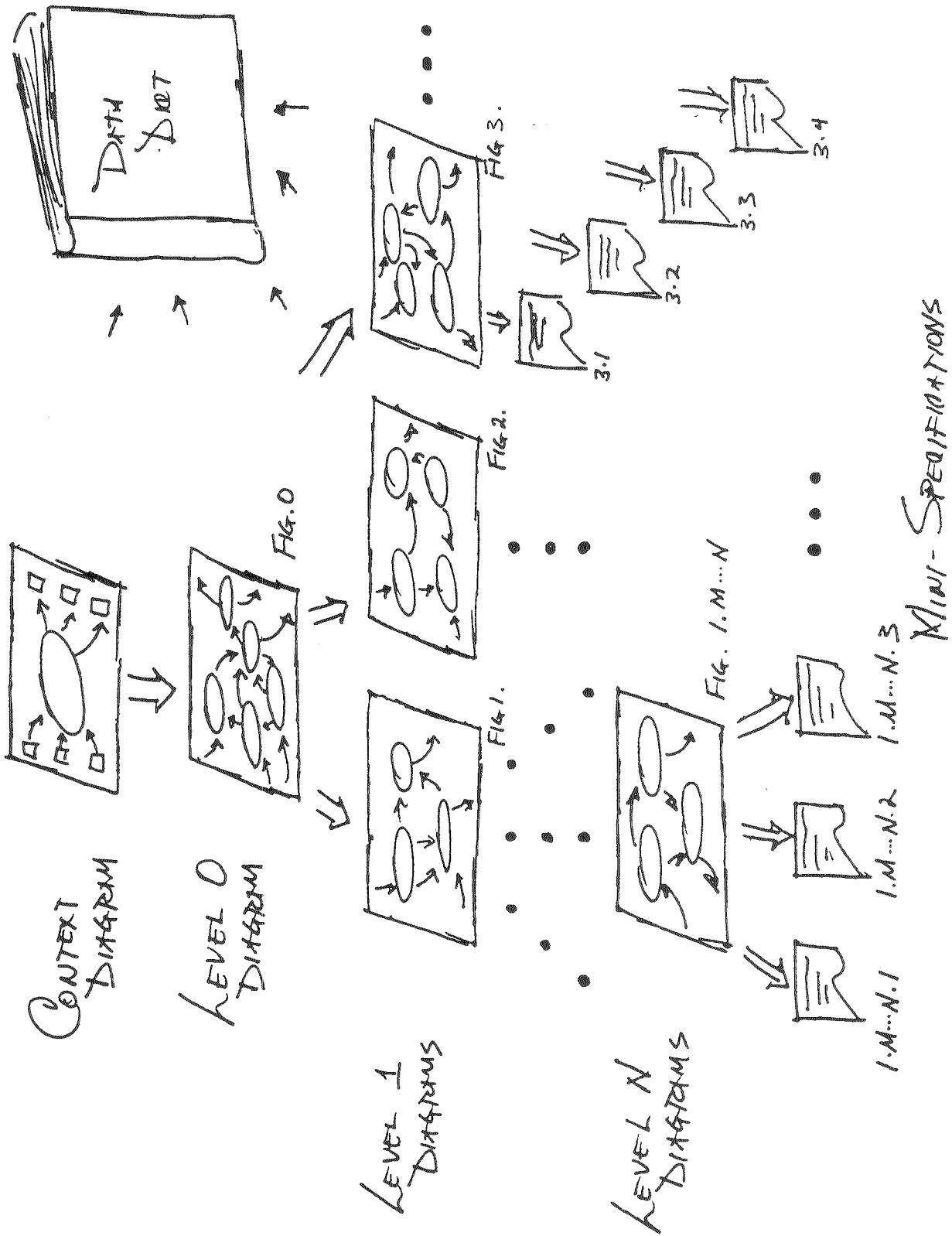
An Overall Modeling Life-Cycle



Tools are not Everything



Morphology of a DeMarco Model



The Four Generations of CASE Technology

- ▼ First: Text-based tools which perform a specific function (e.g. requirements tracers).
- ▼ Second: Graphic-based tools without an underlying repository, may or may not perform rule-based syntax checking.
- ▼ Third: Graphic-based tools with a well integrated repository. Incorporates rule-based syntax checking. May automatically generate various work products (e.g. documents and program code).
- ▼ Fourth: Allows for the execution of a system "model." Very significantly automates the production of work products (especially program code). May incorporate an artificially intelligent assistant or similar facility.

Excelerator/RTS

G GRAPHICS
X XLDICTIONARY
S SCREENS & REPORTS
D DOCUMENTATION
A ANALYSIS
I XLD INTERFACE
H HOUSEKEEPING
E EXIT

Project:RBS (WARD & MELLOR VERSION)
User:carl
Date:16-SEP-92
Free Disk Space: 3616768
C1.90

Carl A. Argila, Ph.D., Inc.
SOFTWARE ENGINEERING CONSULTANT

Radio Button System

The **Radio Button System (RBS)** is a component of a fully automated, digital automobile sound system. The RBS monitors a set of front-panel *Station Selection Buttons* and performs station selection functions.

When a station selection button is momentarily depressed, the RBS causes a new station to be selected. This selection is made on the basis of station setting information stored within the RBS.

The RBS can "memorize" new station selections in the following manner: When a given station selection button is depressed longer than "momentarily" (say, for more than two seconds), the currently selected station will be "memorized." Future momentary depressions of this button will result in this "memorized" station being selected.

The RBS also performs a muting function. While a station is being selected, the RBS will cause the *Audio System* to mute the audio output signal. The RBS will also cause the audio output signal to be muted until a new station selection has been memorized.

The RBS interfaces with the *Audio System* through a set of "relational selection buttons by" memory location. Each button has a unique memory location. The value of zero in the memory location indicates that the corresponding button has not been depressed. The value of one indicates that the button has been depressed. (For example, if the value of the button is 0000, the button has not been depressed; if the value is 0001, the button has been depressed.)

The RBS also interfaces with the *Audio System* through a set of "relational selection buttons by" memory location. Each button has a unique memory location. The value of zero in the memory location indicates that the corresponding button has not been depressed. The value of one indicates that the button has been depressed. (For example, if the value of the button is 0000, the button has not been depressed; if the value is 0001, the button has been depressed.)

SESSION 2

The Repository

The Repository

- ▼ Evaluating Repository Robustness
- ▼ Repository Access Models
- ▼ Repository Openness
- ▼ Repository Maintenance
- ▼ Repository Products

The Repository

- ▼ A CASE tool *repository* is a special purpose database which stores all (or most, or some) of the information associated with a software development project and/or software development models. In addition, a repository maintains information about the *relationships* between its stored entries.
- ▼ The repository is the "heart" of modern CASE tools.
- ▼ Repositories should be evaluated on the basis of their "robustness" and their support for the software engineering life-cycle being used.
- ▼ Repositories will differ depending upon methods supported and life-cycle phase supported.

Evaluating Repository Robustness

- ▼ A formal *information model* (or *data model*) defines the repository.
- ▼ The number of *entity types* which the repository maintains must be adequate to fully represent all of the software engineering process and software development model information.
- ▼ The number of *relationship types* which the repository maintains must be adequate to allow for analysis and queries to be performed.
- ▼ These should be the key criteria for selecting any CASE tool -- but you must know in advance what process you're automating!

Repository Entity and Relationship Types

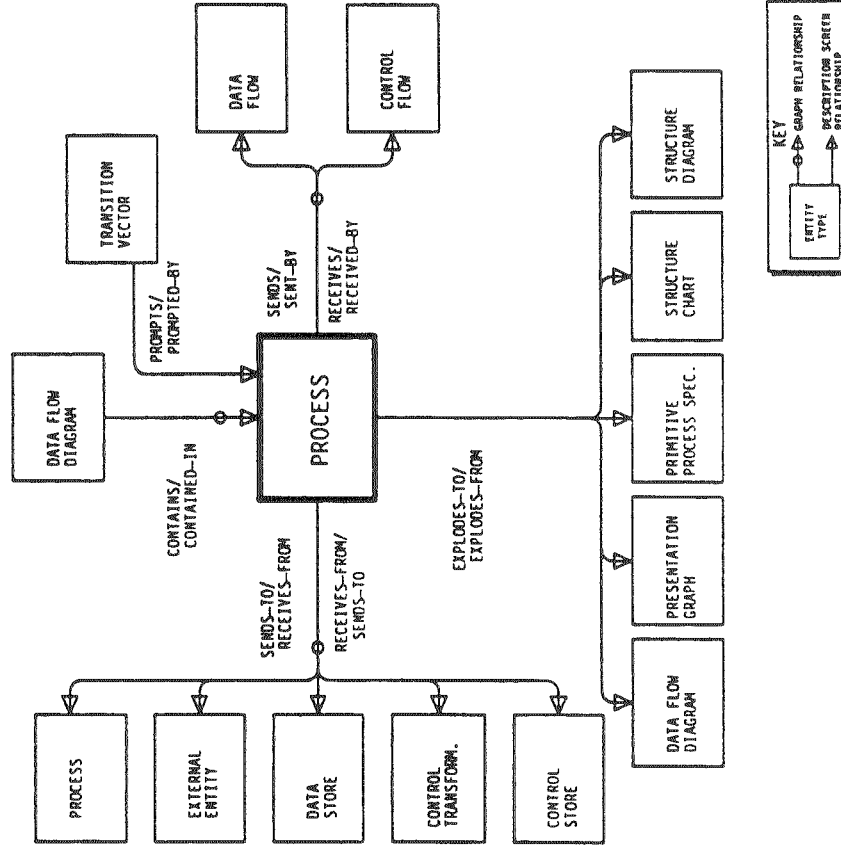
XLDictionary Entity Types

Entity Type	Type Code	XLDictionary Class
Category	CAT	MANAGE
Change Request	CHG	MANAGE
Control Flow	CTF	CONTROL
Control Store	CSA	CONTROL
Control Table	CTT	CONTROL
Control Transformation	CTA	CONTROL
Data Entry	DAE	DATA
Data Flow	DAF	DATA
Data Flow Diagram	DFD	GRAPHS
Data Model Diagram	DMD	GRAPHS
Data N-Ary Relationship	DNAR	DATA
Data Relationship	DAR	DATA
Data Store	DAS	DATA
Deliverable	DEL	MANAGE
Document Fragment	DOF	OTHER
Document Graph	DCG	GRAPHS
Document Group	DOC	OTHER
Element	ELE	RECYCLE
Engineering Requirement	ERQ	MANAGE
Entity List	ELS	OTHER
Entity-Relationship Diagram	ERA	GRAPHS
External Entity	EXT	PROCESS
Function	FUN	PROCESS
Issue	ISS	MANAGE
Module	MOD	PROCESS
Note	NTE	MANAGE
Presentation Graph	PRG	GRAPHS
Presentation Graph Connection	PGC	PROCESS
Presentation Graph Object	PGO	PROCESS
Primitive Process Specification	PPS	PROCESS

Entity Type	Type Code	XLDictionary Class
Process	PRC	PROCESS
Prompt	PRM	CONTROL
Record	REC	RECYCLE
Reference Document	REF	MANAGE
Report	REP	OTHER
Report Design	RED	SCVAREPS
Screen Data Entry	SDE	SCVAREPS
Screen Data Report	SDR	SCVAREPS
Screen Design	SCD	SCVAREPS
Signal	SIG	CONTROL
State	STA	CONTROL
State Transition Diagram	TRD	GRAPHS
Structure Chart	STC	GRAPHS
Structure Diagram	STD	GRAPHS
Structure Graph Connection	SGC	PROCESS
Structured Decision Table	SOT	CONTROL
System Device	SDV	PROCESS
Table of Codes	TAB	DATA
Test	TST	MANAGE
Transition Vector	TVA	CONTROL
User	USR	MANAGE
User Requirement	URQ	MANAGE
Work Breakdown Structure	WBS	GRAPHS

Note: For details on each Excelsior/IS entity type, see Data & Reports, Chapter 2.
Entity types: Key terms.

Repository Information Model



Navigating within the Repository

- ▶ Should be able to access and edit each entity type and traverse each relationship.
- ▶ Look for simple analyses and reporting facilities (e.g. "missing entities" analysis, "where used" reports, etc.)
- ▶ ...or more sophisticated capabilities.

Boot-Strapping the Repository



Repository Access Models

- ▼ "Stand-Alone"
- ▼ Main-Frame Based
- ▼ LAN Based
- ▼ Client-Server Based
- ▼ Object-Oriented

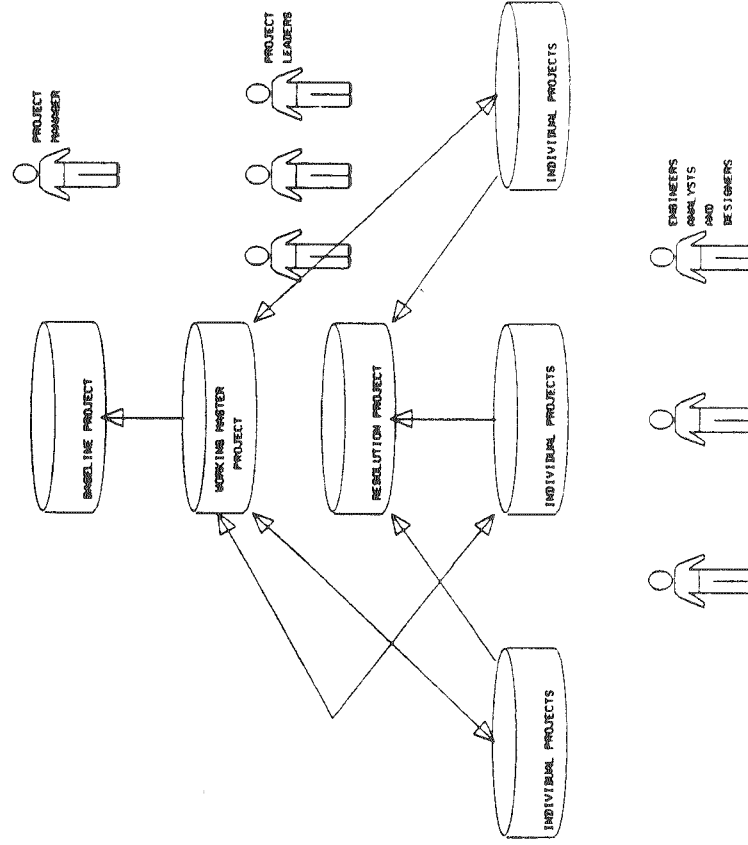
Repository Openness

- ▼ Open vs. Proprietary Repositories
- ▼ AD/Cycle
- ▼ CDIF
- ▼ PCTE
- ▼ IRDS
- ▼ ATIS

Repository Maintenance

- ▼ Managing a repository is tantamount to managing *change* within a software project. The same issues and techniques apply.
- ▼ The basic approach is "divide and conquer." Establish individual or small group sub-repositories, establish a procedure for consolidating these sub-repositories, ultimately at the "master project" level.
- ▼ Establish the concept of "ownership."
- ▼ Each *entity* within a repository must have a *version* associated with it. Work products can then be defined as a "stock list" of versions of entities.

Managing Repository Change



Evaluating Repository Products*

- ▶ Integration: with development tools (import/export vs. "live links"), semantic vs. syntactic integration (common information models vs. common data exchange formats).
- ▶ Platform(s)
- ▶ Access Models (client/server, distributed, etc.)
- ▶ Configuration Management, Version Control, etc.
- ▶ Information Model(s) Supported
- ▶ Support for Group Development
- ▶ Support of Standards
- ▶ Support for Secured Access
- ▶ Maintenance, Housekeeping and Administration Facilities
- ▶ Extensibility
- ▶ Vendor Related Issues (support, longevity, R&D, etc.)

*Based on ideas from Kay Paine's "Designing a Repository Solution for your Organization," *CASE Trends*, March 1993.

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Current Repository Products

REPOSITORY PRODUCTS SUMMARY

6 January 1994

The following is a list of advertised repository (and related) products available as of this date. Please contact the undersigned for additional information.

PRODUCT	VENDOR
ADMINS/V32 (V.5.0)	ADMINS, Inc.
Hindsight	Advanced Software Automation, Inc.
Reveng	Advanced Systems Technology Corp. (ASTEC)
Thesis	Affiliated Computer Services, Inc.
Object CM	Alsys, Inc.
Design/1	Andersen Consulting
Design/1 for Windows	Andersen Consulting
Foundation for Cooperative Processing (FCP) for Windows (V.2.0)	Andersen Consulting
Foundation for Cooperative Processing (FCP) (V.2.0)	Andersen Consulting
Traxis	Angeli Systems Corp.
ADS/MVS (Automatic Documentation System) (Rel.7.0)	A + Software, Inc.
Flow & SMS Migration Management Aid	A + Software, Inc.

Axiomatics, Inc.

Corp.

Extended

1994

SESSION 3

Exploring Facilities

Exploring Facilities

- ▼ Graphics
- ▼ Analysis & Report
- ▼ Automated Work Products Generation
- ▼ Support for Automated Testing
- ▼ Support for Re-Engineering and Legacy Systems
- ▼ Traceability Analysis
- ▼ Support for Metrics
- ▼ Support for Import/Export, e-Mail, etc.
- ▼ Prototyping and Model Execution
- ▼ Support for Project Management

CASE Facilities

- ▼ Tools tend to be either "broad" or "deep."
- ▼ Full "life-cycle" tools tend to be "broad."
- ▼ Tools which automate only one aspect of the software engineering process tend to be "deep."
- ▼ Facilities should be judged accordingly. Deep tools may be very methodology specific. Broad tools may not be sufficiently methodology specific!

Graphics Facility

- ▶ Graphics editor must support the notations and conventions used for the given methodology.
- ▶ "Filters" may be useful for showing various levels of detail (especially useful for some object-oriented methods)
- ▶ Graphics facility must be "tightly" integrated with the repository.
- ▶ An underlying *rule base* may be enforced or used only for syntax checking.
- ▶ But...the graphics facility should allow for the intelligent violation of the rules!

Analysis & Report Facility

- ▼ Analysis may be classified as "macro-analysis" and "micro-analysis."
- ▼ Macro-analyses assess an entire process or model. "Level balancing," for example, is performed on an entire structured analysis model.
- ▼ Micro-analyses assess individual aspects of a process or model. For example, dataflow digram syntax checks.
- ▼ Reports are repository queries. (Not to be confused with documentation produced as a work product.)

Automated Work Products Generation

- ▼ Documentation, especially voluminous standards (e.g. DoD-STD-2167A) can be automatically produced by many CASE tools. For many projects this may represent a very significant productivity improvement.
- ▼ Many CASE tools can produce some, most or all program code.

Support for Automated Testing

- ▼ The full specification of system requirements and capabilities (as part of a formal software development model) may facilitate automated testing.
- ▼ Automated testing is more a function of the methodology being used than the CASE tool utilized.

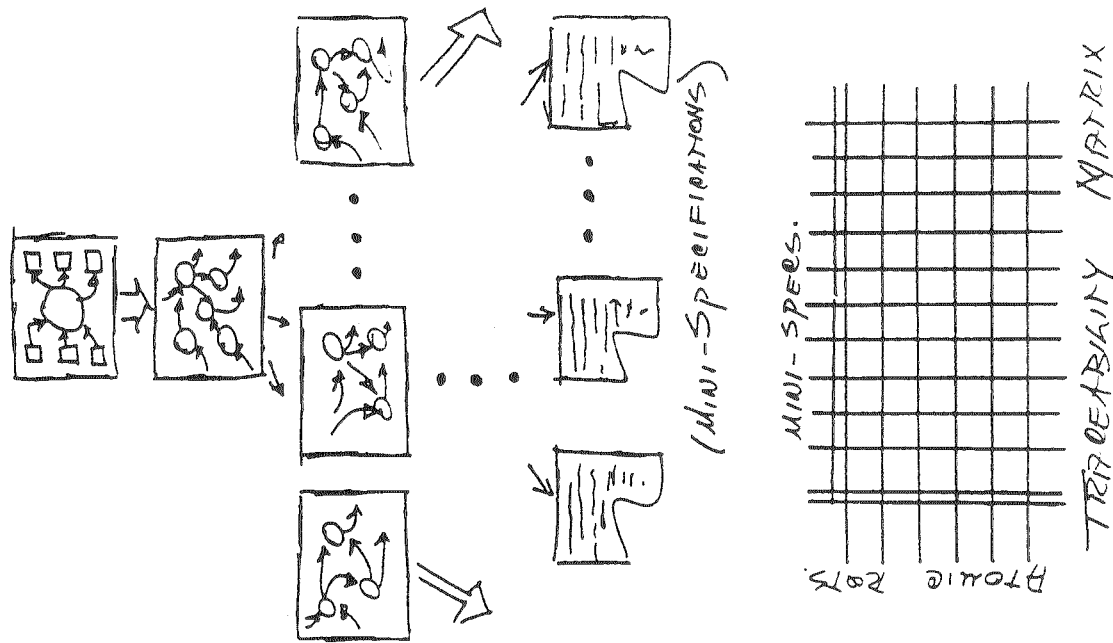
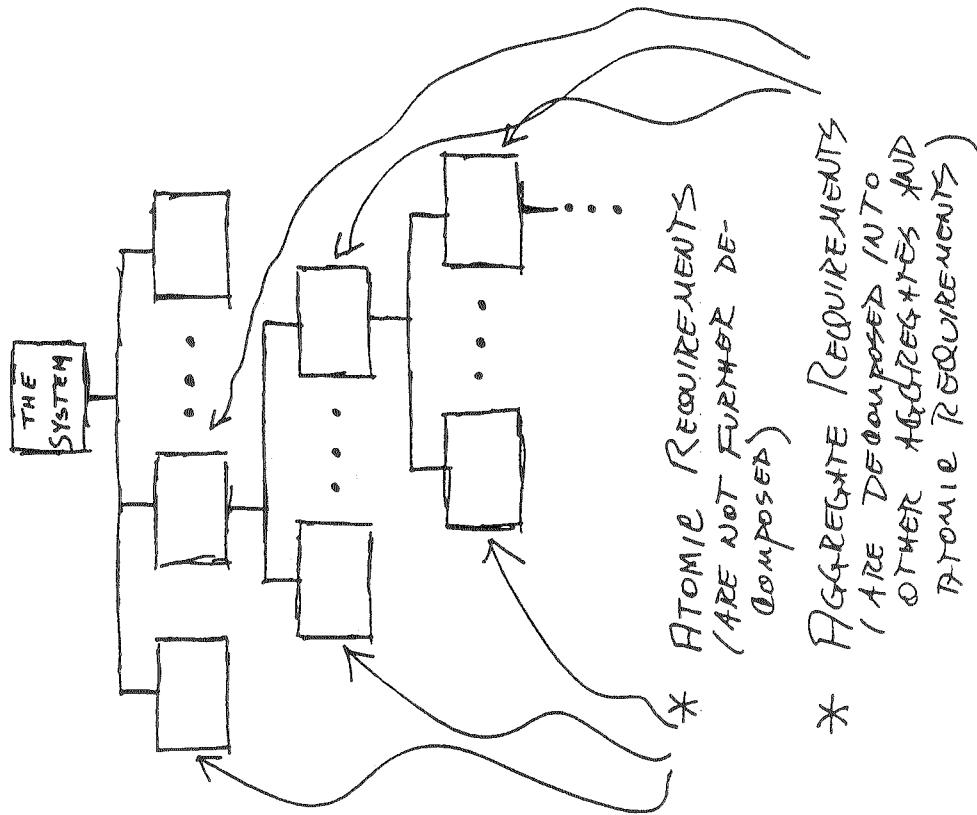
Support for Re-Engineering and Legacy Systems

- ▼ Initially an undocumented implementation must be "reverse engineered" into a form which can be maintained.
- ▼ We strive for "design level maintenance"
- ▼ The selected methodology must be capable of supporting design level maintenance.
- ▼ There must be a clear transformation from design to implementation (even if not automated).

Traceability Analysis

- ▶ Potentially, CASE technology makes it possible to establish full traceability from requirements to implementation and vice versa.
- ▶ One strategy is to establish a software development model as *the* statement of system requirements.
- ▶ Another strategy is to build a formal *requirements definition model*.

Requirements Traceability



Support for Metrics

- ▶ A sufficiently robust repository allows software metrics to be captured by means of macro-analysis.
- ▶ Function points ("bang") can be readily computed.
- ▶ Project management metrics can be captured -- provided project management standards are enforced!
- ▶ Configuration management reports should be drawn directly from the repository.

SESSION 4

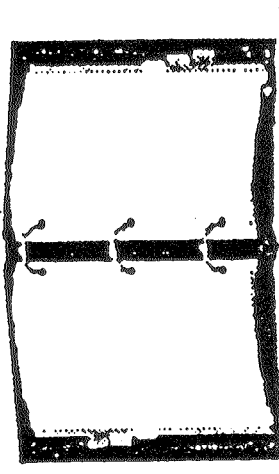
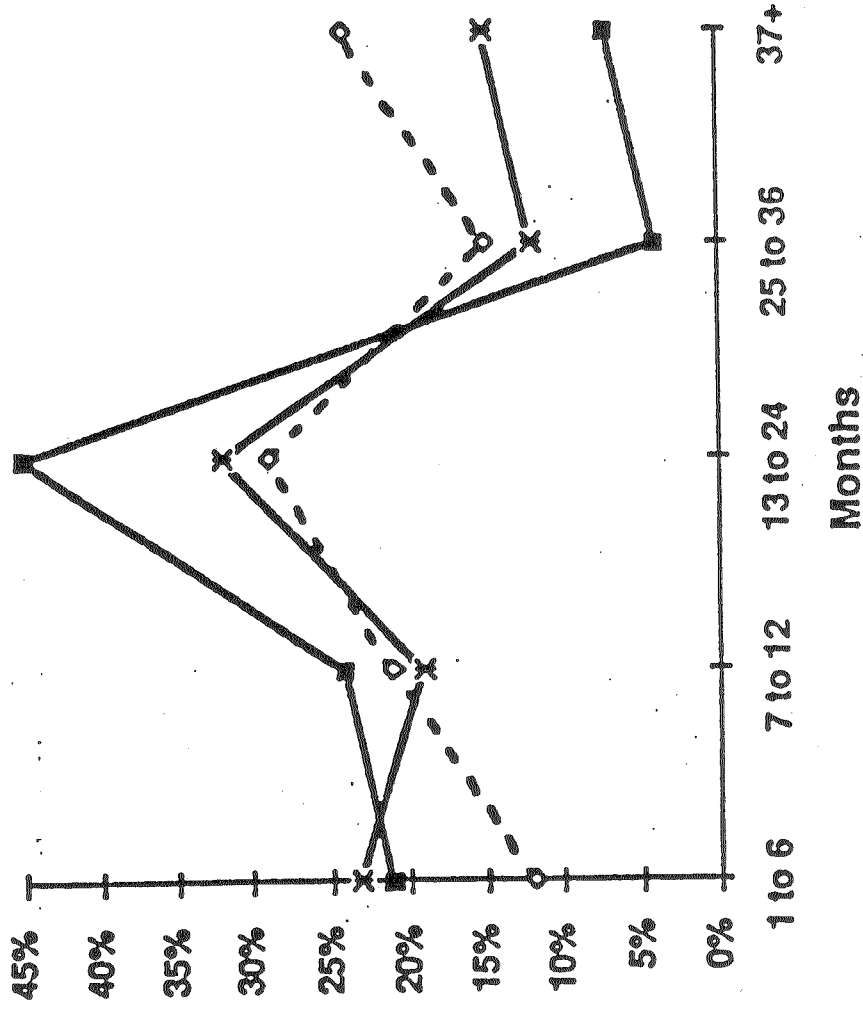
CASE Issues

CASE Issues

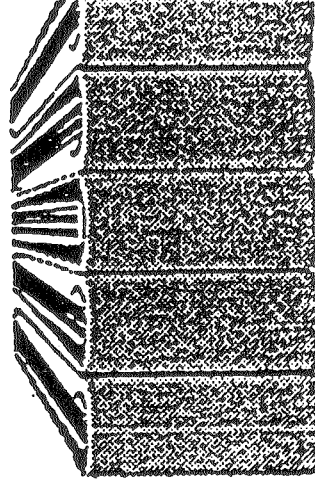
- ▼ Technology Transfer Strategies
- ▼ CASE Economics
- ▼ Quality and Productivity
- ▼ Supporting Re-use
- ▼ Supporting Project Management
- ▼ I-CASE
- ▼ Configuration Management
- ▼ Standards

METHODOLOGIES "LEARNING CURVE"

from a lecture by Ed Yourdon at
CASE WORLD, Chicago, 9-Oct-90

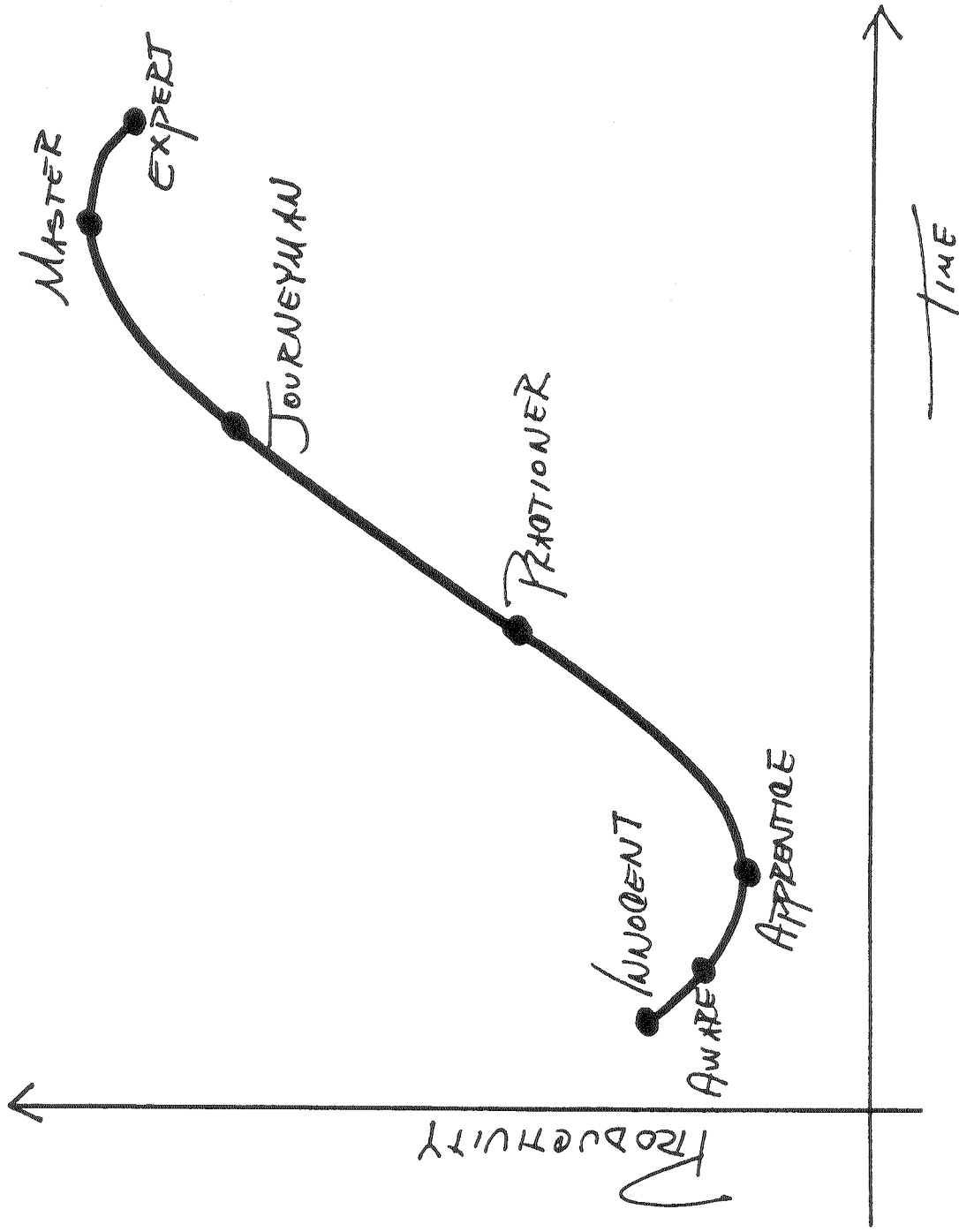


- Yourdon/DeMarco
- Gane/Sarson
- x- Inhouse



The Second Annual Report on CASE, 1990

THE PRODUCTIVITY "J" CURVE



From a lecture by Ed Yourdon at
CASE WORLD, Chicago, 11-Oct-90

Meilir's Ten Pit-Falls*

- ▶ Outdated management demands on first project.
- ▶ Unrealistic management expectations on first project.
- ▶ Technology trap.
- ▶ Giving CASE tools to Stage Threes (or less).
- ▶ Mousing around.
- ▶ Inadequate training.
- ▶ No-one to turn to when things get tough.
- ▶ Lack of management support and encouragement.
- ▶ Introducing CASE into an Age B (or earlier) shop.
- ▶ Unwillingness to change.

* Meilir Page-Jones, Wayland Systems, Inc., 1990.

CASE Economics

- ▼ Quantifying the benefits derived from the introduction of CASE technology is extraordinarily difficult.
- ▼ Management must assess the benefits of CASE not necessarily for the current project but for future projects (remember the "learning curves").
- ▼ And to make matters even more complicated, the derived benefits depend heavily on the "process maturity" of the organization adopting CASE.

Technology Transfer Strategies

- ▼ First: recognize the "learning curves" associated with the introduction of any new technology.
- ▼ Establish a technology transfer plan. "This is what we will be doing, this is how we will do it and these are the benefits which we expect to derive..."
- ▼ The introduction of new technology should be an "iterative" process -- initial focus should be on non-critical "pilot" projects but "mission critical" projects can and should be involved long before pilot projects are completed.
- ▼ Non-technical ("soft") factors are key for the successful introduction of new technology. Remember: "malicious compliance"!
- ▼ Outside support is essential!

Tactical vs. Strategic Change

- ▶ With *tactical* change the same processes are performed in an improved manner. (For example, automating document production.)
- ▶ With *strategic* change fundamental processes are altered or replaced. (For example, building models instead of doing documents.)
- ▶ Tactical changes are (relatively) easy to implement. People can see (and appreciate) the potential benefits, change can be measured and benefits quantified.
- ▶ Strategic change can be difficult and risky. Potential benefits may not be obvious or measureable. Managing strategic change is much more difficult than managing tactical change.

(based on ideas presented at CASE World,
Boston, 9/30/92 by Eric Aranow.)

Quality and Productivity

- ▼ CASE technology can significantly improve both quality and productivity but only to the extent that the underlying methods are supported.
- ▼ It is critically important that metrics be captured and maintained.
- ▼ Quality of the software development process may be significantly improved just because of good formal method is utilized (independent of CASE).

Supporting Re-Use

- ▼ Re-use is supported to the extent that the underlying process supports re-use. CASE will facilitate that process.
- ▼ Simply the availability of existing analysis and design products in an accessible repository facilitates re-use.
- ▼ Object-oriented methods place more emphasis on re-use.

Supporting Project Management

- ▶ Macro-analysis allows for extensive project management reporting.
- ▶ Once again, the ability of a CASE tool to support this capability will depend upon the robustness of the repository and how effectively project management "rules" are enforced.

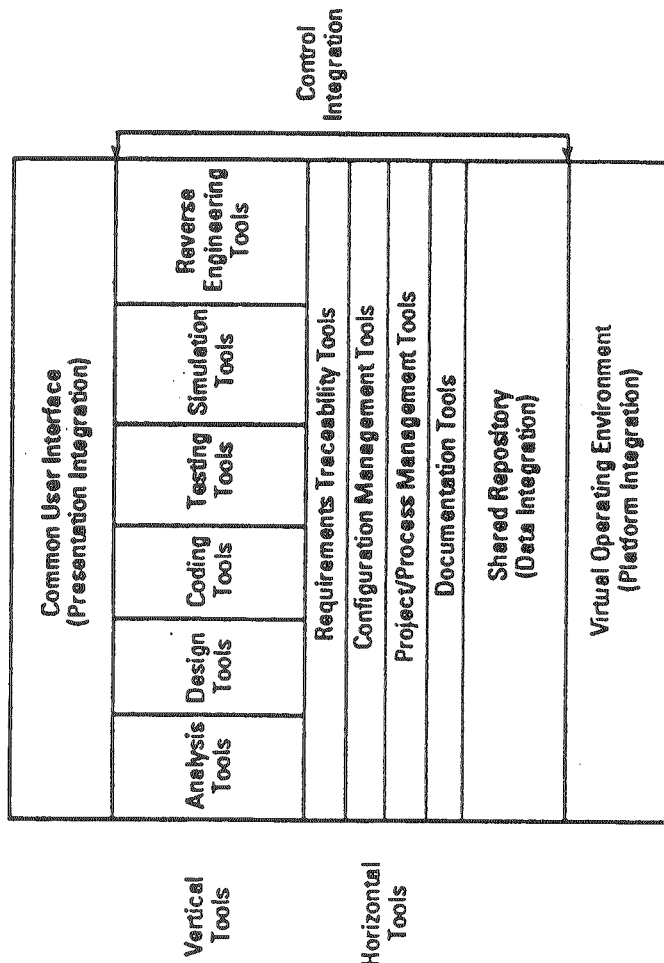
- ▼ *Integrated* CASE products may not be sufficiently mature for many project environments.
- ▼ The same effect may be accomplished by "bridging" several products together. This will depend upon how "open" is each product's repository.
- ▼ Integration may be at three levels:
 - Data Integration (shared repository)
 - Control Integration (point-to-point vs. broadcast)
 - Presentation Integration (user interface)

(continued)

Different Levels of Tool Integration

- ▼ Data Integration -- Tools share data in a common repository, with a common information model, common access methods, etc.
- ▼ Control Integration -- Tools share a common set of message interfaces. Tools send and receive control and coordination messages.
- ▼ Presentation Integration -- Tools share a common "front end" or share a common "look and feel."
- ▼ Format Integration -- A weaker form of data integration. Tools share a common exchange mechanism.
- ▼ Method Integration -- A weaker form of data integration. Tools support a common method syntax and semantics.

I-CASE (continued)



(From: Anthony Wasserman at CASE World,
Boston, 10/1/92)

Configuration Management

- ▼ CASE technology can greatly facilitate configuration management to the extent that an underlying configuration management system is in place and to the extent that the repository supports maintenance of the various work products.
- ▼ CASE tools may be *integrated* with existing configuration management systems by establishing traceability between repository entities and controlled entities (similar to requirements traceability).

CASE Standards

- ▶ CASE standards are still very immature.
- ▶ The principal emerging standard seems to be CDIF (CASE Data Interchange Format) being developed by the Electronic Industries Association (EIA). (202-457-4962)
- ▶ Some vendors are supporting CDIF -- but there are HOLES!
- ▶ Some ad hoc standards have evolved.

News Shorts

Gates offers NT direction

In addition to talking up Chicago at Comdex, Microsoft Corp. Chairman Bill Gates elaborated on a promised major update for Windows NT next year. The update will feature improved file server performance in a bid to match Novell, Inc.'s NetWare and a slightly smaller memory size requirement to give NT an edge over Unix in the technical workstation market. Gates also said Microsoft will modify the Windows interface on NT to match the new interface under development in Chicago (see story on cover 1).

Hacker breaks into Internet branch

A computer intruder last week breached security in the Bay Area Regional Research network (BARRnet), a major branch of the Internet in Northern California. The person was trying to steal passwords that would permit him to access other linked networks, according to BARRnet officials. BARRnet subscribers have been advised to change their passwords while the hunt for the hacker goes on.

IBM object standard gets support

IBM's Systems Object Model (SOM) and Distributed Systems Object Model (DSOM) got a significant boost last week when five suppliers of object-oriented tools said they have licensed and will integrate the technologies into a range of different products. The companies include MetaWare, Inc., which said it has already shipped to beta sites its High C/C++ compilers for IBM's AIX 6000 and OS/2 2.1 operating systems that include DirectToSOM support for IBM's SOM and workstation DSOM. The other four companies include ParcPlace Systems, Inc., Digital, Inc., Watcom International Corp. and Objective, Inc.

Met Life IS chief moves on

Bruce J. Goodman, formerly senior vice president of corporate information systems and chief information officer at Metropolitan Life Insurance Co. in New York, has joined The Prudential Insurance Co. of America in Newark, N.J., as president of its newly formed Prudential Business Systems Unit. In his new post, Goodman will be responsible for re-engineering the individual insurance units' core systems.

Phoenix will Plug-and-Play

Phoenix Technologies Ltd. has signed a deal to develop and license to Microsoft Corp. a key piece of technology that supports the Plug-and-Play BIOS in an operating system. Phoenix will develop the BIOS Enumerator, which provides access to system board devices during a configuration process.

DOD official hit with harassment suit

The U.S. Department of Defense asked its inspector general to probe allegations that Gary Denman, head of the Pentagon's Advanced Research Projects Agency, sought sexual favors from IBM representative Veronica Gunther. Gunther filed suit last week against IBM for allegedly forcing her to have sex with Denman in order to win business. Denman denied the allegations but recused himself from dealings with IBM.

SHORT TAKES IBM said its DB2 3.0 database system, which allows for some distribution of data, will be generally available Dec. 17. Microsoft Corp. has reported some problems in an unspecified number of its recently released Microsoft Office 4.0 suite. Some versions contain the lead name of the Microsoft product tester in the employee name information box in the Microsoft Office Manager shell. The company said the gaffe does not result in any technical problems but will replace any copies upon request.

DOD plots common IS scheme

By David Goodman

The U.S. Department of Defense's game plan for a standards-based architecture (SBA), released for public review this month, is one of the first fruits of the 4-year-old Corporate Information Management (CIM) initiative.

The SBA guide describes a new world of systems built on common building blocks that are supposed to reduce software development and maintenance costs. Key elements include reusable code, standard platforms and shared data repositories. Software accounts for more than half of the DOD's \$9.5 billion annual information systems budget, excluding classified systems.

The SBA — based on POSIX, Government Open Systems Interconnect Profile, TCP/IP and the International Standards Organization 9000, for example — promises a framework for remaking the DOD's IS infrastructure. "If the [SBA] concept is accepted within the [DOD] user community," said Bob Keller, a vice president at Input in Vienna, Va., "then someone will probably come in as a contractor and lay it all out."

The Defense Information Services Agency (DISA), provider of central IS services to DOD agencies and publisher of the SBA guide, is looking for user comment. "We want feedback," said John J. Keane Jr., a senior DISA planner. "Within two years," he said, "instead of seeing hundreds of ways of doing business with DOD, users will see one, and we'll take care of any translation and navigation that needs to be done."

That may be a tall order because the DOD has virtually every major type of computer, from PCs to mini-computers to mainframes. Each military agency will specify its own technology, weeding out redundant systems, consolidating data centers and building a centrally managed network.

The benefits of SBA will come from breaking down

open means that you are vendor-independent and that the software is portable," said Paul Strassmann, CIM director until January and now a consultant at Ernst & Young. "It doesn't mean Unix or another operating system. It means that the code and the objects that get delivered from application A can be reused in application B."

The SBA's debut has come, however, as CIM's momentum has slowed following the change in administrations and a review of

However, Strassmann's successor, Ret. Gen. Ernest Paige, agrees with the premise of CIM, which is to consolidate data centers and adopt object-oriented development methods. "But he wants to see the process move along a little faster than it has."

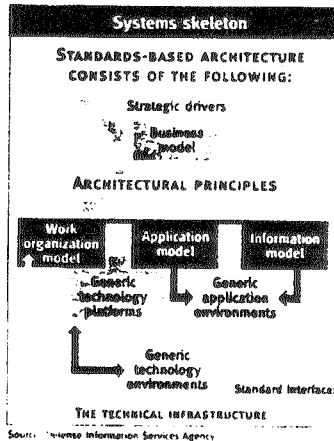
Marine model

Progress is evident at the U.S. Marine Corps, which finished its own SBA model in January. The Marines are now an example for other DOD agencies as CIM proceeds, Keane said. "Because the Marines have done all this work [in the

last year], people are recognizing that a significant amount of [the work] can be reused for other organizations." He said he believes other military services could build their own SBA model in six months.

Despite SBA's stated goals, today's Marine Corps has few open systems on-line at its 27 sites in the U.S., Hawaii and Japan, users said. Its LANs connect more than 25,000 PC users to mainframes that are linked via an IBM SNA network.

The Marine Corps uses Unix sparingly, mostly for "tactical" real-time systems deployed in combat, according to Lt. Col. Bob Sherrer at Marine Corps headquarters in Arlington, Va. To integrate systems, the Marines may elect to use the X Window System to allow PC users to view mainframe and Unix server data, he said.



Framing re-engineering plans

Architecture is fast becoming a way for large IS organizations to protect valuable re-engineering plans from being ruined by changes in open systems technology.

Declaring a "profile" based on functionality, these users have the flexibility to plug new products into the architectural framework as they go along.

In addition to the Department of Defense, other organizations that have an open systems architecture include Charles Schwab & Co., The Chase Manhattan Bank NA and Sun Microsystems Computer Corp.

Insulation from specific prod-

ucts is key, as is storing business rules in high-level application code, users said.

"Do your homework first, have an architecture, have a standard tool set, have training and have a methodology," advised Gene Friedman, Chase Manhattan's vice president of applied technology.

Shopping limits

The New York bank has many global systems, including Unix servers, IBM mainframes and Novell, Inc. PC LANs. But its shopping list is short. "The issue is interoperability," Friedman said. "There is a limited set of

things you can choose."

DMR Group, Inc., which helped the U.S. Marine Corps design its model architecture, advocates business process re-engineering, followed by technology adoption.

"Once you have an architectural framework, then you can hand off to the technology guys to operate creatively within the structure," said DMR's Boston director Robert Howie.

"Instead of arguing over [IBM] DB2 vs. Oracle [databases], you standardize on SQL," he said. "You can let 1,000 flowers bloom, as long as they can connect." — Jean S. Borman

News Shorts

CompuAdd CEO resigns

CompuAdd Computer Corp. said Bill H. Hayden is stepping down as chief executive officer of the Austin, Texas-based mail order company, which recently emerged from Chapter 11 bankruptcy protection. Richard W. Krause, CompuAdd's president and chief operating officer, will take on the duties of CEO until a successor is named. Hayden's departure comes on the heels of CompuAdd's announcement that it has begun preliminary merger talks with Zeos International, Inc. (CW, Nov. 8). Hayden will reportedly turn his attention to running his point-of-sale software company, CompuAdd Information Services.

DOD selects development contractor

The U.S. Department of Defense last week awarded its Integrated Computer-Aided Software Engineering (ICASE) contract to Lockheed Missiles and Space Co. in Sunnyvale, Calif. The 10-year, \$400 million contract, which includes subcontracts to IBM, Hewlett-Packard Co. and others, will provide ICASE tools throughout DOD for the development of Ada applications. The tools will be integrated with Pentagon repositories of reusable software components. ICASE is a cornerstone of DOD's Corporate Information Management initiative, a program aimed at cutting information systems costs while boosting IS effectiveness.

Morgan Stanley names new CIO

Kevin Parker, who most recently headed Morgan Stanley & Co.'s Tokyo-based international equity derivatives trading group, was recently named managing director and chief information officer at the New York-based brokerage. Parker's charter includes the restructuring of Morgan Stanley's front- and back-office environments. Parker replaces managing director Gary Goehrlke, who is now in charge of the controller's office. Parker reports to Carter McClelland, the firm's head of administration and operations.

CA, American Fundware settle

Following a September Federal Court award of \$8.5 million to Computer Associates International, Inc. for American Fundware, Inc.'s misappropriation of CA trade secrets in the late 1970s and early 1980s, the two firms last week announced a resolution of the dispute. Under the agreement, American Fundware will pay CA an undisclosed amount of cash plus a royalty on all its revenue over the next 10 years. Meanwhile, CA will continue to license technology to American Fundware for use in its PC Fund and Fundware PC-based fund accounting programs.

Apple, Fujitsu to do multimedia packs

Apple Computer, Inc. and Fujitsu Ltd. have agreed to develop compatible software for their respective multimedia platforms in Japan. Under the agreement, Apple will license QuickTime to Fujitsu, and the two firms will develop a set of common software development guidelines that will enable independent software vendors to develop multimedia applications that will run on both Fujitsu and Macintosh computers.

SHORT TAKES Oracle Corp. and Novell, Inc. said the first of several expected Oracle database and Novell operating system bundles will be in user hands by Dec. 18. . . . Computer Associates and Symbol Technologies, Inc. have introduced ScanPac, which combines two new modules of CA's AccPac Plus Accounting software with Symbol's LaserTouch bar code scanners. . . . Digital Equipment Corp.'s PC business unit has signed a distribution agreement with a Chinese computer company and is exploring setting up a PC manufacturing plant in China.

UK tax agency will outsource to EDS

By Mark Hulper

Electronic Data Systems Corp. and Inland Revenue, the UK's tax service, said last week they expect to sign by April a 10-year outsourcing deal, worth up to \$2 billion, for EDS' EDS-Scion Ltd. subsidiary to take over information technology services. But before it can close the deal, EDS must first face questions regarding data confidentiality and labor.

The announcement comes one week after Computer Sciences Corp. beat out EDS for a tentative \$1.35 billion deal with British Aerospace PLC (CW, Nov. 22). Computer Sciences also bid for the tax job.

EDS plans to invest \$105 million to purchase information technology equipment from Inland and to hire 2,000 of its 2,500 information technology workers. About 300 workers would stay with Inland. Inland's information technology budget is estimated at \$375 million.

The two parties said they expect to complete the deal in stages. They were unspecific about the

technology changes EDS would implement or whether EDS would use its own processing centers.

A civil servant union at Inland has voiced its objection to the pact and is lobbying members of Parliament and major British companies to intervene, contending that the arrangement undermines the confidentiality of mountains of financial and personal data that companies and individuals provide.

Union distrust

"We believe there's an increased risk to confidentiality," said Bill Hawkes, assistant secretary of the Inland Revenue Staff Federation, which represents most of the 2,500 information technology workers at Inland.

Inland stated last week that it and the British government "attach the greatest importance to safeguarding the privacy" of taxpayer information. An Inland spokeswoman said Inland would retain ultimate responsibility for confidentiality and would use "legal sanctions" to punish any leaks.

An EDS spokesman responded

that EDS customarily safeguards "very confidential, proprietary information."

The union was scheduled to meet with EDS last Friday, after press time. Its first demand was for EDS to recognize the union as the representative of the information technology workers, Hawkes said.

"They've avoided being unionized up until [recently]," said Merrill Lynch analyst Steve McClelland.

Hawkes said one positive sign is that EDS recognized the union in a recent deal with the UK's Drivers and Vehicle Licensing Agency.

The EDS spokesman said EDS has no union workers in the U.S., but it operates differently in Europe, where "there are different regulations and different laws" regarding workers' rights.

Furman Selz, Inc. analyst Terry Quinn questioned how profitable the outsourcing deal might be for EDS once it meets various union demands. Government sector jobs are less profitable than private sector jobs, even without union issues, he noted.

Nintendo

CONTINUED FROM PAGE 1

would have to spend implementing its own system, Rogers said.

Some 11 retail chains and three licensees have signed up to process orders and invoices in the next year through the Unisys system, executives at Nintendo and Unisys said. The EDI network ties into an electronic-mail network provided by General Electric Information Services (see chart). "Several thousand" orders have already been processed through it, Rogers said.

Rogers said nondisclosure terms prohibit him from identifying participating retailers and licensees. One source said Kmart Corp. and Woolworth Corp. have signed on. About 30 licensees are expected to sign on.

A Kmart spokeswoman said she could not confirm or deny participation. Phone calls to Woolworth were not returned. Jim Matlack, a district manager at Unisys, confirmed that 11 retailers are using the system.

About two-thirds of all Nintendo-made games, including its Jurassic Park title, were designed by licensees, who are responsible for distributing their products. Many of these companies are small outfits that cannot afford the investment to install and support EDI connections among them, retailers and Nintendo, Rogers claimed.

Rogers estimated that if licensees were to set up a comparable EDI system on their own, it could cost them between \$20,000 and \$500,000 each. While some have rudimentary EDI systems, the Unisys project provides considerable sales administration, such as credit and location checks, that ac-

tion of hundreds of thousands of cartridges on a yearly basis."

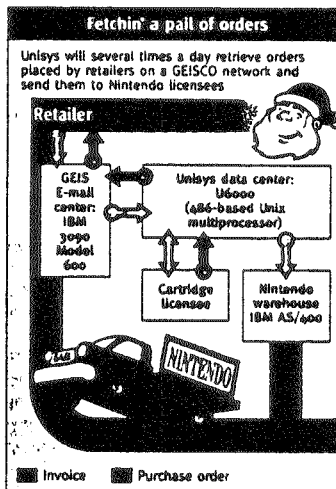
Ken Jones, director of inventory management at Toys R Us, Inc. in Paramus, N.J., observed that "a hefty percentage" of Nintendo licensees are not tied to Toys R Us through EDI and could benefit from the program. "Without [EDI],

the product is definitely slowed down in terms of how fast it goes out to the sales floor," Jones said.

Nintendo is charging each licensee a fee for each cartridge it sells using the EDI system for ordering, invoicing, Nintendo in turn pays a per-cartridge fee to Unisys. The arrangement marks the latest twist in the move toward tying the price of outsourcing deals to business results (CW, June 21). Rogers declined to name the fee amounts.

Charlie McMurtry, a strategy manager at Wal-Mart Stores, Inc. in Bentonville, Ark., said he was skeptical about the program, noting that Wal-Mart already uses EDI links with Nintendo licensees.

But Rogers said Fast EDI would provide more elaborate support than what retailers now receive.



Source: Nintendo Co.

CW Chart: Dave Marshall

companies any transaction.

"What Unisys came up with was a design that lets the licensee have a sophisticated hookup to retailers without spending a large investment up front," he said. "It's designed to facilitate the distribu-

SESSION 5

Products Overview

Products Overview

- ▼ Evaluation and Selection Criteria
- ▼ Demonstrations of CASE Tools
- ▼ How to be a Savvy CASE Shopper!

Evaluation and Selection Criteria

- ▼ First and foremost: understand what process and method you want to automate. Automating chaos and uncertainty should be avoided!
- ▼ Platform and O/S will narrow choices. How many users? LAN based? Client/Server? Single user?
- ▼ Automating which part of the life-cycle (or automating the generation of which work products) will benefit your project the most??? (Automating 99% of 1% of the job isn't smart!)
- ▼ After establishing the above, then look for robustness of repository (50 to 100 entity types, 1000+ relationship types).
- ▼ Support??? (And not just on the tool!)
- ▼ All things being equal, buy cheap!

Current CASE (Analysis) Products

CASE TOOLS FOR ANALYSIS -- PRODUCTS SUMMARY

12 January 1994

The following is a list of commercially available CASE tools for analysis (and related) products as of this date. Please contact the undersigned for additional information.

PRODUCT	VENDOR
I-G SPICE, Version V	AB Associates, Inc.
Super ° Sceptre	AB Associates, Inc.
ABELDent	ABEL Computers, Ltd.
MATE Process Manager Workbench	Advanced Development Methods, Inc.
MATE Process Manager Workbench for Windows	Advanced Development Methods, Inc.
Hindsight	Advanced Software Automation, Inc.
QASE RT (V.1.3)	Advanced System Technologies, Inc.
CaMERA	Advanced Systems Technology Corp. (ASTEC)
firstCASE Manager	AGS Management Systems, Inc.
firstCASE Manager for Windows	AGS Management Systems, Inc.
firstCASE Process Manager	AGS Management Systems, Inc.
firstCASE Process Manager for Windows	AGS Management Systems, Inc.
PLASMA	AGS Management Systems, Inc.

Logistics

Windows

How to be a Savvy CASE Shopper!

- ▼ First and Foremost: Be Informed! "Network with others in a non-vendor specific setting. Get outside help!"
- ▼ Remember: The CASE tool market place is divided into the "high end" and the "low end."
- ▼ In the "high end" market you are buying into a company more than buying a specific tool. You should carefully evaluate where that company is going. How much of their budget goes into R & D? How stable is the company? What's their track record been like in the past? Buying into the "high end" market should not be your first choice!
- ▼ In the "low end" market you are buying a tool more than a company. Look for specific tool features but consider it as a "stepping stone" along the "learning curve."

(continued)

How to be a Savvy CASE Shopper! (continued)

- ▶ Remember: whatever tool you buy today, you will most likely be using a different tool three to five years from now!
- ▶ "Buy a CASE tool that you can grow into, rather than one you will grow out of." NOT!
- ▶ Remember: when you get outside help "whose bread I eat his song I must sing"!
- ▶ And finally: caveat emptor!

(continued)

Predicting the Future!!!

- ▼ Expect significant growth in the "low end" market. Basic, sound, stable CASE tools selling for less than (maybe much less than) \$1000. (Will we see *CASEperfect*?)
- ▼ The only way "high end" vendors will survive will be by developing fourth generation tools.
- ▼ The symbiotic relationship between CASE and methods will result in the predominance of a few de facto "industry standard" methods rather than the "tower of babble" we have today.
- ▼ Expect to see more (many more) tools which support "executable specifications" and tools which incorporate some kind of "expert" advisor.

(continued)

Predicting the Future!!! (continued)

- ▶ Expect to see more "Class Library" tools which will allow *system builders* to assemble large, complex software systems by defining collaborations of re-usable objects.
- ▶ Expect to see more "Object Building" tools.
- ▶ GOOD LUCK!

APPENDIX 1

Case Study Radio Button System

Carl A. Arella, Ph.D., Inc.
SOFTWARE ENGINEERING CONSULTANT

Radio Button System

The Radio Button System (RBS) is a component of a fully automated, digital automobile sound system. The RBS monitors a set of front-panel *Station Selection Buttons* and performs station selection functions.

When a station selection button is momentarily depressed, the RBS causes a new station to be selected. This selection is made on the basis of station setting information stored within the RBS.

The RBS can "memorize" new station selections in the following manner: When a given station selection button is depressed longer than "momentarily" (say, for more than two seconds), the currently selected station will be "memorized." Future momentary depressions of this button will result in this "memorized" station being selected.

The RBS also performs a muting function. While a station is being selected, the RBS will cause the *Audio System* to mute the audio output signal. The RBS will also cause the audio output signal to be muted until a new station selection has been successfully memorized.

The RBS interfaces with the front-panel station selection buttons by "reading" a single byte memory location. Each bit position of this memory location is associated with a particular front-panel station selection button. The value of zero in a given bit position indicates that the corresponding button is *not* depressed. The value of one in that bit position indicates that the corresponding button is depressed. (For example, 0000 0000 indicates no station selection buttons are currently depressed; 0000 0010 indicates that the second button is currently depressed, etc.)

The RBS interfaces with the *Tuning System* by means of a common memory location. This single byte memory location contains a non-negative integer value which represents a station selection. (For example, 0000 0000 might represent 87.9MHz, 0000 0001 might represent 88.1MHz, etc.) The RBS may "read" this memory location to "memorize" a current station selection. The RBS may also "write" to this memory location to cause the *Tuning System* to select another station.

Finally, the RBS interfaces with the *Audio System* by sending two signals. The RBS may send a MUTE-ON signal to the *Audio System* causing the *Audio System* to disable the audio output. A MUTE-OFF signal would cause the *Audio System* to enable the audio output.

\$ \$ \$

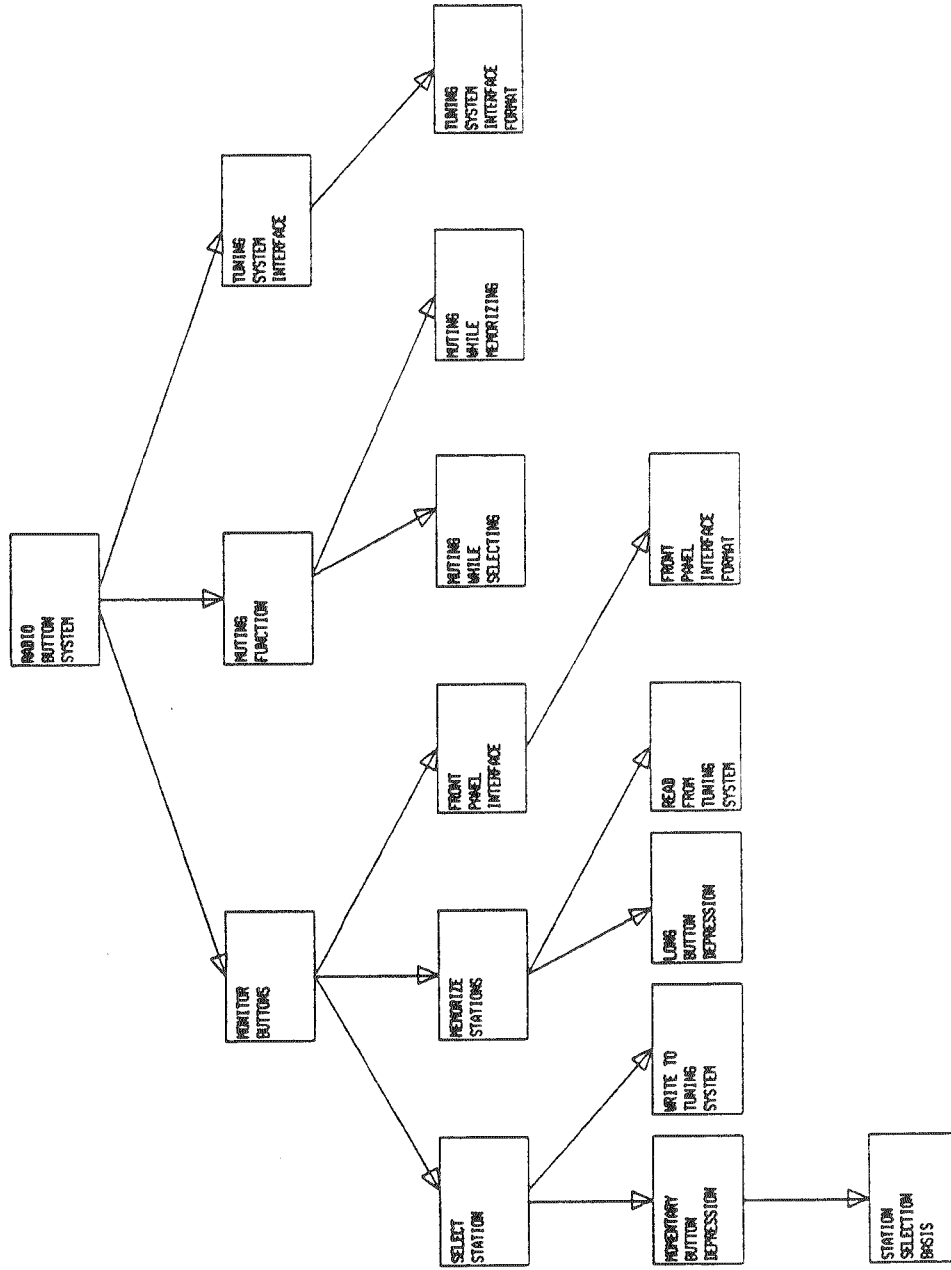
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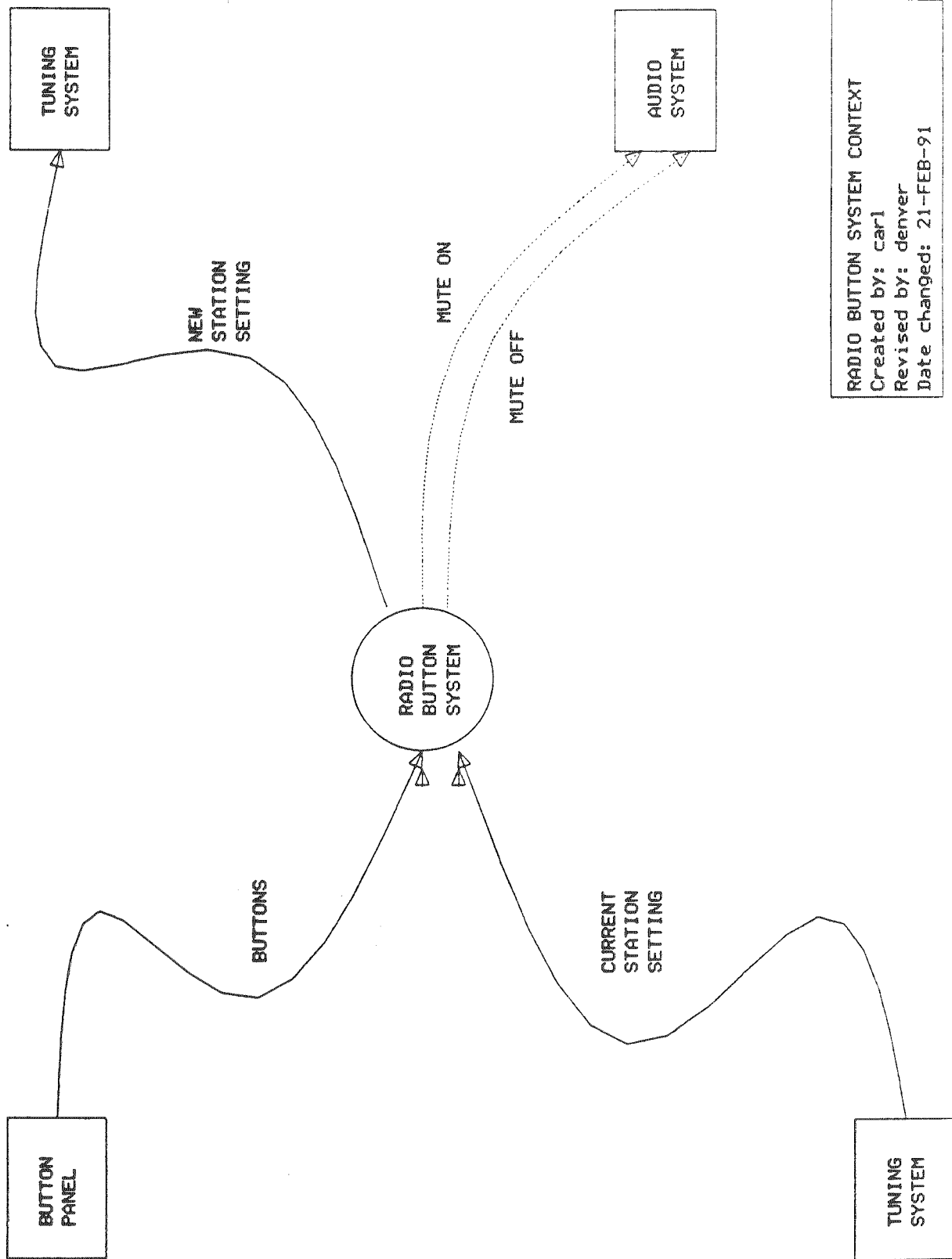
REV 5
29-JUN-91

Radio Button System -- Requirements Model

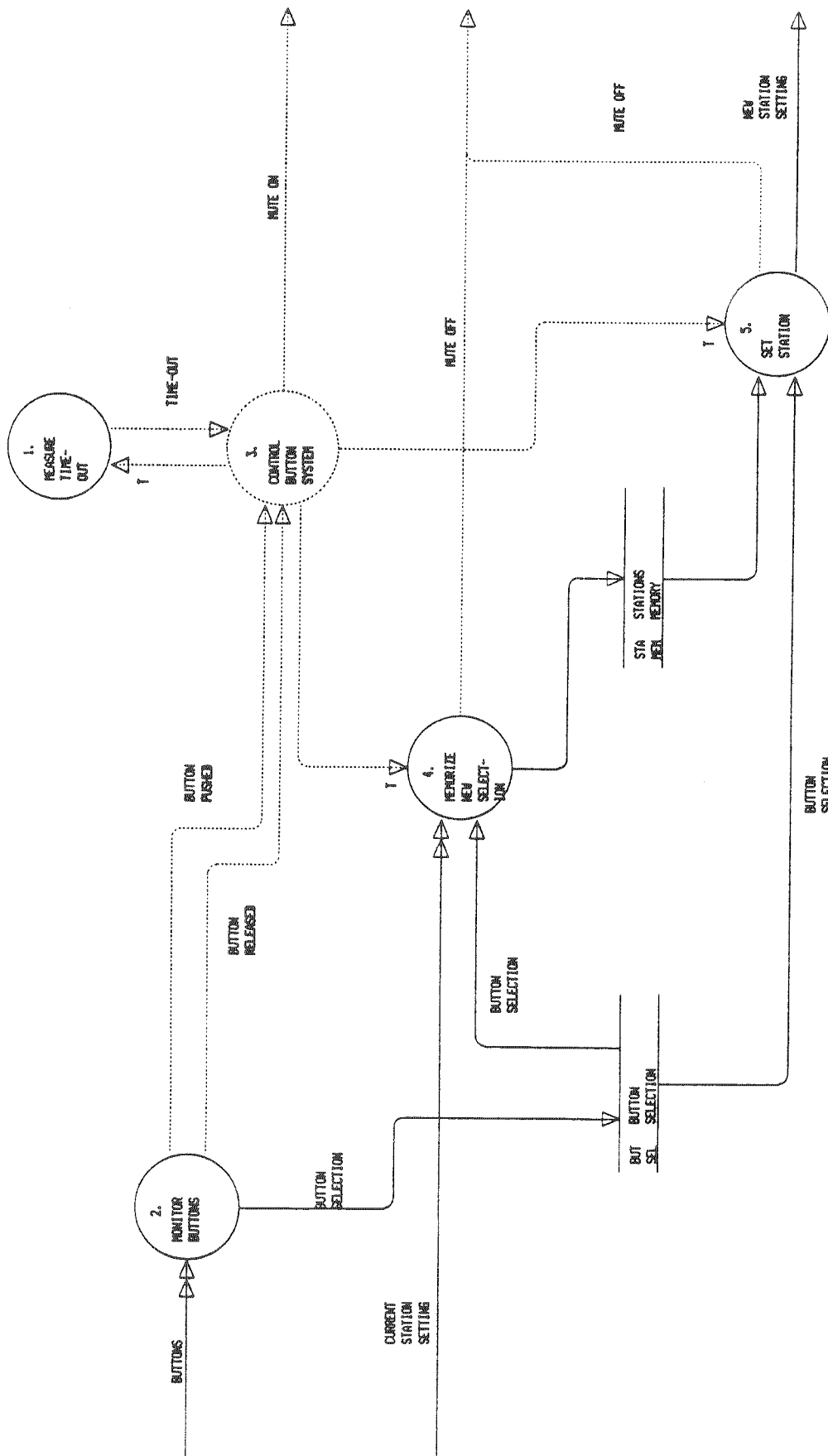


RADIO BUTTON SYSTEM -- EVENT LIST

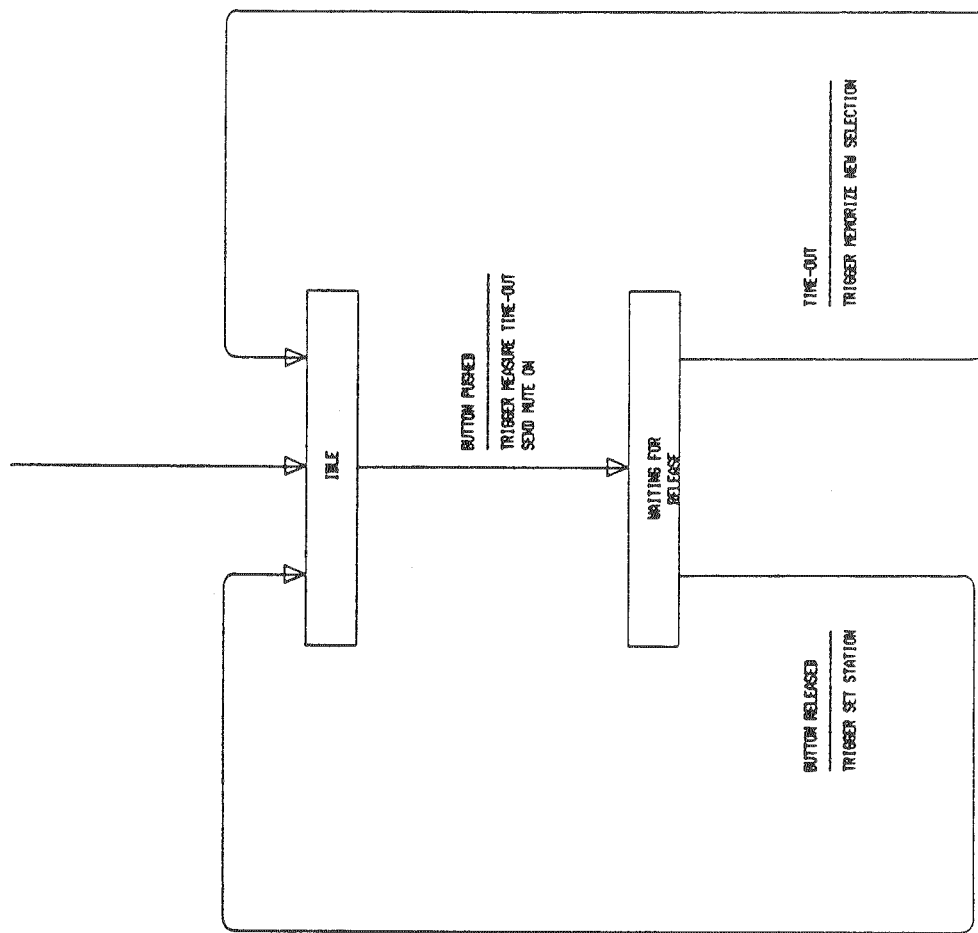
EXTERNAL EVENT	SYSTEM RESPONSE
(1) Selection button depressed.	(1) Mute audio system.
(2) Button released within two seconds after it was depressed.	(2) Select a memorized station. Un-mute audio system.
(3) Two seconds elapses after button was depressed while button remained depressed.	(3) Memorize current station. Un-mute audio system.



RADIO BUTTON SYSTEM CONTEXT
Created by: carl
Revised by: denver
Date changed: 21-FEB-91



RADIO BUTTON SYSTEM DIAGRAM 0
 Created by: carl
 Revised by: carl
 Date changed: 08-JUN-92



RADIO BUTTON SYSTEM STATE DIAG.
 Created by: Carl
 Revised by: Carl
 Date changed: 17-JUL-92

TIME: 13:30 NAME: * Excelerator/RTS

TYPE Primitive Process Specification NAME 1.

	Inputs:	Outputs:
Type Name		Type Name
		SIG TIME-OUT

Process Description

MEASURE TIME-OUT

1. Wait for time-out period.
2. Issue TIME-OUT

Constants:

Type Name

	Satisfies Requirement:	Associated Entities:
Type Name		Type Name

Document Cross Reference:

Type	Document Name/ID	Paragraph/Page Number
------	------------------	-----------------------

Generic Fields

Last Rev Code

Last Rev Auth Code

Short Description

Modified By	carl	Date Modified	920717	# Changes	2
Added By	carl	Date Added	920717		
Last Project	RBS (WARD & MELL				
Locked By		Date Locked	0	Lock Status	

DATE: 17-JUL-92 PRIMITIVE PROCESS SPECIFICATION - OUTPUT PAGE 2
TIME: 13:30 NAME: * Excelerator/RTS

TYPE Primitive Process Specification NAME 2.

Inputs:		Outputs:	
Type	Name	Type	Name
REC	BUTTONS	SIG	BUTTON PUSHED
		SIG	BUTTON RELEASED
		REC	BUTTON SELECTION

Process Description

MONITOR BUTTONS
1. Monitor dataflow BUTTONS.
2. If a button push is detected then:
 2.1 Send signal BUTTON PUSHED.
 2.2 Output BUTTON SELECTION.
 2.3 Wait for button release.
 2.4 Send signal BUTTON RELEASED.
3. Repeat.

Constants:
Type Name

Satisfies Requirement:		Associated Entities:	
Type	Name	Type	Name
		ISS	MULTIPLE BUTTON DEPRESSIONS
		ISS	PRESSING BUTTONS TOO FAST

Document Cross Reference:
Type Document Name/ID Paragraph/Page Number

Generic Fields

Last Rev Code

Last Rev Auth Code

Short Description

Modified By	carl	Date Modified	920717	# Changes	8
Added By	denver	Date Added	910221		
Last Project	RADIO BUTTON SYS				
Locked By		Date Locked	0	Lock Status	

TIME: 13:30 NAME: * Exclerator/RTS

TYPE Primitive Process Specification NAME 4.

Inputs:		Outputs:	
Type	Name	Type	Name
REC	CURRENT STATION SETTING	SIG	MUTE OFF
REC	BUTTON SELECTION	REC	STATION MEMORY ENTRY

Process Description

MEMORIZE NEW SELECTION

1. Read STATION NUMBER
2. Read BUTTON SELECTION
3. Store STATION MEMORY ENTRY
4. Issue MUTE OFF

Constants:

Type	Name
------	------

Satisfies Requirement:		Associated Entities:	
Type	Name	Type	Name

Document Cross Reference:

Type	Document Name/ID	Paragraph/Page Number
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Generic Fields

Last Rev Code

Last Rev Auth Code

Short Description

Modified By	carl	Date Modified	920717	# Changes	2
Added By	carl	Date Added	920717		
Last Project	RBS (WARD & MELL				
Locked By		Date Locked	0	Lock Status	

DATE: 17-JUL-92 PRIMITIVE PROCESS SPECIFICATION - OUTPUT PAGE 4
 TIME: 13:30 NAME: * Excelerator/RTS

TYPE Primitive Process Specification NAME 5.

Inputs:		Outputs:	
Type	Name	Type	Name
REC	STATION MEMORY ENTRY	REC	NEW STATION SETTING
REC	BUTTON SELECTION	SIG	MUTE OFF

Process Description

SET STATION

1. Read current value of BUTTON_SELECTION from store
BUTTON_SELECTION.
2. Using current value of BUTTON_SELECTION read
STATION NUMBER from store STATIONS MEMORY.
3. Write NEW STATION SETTING.
4. Issue MUTE OFF.

Constants:

Type	Name
------	------

Satisfies Requirement:		Associated Entities:	
Type	Name	Type	Name

Document Cross Reference:

Type	Document Name/ID	Paragraph/Page Number
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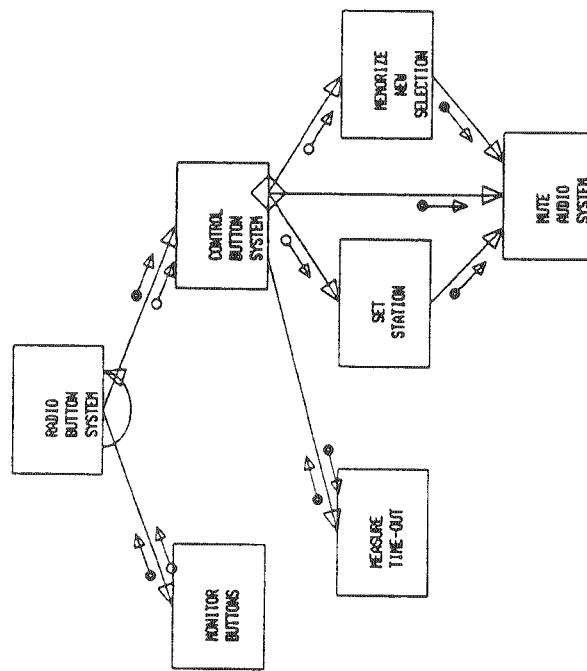
Generic Fields

Last Rev Code

Last Rev Auth Code

Short Description

Modified By	carl	Date Modified	920717	# Changes	2
Added By	carl	Date Added	920717		
Last Project	RBS (WARD & MELL				
Locked By		Date Locked	0	Lock Status	



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RADIO BUTTON SYSTEM MODULE CHART
 Created by: carl
 Revised by: carl
 Date changed: 10-11-91

APPENDIX 2

REPOSITORY PRODUCTS

This appendix contains a listing of advertised repository (and related) products available as of this date.

Carl A. Argila, Ph.D., Inc.
SOFTWARE ENGINEERING CONSULTANT

REPOSITORY PRODUCTS SUMMARY

6 January 1994

The following is a list of advertised repository (and related) products available as of this date. Please contact the undersigned for additional information.

PRODUCT	VENDOR
ADMINS/V32 (V.5.0)	ADMINS, Inc.
Hindsight	Advanced Software Automation, Inc.
Revengg	Advanced Systems Technology Corp. (ASTEC)
Thesis	Affiliated Computer Services, Inc.
Object CM	Alsys, Inc.
Design/1	Andersen Consulting
Design/1 for Windows	Andersen Consulting
Foundation for Cooperative Processing (FCP) for Windows (V.2.0)	Andersen Consulting
Foundation for Cooperative Processing (FCP) (V.2.0)	Andersen Consulting
Traxis	Angeli Systems Corp.
ADS/MVS (Automatic Documentation System) (Rel.7.0)	A+ Software, Inc.
DASD/View & SMS Migration Management Aid	A+ Software, Inc.
Metavision (V.2.0)	Applied Axiomatics, Inc.
eSSbase (V.3.0)	Arbor Software Corp.
Archibus/FM SQL-Link Toolkit for Extended DOS	ARCHIBUS, Inc.
Archibus/FM SQL-Link Toolkit for Windows	ARCHIBUS, Inc.
Ptech (Rel.3.2)	Associative Design Technology

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P. O. Box 1219-B

Pico Rivera, CA 90660-1219

310-699-3196

PRODUCT	VENDOR
InfoDesigner	Asymetrix Corp.
CASE BackPlane	Atherton Technologies, Inc.
Merge Ahead	Atherton Technologies, Inc.
Software BackPlane (V.3.0)	Atherton Technologies, Inc.
ClearCase	Atria Software, Inc.
ToolBus	The Barton Group, Inc.
StatLAN Oasis	Bell Atlantic Healthcare Systems, Inc.
BlackSmith OpenNet	Blacksmith
Messenger	Blue Rainbow Software International Corp.
DB2 Admin/Solution (V.2.0)	Brownstone Solutions, Inc.
IE Admin/Solution	Brownstone Solutions, Inc.
AS/Messenger	Business Partner Solutions, Inc.
ObjectTeam for Rumbaugh	Cadre Technologies Inc.
ObjectTeam for Rumbaugh for Windows	Cadre Technologies Inc.
ObjectTeam for Shlaer-Mellor	Cadre Technologies Inc.
JCL Navigator (V.2.0)	Canyon Software Corp.
OCF/PowerChart	Cerner Corp.
PacBase (V.8.0.2)	CGI Systems, Inc.
PacLAN (V.8.0.2)	CGI Systems, Inc.
PacLAN/X (V.2.0)	CGI Systems, Inc.
PacReverse	CGI Systems, Inc.
DB2/SOP (DB2 Standards and Operating Procedures)	Chicago Soft, Ltd.
MVS/SOP (MVS/Standards and Operating Procedures)	Chicago Soft, Ltd.

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PRODUCT	VENDOR
Mantis Developer's Workstation	Cincom Systems, Inc.
CA-7 for AS/400	Computer Associates International, Inc.
CA-APCDOC	Computer Associates International, Inc.
CA-C++ for OS/2	Computer Associates International, Inc.
CA-CORPORATE TIE	Computer Associates International, Inc.
CA-DATACOM	Computer Associates International, Inc.
CA-DYNAM/D	Computer Associates International, Inc.
CA-DYNAM/FI	Computer Associates International, Inc.
CA-DYNAM/T VSE	Computer Associates International, Inc.
CA-FPXpert	Computer Associates International, Inc.
CA-IDEAL/CCF	Computer Associates International, Inc.
CA-IDMS	Computer Associates International, Inc.
CA-IDMS/DB	Computer Associates International, Inc.
CA-METRICS	Computer Associates International, Inc.
CA-PRMS:Product Structure	Computer Associates International, Inc.
CA-PRMS:SCAN	Computer Associates International, Inc.
CA-VERIFY	Computer Associates International, Inc.
CA-VERIFY/EEO	Computer Associates International, Inc.
Silverrun Distributed Application Generators (DAGs)	Computer Systems Advisers, Inc.
Silverrun-ADC (Application Design Center)	Computer Systems Advisers, Inc.
PAPERS	Computer Systems Co., Inc.
DATATEC	Compuware Corp.
CorVision (V.5.1)	CORTEX Corp.
Da Vinci eMAIL for Windows (V.2.5)	Da Vinci Systems Corp.

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PRODUCT	VENDOR
Customer Management Facility (CMF); Customer Marketing Information System (CMIS)	Data-Core Systems, Inc.
Vineyard (V.1.0)	Data Fellows, Inc.
TextBOOK/Online Manuals (V.2.9)	Data Retrieval Corp.
TextBOOK/Online Manuals for Windows	Data Retrieval Corp.
School Series MARC Archive	Data Trek, Inc.
SmartLeaf/Librarian	DataBase Publishing Software, Inc.
X-36	Databorough, Inc.
X-Analysis Complete System	Databorough, Inc.
X-Control	Databorough, Inc.
X-Repository	Databorough, Inc.
X-Rev	Databorough, Inc.
Software Metric Repository	Denver Metrics Group
CDD/Administrator (V.1.2)	Digital Equipment Corp. (DEC)
CDD/Repository	Digital Equipment Corp. (DEC)
DEC Datatrieve (V.6.1)	Digital Equipment Corp. (DEC)
DEC Graphical Schema Editor for Rdb/VMS (V.1.0)	Digital Equipment Corp. (DEC)
DEC TP WORKcenter for ACMS (V.1.0)	Digital Equipment Corp. (DEC)
DECtp Desktop for ACMS (V.1.2)	Digital Equipment Corp. (DEC)
ObjectBroker (V.2.5)	Digital Equipment Corp. (DEC)
ObjectBroker for Windows (V.2.5)	Digital Equipment Corp. (DEC)
POLYCENTER Framework (V.1.3)	Digital Equipment Corp. (DEC)
POLYCENTER Network Management Services (V.1.3)	Digital Equipment Corp. (DEC)
POLYCENTER Shelving	Digital Equipment Corp. (DEC)

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PRODUCT	VENDOR
Task Flow Management (TFM) (V.3.1)	Digital Equipment Corp. (DEC)
DOCU/TEXT	Diversified Software Systems, Inc.
INFO/X	Diversified Software Systems, Inc.
ONLINE XREF	Diversified Software Systems, Inc.
JDE World CASE	J.D. Edwards & Co.
GROUP FOUR Application Generation System	ESI
Reuse Library Toolkit	EVB Software Engineering, Inc.
Reuse Library Toolkit for Windows	EVB Software Engineering, Inc.
Component:EXPress	EXP Group, Inc.
Envision (V.3.3)	Future Tech Systems, Inc.
Envision for Windows (V.3.3)	Future Tech Systems, Inc.
HUGO	Global Software, Inc. (MA)
OLGA	Global Software, Inc. (MA)
SILAS	Global Software, Inc. (MA)
TAGUS	Global Software, Inc. (MA)
URMA	Global Software, Inc. (MA)
HealtheQuest's Patient Management	HBO & Co.
StoreScript!	Heizer Software
Warehaus	Helpful Programs, Inc. (HPI)
Warehaus for Windows	Helpful Programs, Inc. (HPI)
Dictionary/3000	Hewlett-Packard Co.
HP Interface Architect (V.2.0)	Hewlett-Packard Co.
Sparcus	HIARC, Inc.
HyperDesk Distributed Object Management System (HD-DOMS) (V.1.1)	HyperDesk Corp.

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PRODUCT	VENDOR
HyperDesk Distributed Object Management System for Windows (HD-DOMS) (V.1.1)	HyperDesk Corp.
CATIA Data Management (V.1, Rel.2)	IBM (International Business Machines)
CATIA Data Management Access (V.3, Rel.2.4)	IBM (International Business Machines)
Common Data Facility/MVS (V.1, Rel.2.1)	IBM (International Business Machines)
Dictionary Model Transformer (Rel.1)	IBM (International Business Machines)
Repository Manager/MVS (V.1, Rel.2)	IBM (International Business Machines)
SAA AD/Cycle	IBM (International Business Machines)
SAA AD/Cycle Dictionary Services/MVS (V.1, Rel.2)	IBM (International Business Machines)
SAA AD/Cycle FastRef/2 (V.1, Rel.1)	IBM (International Business Machines)
Solution Pac - VM/Software Engineering	IBM (International Business Machines)
SystemView Managed System Services/400 (V.2, Rel.3)	IBM (International Business Machines)
Teleprocessing Network Simulator (TPNS) (V.3, Rel.3)	IBM (International Business Machines)
Workstation LAN File Services/VM	IBM (International Business Machines)
PowerTools	Iconix Software Engineering, Inc.
COBOL-Master	I M Computer Services, Inc. (IMCSI)
Media (V.2.2)	Info Innov, Inc.
RightStart (V.1.2)	Informatica Corp.
InforSpan Open Repository	InfoSpan Corp.
InfoSpan CASE Integrator (V.3.0)	InfoSpan Corp.
Upstream (V.2.3.0)	Innovation Data Processing
Vision	Innovative Systems Techniques, Inc.
AM/Harvest	Intelligent Environments, Inc.
CP/Workbench	Intelligent Environments, Inc.

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PRODUCT	VENDOR
SQL/Workbench (V.2.1)	Intelligent Environments, Inc.
Accounting Vision/32 General Ledger with Check Reconciliation for Windows	IntelliSoft, Inc.
Accounting Vision/32 General Ledger with Check Reconciliation	IntelliSoft, Inc.
C Development Environment	Interactive Development Environments, Inc. (IDE)
Code Generator for Ada	Interactive Development Environments, Inc. (IDE)
Code Generator for C	Interactive Development Environments, Inc. (IDE)
OOSD/C++	Interactive Development Environments, Inc. (IDE)
Software through Pictures Information Modeling (StP/IM)	Interactive Development Environments, Inc. (IDE)
Software through Pictures Integrated Structured Environment (Rel.4.2D)	Interactive Development Environments, Inc. (IDE)
StP/OMT	Interactive Development Environments, Inc. (IDE)
ADS/Interbase (Application Development System)	InterBase
Resolve Trouble Ticketing System	Internet Communications Corp.
APS (V.3.0)	Intersolv, Inc.
Design Recovery (V.1.0)	Intersolv, Inc.
Design Recovery for Windows (V.1.0)	Intersolv, Inc.
Excelerator for Windows (XL/Windows) (V.2.0)	Intersolv, Inc.
Excelerator II (XL/II) (V.1.3)	Intersolv, Inc.
Intersolv Maintenance Workbench	Intersolv, Inc.
Intersolv Maintenance Workbench for Windows	Intersolv, Inc.
Catapult (V.1.3)	Ipswitch, Inc.
Ratabase (V.1.4)	ISI Systems, Inc.
Rochade	KnowledgeWare, Inc.

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PRODUCT	VENDOR
Lamaura Data Dictionary	Lamaura Development, Ltd.
LANSA for Windows	LANSA USA, Inc.
LBMS Systems Engineer (V.5.0)	LBMS, Inc.
LBMS Systems Engineer Toolset for Windows (V.5.0)	LBMS, Inc.
Process Engineer (V.2.0)	LBMS, Inc.
Process Engineer for Windows (V.2.0)	LBMS, Inc.
SE/Open for PowerBuilder (V.3.0)	LBMS, Inc.
XCOM/SDS	Legent Corp.
MAGEC Rapid Application Development System (Rel.3.0)	MAGEC Software
MAGEC Rapid Application Development System for Windows NT (Rel.3.0)	MAGEC Software
MAGEC SQL Interface	MAGEC Software
MAGEC SQL Interface for Windows NT	MAGEC Software
DataManager	MANAGER SOFTWARE PRODUCTS INC.
DesignManager	MANAGER SOFTWARE PRODUCTS INC.
DictionaryManager	MANAGER SOFTWARE PRODUCTS INC.
managerVIEW	MANAGER SOFTWARE PRODUCTS INC.
MethodManager	MANAGER SOFTWARE PRODUCTS INC.
ObjectMaker (V.2.0)	Mark V Systems, Ltd.
ObjectMaker for Windows (V.2.0)	Mark V Systems, Ltd.
Foundation CBT	Menlo Business Systems, Inc.
M/4 for Windows (V.4.31)	Micro Data Base Systems, Inc.
MDBS IV (V.4.4)	Micro Data Base Systems, Inc.
STOR	Microbank Software, Inc.

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PRODUCT	VENDOR
STOR/QM	Microbank Software, Inc.
Mozart (V.3.1)	Mozart Systems Corp.
MULTITRAK Enterprise-Wide Work Management System (V.2.9)	Multitrak Software Development Corp.
DBL QuickStart	National Information Systems, Inc.
SHAMAN	NewEra Software, Inc.
M.A.T.I.S.S.E. (V.2.2)	Object Databases (ODB)
Envy/Developer (Rel.1.41)	Object Technology International, Inc.
SourceSafe (V.2.2)	One Tree Software
CASE*Designer (V.1.1)	Oracle Corp.
CASE*Dictionary (V.5.0)	Oracle Corp.
CASE*Generator for SQL*Forms/SQL*Menu (V.2.0)	Oracle Corp.
CASE*Generator for SQL*ReportWriter/SQL*Plus (V.1.0)	Oracle Corp.
Oracle CDE (Cooperative Development Environment)	Oracle Corp.
Oracle CDE (Cooperative Development Environment) for Windows	Oracle Corp.
IPM/MVS (Incident/Problem Management)	The Orcutt Group, Inc.
General Ledger Expert System	Park City Group, Inc.
Operations Expert System	Park City Group, Inc.
Production Planner	Park City Group, Inc.
SA/PowerBuilder Link (V.2.0)	Popkin Software & Systems, Inc.
PowerBuilder for Windows (V.3.0)	Powersoft Corp.
PowerMaker (V.3.0)	Powersoft Corp.
PowerViewer (V.3.0)	Powersoft Corp.
Lexicon	The Progeni Corp.

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PRODUCT	VENDOR
PowerPlus	P+W Software
Rational Apex	Rational
Rational Rose (V.1.5)	Rational
MPower	RDD (Reilly Dike Doshier Corp.)
DB EXCEL (Rel.3.2)	Reltech Products, Inc.
DB Explorer	Reltech Products, Inc.
OpenInsight (V.2.0)	Revelation Technologies, Inc.
ADA Buffet	Rocket Shareware
ADA Masters	Rocket Shareware
GEMBASE (V.5.1)	Ross Systems, Inc.
High Productivity Systems (V.5.0)	Seer Technologies, Inc.
FlexGen (V.2.3)	SINC, Inc.
SmartStar VMS (V.6.1)	SmartStar Corp.
SmartStar:Ingres Connection	SmartStar Corp.
SmartStar:Oracle Connection	SmartStar Corp.
SmartStar:Sybase Connection	SmartStar Corp.
LogiCASE Workstation for Systems Maintenance	Softlab, Inc.
Natural Predict	Software AG of North America, Inc.
SQA TeamTest for OS/2 (V.2.5)	Software Quality Automation, Inc. (SQA)
SQA TeamTest for Windows (V.2.5)	Software Quality Automation, Inc. (SQA)
PC Dictionary (V.3.3)	Software Solutions, Inc. (VA)
XPONENT Documentation Facility	Software Solutions Unlimited, Inc.
Diamond	Software Spectrum
desc (Distributed Enterprise Service Center)	SSDS, Inc.
Answer:Architect	Sterling Software, Inc.

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PRODUCT	VENDOR
SAMS:Compress for DB2 (V.3.2)	Sterling Software, Inc.
I-DEAS Material Data System	Structural Dynamics Research Corp. (SDRC)
Solaris Enterprise Server (V.2.1)	SunSoft, Inc.
Solaris Workgroup Server (V.2.1)	SunSoft, Inc.
Synon Gateway/3X	Synon, Inc.
AS/SET (V.3.1)	System Software Associates, Inc.
AS/SET IWS (Intelligent Workstation) (V.3.1)	System Software Associates, Inc.
TeamMake	TeamOne Systems, Inc.
TeamNet (V.3.0)	TeamOne Systems, Inc.
Existing Systems Workbench (ESW)	Viasoft, Inc.
Visible Analyst Workbench (V.5.0)	Visible Systems Corp.
Visible Analyst Workbench for Windows (V.5.0)	Visible Systems Corp.
VHDL Developer Plus (V.2.0)	Vista Technologies, Inc.
Stark	VSS, Inc.
Westmount I-CASE SSADM (V.1.0)	Westmount USA, Inc.
Westmount I-CASE Ward/Mellor (V.3.1)	Westmount USA, Inc.
Westmount I-CASE Yourdon (V.3.1)	Westmount USA, Inc.
WindMenu	Windstar Corp.
DesignAid II (V.1.0)	Yourdon, Inc.

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APPENDIX 3

CASE PRODUCTS

This appendix contains a listing of commercially available CASE tools for analysis (and related) products as of this date

Carl A. Argilla, Ph.D., Inc.
SOFTWARE ENGINEERING CONSULTANT

CASE TOOLS FOR ANALYSIS -- PRODUCTS SUMMARY

12 January 1994

The following is a list of commercially available CASE tools for analysis (and related) products as of this date. Please contact the undersigned for additional information.

PRODUCT	VENDOR
I-G SPICE, Version V	AB Associates, Inc.
Super * Sceptre	AB Associates, Inc.
ABELDent	ABEL Computers, Ltd.
MATE Process Manager Workbench	Advanced Development Methods, Inc.
MATE Process Manager Workbench for Windows	Advanced Development Methods, Inc.
Hindsight	Advanced Software Automation, Inc.
QASE RT (V.1.3)	Advanced System Technologies, Inc.
CaMERA	Advanced Systems Technology Corp. (ASTEC)
firstCASE Manager	AGS Management Systems, Inc.
firstCASE Manager for Windows	AGS Management Systems, Inc.
firstCASE Process Manager	AGS Management Systems, Inc.
firstCASE Process Manager for Windows	AGS Management Systems, Inc.
PLASMA	American InterFace Computer, Inc.
DCS/Logistics	Andersen Consulting
Design/1	Andersen Consulting
Design/1 for Windows	Andersen Consulting
Install/1	Andersen Consulting
Method/1 (V.9.0)	Andersen Consulting

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P. O. Box 1219-B

Pico Rivera, CA 90660-1219

310-699-3196

PRODUCT	VENDOR
Plan/1	Andersen Consulting
Plan/1 for Windows	Andersen Consulting
Decision Pad (V.2.0)	Apian Software
ModelPro (V.3.5)	D. Appleton Co.
ModelPro for Windows	D. Appleton Co.
Project Bridge (Rel.3.0)	Applied Business Technology Corp.
Project Bridge Modeler in Windows (Rel.1.0)	Applied Business Technology Corp.
Project Workbench System (Rel.3.1)	Applied Business Technology Corp.
Project Workbench System for Windows (Rel.1.1)	Applied Business Technology Corp.
SNA Development Test Facility (SDTF)	Applied Computer Technology
SNAPS (Rel.2.0)	Applied Expert Systems, Inc.
Rescan	Applied Terravision Systems, Inc.
SimCaSe	Archimedes Software, Inc.
RDD-100 (Rel.4.0)	Ascent Logic Corp.
RDD-100/Design Guide (Rel.4.0)	Ascent Logic Corp.
Ptech (Rel.3.2)	Associative Design Technology
Methods_Help	ATA, Inc.
AT&T Sablime Product Administration System (V.3.0.2)	AT&T
Bachman/DA Link for IEW	Bachman Information Systems, Inc.
Bachman/Data Analyst	Bachman Information Systems, Inc.
Bachman/WindTunnel	Bachman Information Systems, Inc.
BOCS	Berard Software Engineering, Inc.
BOCS for Windows	Berard Software Engineering, Inc.
DataDictionary/Solution (V.3.0)	Brownstone Solutions, Inc.

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PRODUCT	VENDOR
IE Admin/Solution	Brownstone Solutions, Inc.
REvolve (V.1.2)	Burl Software Laboratories, Inc.
DCNAP	BV Engineering Professional Software
ObjectTeam for Rumbaugh	Cadre Technologies Inc.
ObjectTeam for Rumbaugh for Windows	Cadre Technologies Inc.
ObjectTeam for Shlaer-Mellor	Cadre Technologies Inc.
Teamwork/OOA and Teamwork/OOD	Cadre Technologies Inc.
Teamwork/RT (Real-time)	Cadre Technologies Inc.
Teamwork/SA (Systems Analysis)	Cadre Technologies Inc.
JCL Navigator (V.2.0)	Canyon Software Corp.
Systems Design	CBT Systems USA
Distributor II	Cerritos Computer Services, Inc.
PacBase (V.8.0.2)	CGI Systems, Inc.
PacLAN (V.8.0.2)	CGI Systems, Inc.
PacLAN/X (V.2.0)	CGI Systems, Inc.
PacReverse	CGI Systems, Inc.
TimingDesigner (V.1.3)	Chronology Corp.
CASE	Cisco Public Safety Software, Inc.
Primus.Medics	CLINARIUM, Inc.
Dimension	Commercial Data Systems Corp.
Common Practice Legal Time and Billing (V.3.10)	Common Practice, Inc.
CA-CONSENSUS for CA-TELON	Computer Associates International, Inc.
CA-ESTIMACS	Computer Associates International, Inc.
Scan/COBOL	Computer Data Systems, Inc.
Silverrun (V.2.1)	Computer Systems Advisers, Inc.

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PRODUCT	VENDOR
Silverrun for Windows (V.2.1)	Computer Systems Advisers, Inc.
SAFECO	Computers and Structures, Inc.
DATATEC	Compuware Corp.
Pathvu (V.6.1)	Compuware Corp.
Trailblazer Source (V.2.1)	Cynepco, Inc.
WinSleuth Gold (V.3.04)	Dariana Software, Inc.
dMILL Network Kit for Clipper (V.4.11)	Database Software Consultants
X-Analysis Complete System	Databorough, Inc.
X-Repository	Databorough, Inc.
X-Rev	Databorough, Inc.
Crystal Ball (V.3.0)	Decisioneering, Inc.
Crystal Ball for Windows (V.4.0)	Decisioneering, Inc.
Software Metric Repository	Denver Metrics Group
CDD/Administrator (V.1.2)	Digital Equipment Corp. (DEC)
DEC DocLink (V.1.4)	Digital Equipment Corp. (DEC)
DECdesign (V.2.0)	Digital Equipment Corp. (DEC)
VAX Xway (V.1.2)	Digital Equipment Corp. (DEC)
LAN Command Advanced (V.2.3)	Dolphin Networks
Frequency Assignment System (FAS)	DOMUS Software, Ltd.
ES RE/Vision	Eden Systems Corp.
Elite System	Elite Data Processing, Inc.
Ripcam (V.2.24)	ELSID Software Systems, Ltd.
BottomLine	End If Software, Inc.
BottomLine for Windows	End If Software, Inc.
Documentation Support System (DOCS)	ES Technical Services Elec Sun, Inc.

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PRODUCT	VENDOR
EasyCASE Plus Developer's Edition (V.3.2)	Evergreen CASE Tools, Inc.
EasyCASE Professional (V.4.0)	Evergreen CASE Tools, Inc.
EasyCASE Professional for Windows (V.4.0)	Evergreen CASE Tools, Inc.
MacA&D	Excel Software
MacAnalyst (V.4.0)	Excel Software
MacAnalyst/Expert (V.4.0)	Excel Software
4S-BriefCASE	Four Seasons Software
FourGen Accounting	FourGen Software, Inc.
FuziCalc (V.1.11)	FuziWare, Inc.
COBOL*Express	Giraffe Systems, Inc.
CollectTrack	Goldsoft, Inc.
MedSeries 4 & MedSeries Open	GTE Health Systems, Inc.
Adelia User Module	Hardis Corp.
Teamwork Product Management (V.2.0)	HCm, Inc.
Teamwork/Structured Analysis	Hewlett-Packard Co.
Abstracts/DRGS (V.9.0)	HMDS
Statemate (V.5.0)	i-Logix, Inc.
SAA AD/Cycle	IBM (International Business Machines)
SAA AD/Cycle FastRef/2 (V.1, Rel.1)	IBM (International Business Machines)
Software Analysis Test Tool (V.1, Rel.3)	IBM (International Business Machines)
Workstation Interactive Test Tool (V.2, Rel.2)	IBM (International Business Machines)
ICAD System	ICAD
FreeFlow (V.4.0)	Iconix Software Engineering, Inc.
FreeFlow for Windows (V.4.0)	Iconix Software Engineering, Inc.
ObjectModeler	Iconix Software Engineering, Inc.

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PRODUCT	VENDOR
PowerTools	Iconix Software Engineering, Inc.
Ilog KADS Tool	Ilog, Inc.
C View (V.1.0)	ImageSoft, Inc.
C View for Windows (V.1.0)	ImageSoft, Inc.
IE:Advantage (V.6.1)	Information Engineering Systems Corp.
Operation Force	Information Spectrum, Inc.
OpenCASE/ToolBus	Informix Software, Inc.
Integral CASE Series Distribution	Integral, Inc.
Software through Pictures Integrated Structured Environment (Rel.4.2D)	Interactive Development Environments, Inc. (IDE)
ArchiText (V.1.5)	Interactive Software Engineering, Inc.
EiffelBench	Interactive Software Engineering, Inc.
EiffelCase	Interactive Software Engineering, Inc.
ISE Eiffel 3	Interactive Software Engineering, Inc.
Design Recovery (V.1.0)	Intersolv, Inc.
Design Recovery for Windows (V.1.0)	Intersolv, Inc.
Excelerator for Windows (XL/Windows) (V.2.0)	Intersolv, Inc.
Excelerator II (XL/II) (V.1.3)	Intersolv, Inc.
Intersolv Maintenance Workbench	Intersolv, Inc.
IPSYS HOOD Toolset	IPSYS Software
IPSYS Information Engineering Toolset	IPSYS Software
Enterprise Intelligence	IRI Software
JAM/CASE Interface for Teamwork	JYACC, Inc.
Fourman	Kingwood Systems, Inc.
ADW/Analysis Workstation (V.2.7)	KnowledgeWare, Inc.

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PRODUCT	VENDOR
ADW/Analysis Workstation for Windows (V.2.7)	KnowledgeWare, Inc.
ADW/Rapid Application Development Workstation for Windows (V.2.7)	KnowledgeWare, Inc.
ADW/Rapid Application Development Workstation (V.2.7)	KnowledgeWare, Inc.
NorthStar (V.1.0)	KnowledgeWare, Inc.
Forms*Converter	Kumaran Systems, Inc.
Lansa/RUOM	LANSA USA, Inc.
DB-Delivery for DB2	Legent Corp.
ED-The Programmer's Editor (V.8.0)	Lifeboat Publishing
ED-The Programmer's Editor for Windows (V.2.02)	Lifeboat Publishing
managerVIEW	MANAGER SOFTWARE PRODUCTS INC.
MethodManager	MANAGER SOFTWARE PRODUCTS INC.
DCD III (Data Correlation and Documentation System)	MARBLE Computer, Inc.
DCD-PC	MARBLE Computer, Inc.
Adagen	Mark V Systems, Ltd.
Adagen for Windows	Mark V Systems, Ltd.
Battlemap Analysis Tool	McCabe & Associates, Inc.
McCabe Instrumentation Tool (V.4.0)	McCabe & Associates, Inc.
EN4M (HVAC Energy Consumption, System Simulation and Economic Analysis)	MC2 Engineering Software
Expertise Training	MD Expert International, Inc.
Foundation Vista (V.4.2)	Menlo Business Systems, Inc.
Auditor	Mentor Graphics Corp.
Case Bench	Mentor Graphics Corp.

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PRODUCT	VENDOR
CodeLink Station	Mentor Graphics Corp.
OpenSelect CASE Starter	Meridian Software Systems, Inc.
ProMod/MD	Meridian Software Systems, Inc.
ProMod/SART	Meridian Software Systems, Inc.
ProMod/TMS	Meridian Software Systems, Inc.
Cradle SEE	Mesa Systems Guild, Inc.
Mesa/AD	Mesa Systems Guild, Inc.
Mesa/CUP	Mesa Systems Guild, Inc.
MetaDesign (V.3.0)	Meta Software Corp.
MetaDesign for Windows (V.4.0)	Meta Software Corp.
Guru (V.3.1)	Micro Data Base Systems, Inc.
Design Center for Windows (V.6.0)	MicroSim Corp.
Design Center with Circuit File Entry (V.6.0)	MicroSim Corp.
PSpice Design Center 1	MicroSim Corp.
ORO Project Management Software System	Nichols & Co., Inc.
Envy/Developer (Rel.1.41)	Object Technology International, Inc.
ObjecTime (V.4.1)	ObjecTime, Ltd.
CASE Exchange (V.1.0)	Oracle Corp.
CASE*Dictionary (V.5.0)	Oracle Corp.
CASE*Generator for SQL*Forms/SQL*Menu (V.2.0)	Oracle Corp.
Spag (V.3.0)	OTG Systems, Inc.
PGC CASE Graphics (V.1.0)	Pacific Gold Coast Corp.
PGC CASE Graphics for Windows (V.1.0)	Pacific Gold Coast Corp.
SIMFLEX-II	Peng Engineering
Slot-It Master	Performance Analysis Corp.

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PRODUCT	VENDOR
Phase3	Phase3 Software, Inc.
SA Object-Oriented Analysis and Design Option (OOA/D) for Windows	Popkin Software & Systems, Inc.
SA Project Documentation Facility Option for Windows	Popkin Software & Systems, Inc.
SA Project Documentation Facility Option	Popkin Software & Systems, Inc.
SA/PowerBuilder Link (V.2.0)	Popkin Software & Systems, Inc.
System Architect (V.3.0)	Popkin Software & Systems, Inc.
System Architect for Windows (V.3.0)	Popkin Software & Systems, Inc.
Process Advisor	R.S. Pressman & Associates, Inc.
Prism Warehouse Manager (V.3.5)	Prism Solutions, Inc.
Flexbuild	Progressive Solutions, Inc. (CD)
ETK (Easy Tool Kit)	QUIXX Corp.
HyperAnalyst (V.5.1)	Rapid System Development, Inc.
Rational Rose (V.1.5)	Rational
Rational Rose for Windows	Rational
Refine/COBOL	Reasoning Systems
Software Refinery	Reasoning Systems
Reveal Interactor	Redwood Design Automation, Inc.
ExecPlan	Sawhney Software, Inc.
SBT Time Billing	SBT Corp.
SES/Objectbench	Scientific and Engineering Software, Inc.
COBOL Analyst	SEEC, Inc.
High Productivity Systems (V.5.0)	Seer Technologies, Inc.
MasterCore	Sharpe Systems Corp.

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PRODUCT	VENDOR
SPAYN	SILVACO International, Inc.
PCModel	SimSoft, Inc.
A_Fault	SKM Systems Analysis, Inc.
SmartStar VMS (V.6.1)	SmartStar Corp.
ATF (Automated Test Facility) (V.2.0)	Softbridge, Inc.
LogiCASE Workstation for Systems Analysis and Design	Softlab, Inc.
Natural Architect Workstation	Software AG of North America, Inc.
Natural Predict	Software AG of North America, Inc.
Predict CASE	Software AG of North America, Inc.
Predict CASE Workstation and Coordinator	Software AG of North America, Inc.
Resuscitator Analyzer (COBOL)	Software AnalySYS, Inc.
RPG/400 ZED (Zoom Editor)	Software Contraptions
SE/One (V.3.2)	Software Eclectics, Inc.
ParaSET	Software Emancipation Technology, Inc.
SRMS Complete Professional	Software Resources Corp.
SRMS Complete Professional for Windows	Software Resources Corp.
SRMS Engineer	Software Resources Corp.
SRMS Engineer for Windows	Software Resources Corp.
AISLE/ADADL	Software Systems Design, Inc.
AISLE/ARIS	Software Systems Design, Inc.
AISLE/DocGen	Software Systems Design, Inc.
CISLE/CDADL	Software Systems Design, Inc.
CISLE/CRIS	Software Systems Design, Inc.
TABS III (V.7.0)	Software Technology, Inc. (NE)

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PRODUCT	VENDOR
BriefCASE	South-Western Publishing Co.
SPSS (V.5.0)	SPSS, Inc.
SPSS for Windows (V.6.0)	SPSS, Inc.
MacBubbles	StarSys, Inc.
Answer:Architect	Sterling Software, Inc.
SAMS:Defrag	Sterling Software, Inc.
ContraxPlus	Strategic Decision Systems, Inc. (SDS)
TurboCASE (V.4.0)	StructSoft, Inc.
I-DEAS Tolerance Analysis	Structural Dynamics Research Corp. (SDRC)
FStar (V.1.70)	Structural Research and Analysis Corp.
Sybase SQL Server (V.10.0)	Sybase, Inc.
SNAP Teamwork/OOA	Template Software, Inc.
CSA (Current Systems Analysis)	Texas Instruments, Inc.
Ferret	Tiburon Systems, Inc.
Transition I (V.2.3)	Transition Systems, Inc.
Breeze Haz	Trinity Consultants, Inc.
Roark & Young on TK (V.2.0)	Universal Technical Systems, Inc.
Vantage-P&C	Vantage P&C Systems, Inc.
VSA-2D	Variation Systems Analysis, Inc.
ASA	Verilog, Inc.
Logiscope	Verilog, Inc.
Existing Systems Workbench (ESW)	Viasoft, Inc.
VIA/Renaissance	Viasoft, Inc.
Design Entry	Viewlogic Systems, Inc.
Viewtrace	Viewlogic Systems, Inc.

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PRODUCT	VENDOR
Workview Solution Packages	Viewlogic Systems, Inc.
Workview Solution Packages for Windows	Viewlogic Systems, Inc.
CASE Education Package	Visible Systems Corp.
SSADM-SF/SSADM4-SF	VSF (Virtual Software Factory, Ltd.)
Texel-SF	VSF (Virtual Software Factory, Ltd.)
IEWS-SF	VSF (Virtual Software Factory, Ltd.)
Westmount I-CASE SSADM (V.1.0)	Westmount USA, Inc.
Westmount I-CASE Ward/Mellor (V.3.1)	Westmount USA, Inc.
Westmount I-CASE Yourdon (V.3.1)	Westmount USA, Inc.
Xinotech COBOL Composer (V.2.0)	Xinotech Research, Inc.
Xinotech COBOL Composer for Windows (V.2.0)	Xinotech Research, Inc.
Analyst/Designer Toolkit (V.6.1)	Yourdon, Inc.
DesignAid II (V.1.0)	Yourdon, Inc.

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