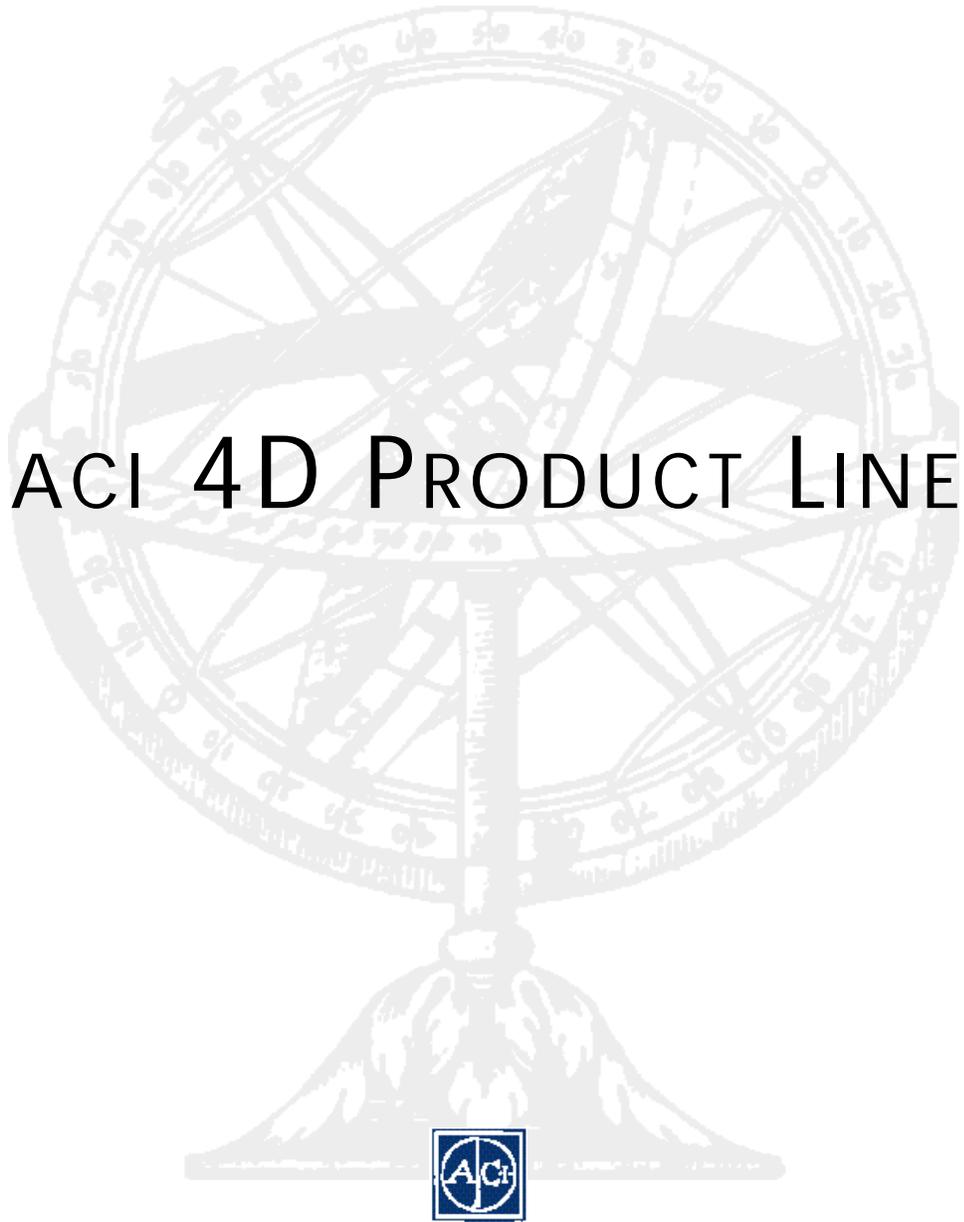




ACI 4th Dimension

v6

# ACI 4D PRODUCT LINE





## Introducing ACI 4th Dimension Version 6

“OVER THE LAST FEW YEARS,” states one 4th Dimension user, “we have had many opportunities to switch to other products, but the bottom line is that they still don’t measure up to 4th Dimension. Literally, there’s nothing we have been unable to do. If you can imagine it, you can do it with 4D.”

The 4D product line is a foolproof data management environment aimed at power users and professional developers. With 4D Version 6, ACI delivers more than an upgrade—it is a fully revamped 4D.

The philosophy behind this major revision resides in the change the Internet has brought to the way users view data and data management. 4th Dimension is designed to recognize that users expect data management systems to manage, send, enter, and retrieve information transparently—they do not care where data resides or how it is moved. With this in mind, ACI has incorporated Web capabilities into its newest release.

In 4D Version 6, Web handling is treated as a standard database task and a typical dimension of the second generation of 4D integrated client/server architecture. A 4D user can use any 4D form in a browser and publish data on the Web without writing a line of code. A Web client is just another 4D client, exploiting the most acclaimed 4D client features, such as context and transaction management. For example, Web clients benefit from built-in manipulation of 4D selections and can enter data without compromising data integrity.

This approach to the Web is in sync with the desire for simplicity also expected by Windows 95 and Windows NT 4 users. They need plug-and-play and versatile tools with which they can interact, similar to what happened in the Macintosh world towards the end of the 1980s. 4D is typically the product that new generation of power users and IS managers will appreciate, because all they have been promised is tangible reality with 4D:

- ▶ Platform and interface independence enabling any application to run without modification on any Windows and Macintosh environment
- ▶ Extensive drill-down Explorer for accessing all 4D areas
- ▶ Efficient form wizards accessible to first-time database users
- ▶ Advanced wizards for template building
- ▶ Object- and event-based model for dramatic code reduction
- ▶ Powerful built-in user wizards for queries, labels, reports, charting, and more
- ▶ Simple path from prototyping to production
- ▶ Straightforward tools enabling easy debugging, code reusability, and cross-platform compilation
- ▶ Cost-effective development and maintenance
- ▶ Transparent, multi-tiered application design
- ▶ Scalable, user-centric, modular client/server environment empowering business units by enabling flexible reapportioning of tasks between users and IS managers

## Simple and seamless—the 4D product line

### 4TH DIMENSION

4th Dimension is the base product of the 4D product line. 4th Dimension is a 32-bit, graphical, multi-threaded relational database designed for end users and expert developers. Combining an intuitive interface with a powerful programming language, 4th Dimension is the ideal development and deployment environment for companies of all sizes. With 4D, you can create virtually any application type, from simple contact management systems and product catalogs to sophisticated multimedia applications and full-scale accounting packages.

The 4D product line meets a wide variety of needs, equally serving:

- ▶ Power-users wanting to create personal applications
- ▶ Vertical-market application developers
- ▶ Professional corporate programmers and system integrators

The 4D solution is the most consistent and cost-effective choice on the market:

- ▶ A 4D application created on one platform is deployable immediately on another. 4D provides native support for Windows 95, Windows NT, Macintosh, and Power Macintosh.
- ▶ Any single-user application scales easily to a workgroup client/server solution with 4D Server
- ▶ Any 4D or 4D Server application interfaces smoothly with existing enterprise databases via 4D Connectivity products.

Because the same tool can be utilized in many situations, companies using 4D save the time and cost associated with maintaining multiple development environments.

### 4D SERVER

4D Server is the multi-user version of 4th Dimension based on a robust client/server architecture.

4D Server fills the gap between desktop products and multi-user minicomputer and mainframe data systems. 4D Server is ideal for users who have outgrown current PC systems based on file-sharing technology, but who cannot justify the cost of traditional client/server systems.

4D Server delivers benefits from both ends of the spectrum, combining the user-focused characteristics of 4D with the data management capabilities of a client/server architecture. 4D Server does not force users to change the personal working style they have gained thanks to desktop computing.

### 4D DEVELOPMENT TOOLS

4D Compiler is a true machine-language compiler optimized to support a wide range of processors:

- ▶ 80386, 80486, and Pentium
- ▶ Macintosh 68020, 68030, 68LC040, 68040, and 68881/68882 math co-processors
- ▶ Power PC 601, 603, 603e, 604

4D Insider is a point-and-click, drag-and-drop code servicing system enabling component builders and users to modularize or merge existing applications, and to examine database objects and their dependencies.

### 4D EXTENSIBILITY TOOLS

The 4D Extension Kit delivers libraries, documentation, and examples to create 4D Plug-ins. Hundreds of 4D Plug-ins are currently available.

### 4D OPEN

4D Open is the 4D application program interface (API), consisting of Pascal and C libraries on Macintosh, C/C++ libraries on Windows, and a 4th Dimension extension package.

4D supports DLL and DDE tools and is also an OLE2 container for creating, editing, and storing OLE objects within Picture or BLOB fields. 4D ODBC

## Simple and Seamless — the 4D Product Line

enables connection to any product supporting an ODBC driver.

### 4D PRODUCTIVITY PLUG-INS

4D Productivity Plug-ins act as compound database objects. In addition, all plug-ins ensure two-way communication with 4D data. Programmability of plug-ins enables sophisticated applications and elaborate user interfaces.

**4D Calc** is a complete spreadsheet designed for analysis, simulation, review, and forecasting of numerical data.

**4D Draw** is a drawing plug-in for creating diagrams, floorplans, technical illustrations, engineering documents, architectural blueprints, and more.

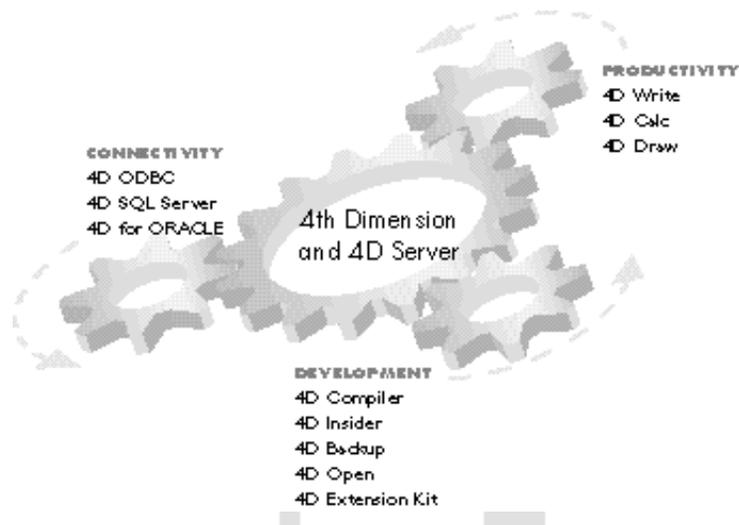
**4D Write** is a simple, elegant tool for creating and modifying all types of textual documents, from simple letters to complex contracts.

### 4D CONNECTIVITY PLUG-INS

With the 4D Connectivity Plug-Ins, 4D becomes a powerful client to back-end SQL databases. 4D applications can query data from various servers

simultaneously, merge and display the result with a unified interface, either directly inside 4D or inside any Web browser accessing 4D.

- ▶ Direct access to low-level APIs: Each connection is built on the native API for its own environment: Open Client for Sybase, OCI for ORACLE.
- ▶ High-level routines: multiple lower-level functions in one call
- ▶ Debugger window
- ▶ Automatic data type conversion
- ▶ Local database engine
- ▶ Static and semi-static storage to enable remote operations and subsequent synchronization)



## Zooming in on 4D and 4D Server

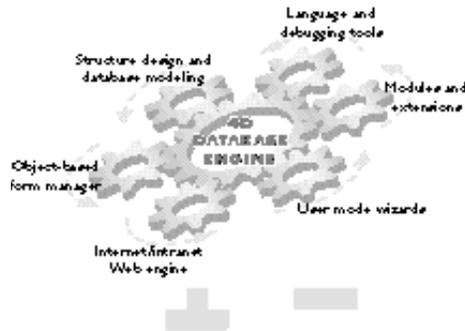
### ZOOMING IN ON 4D

4D is composed of complementary parts linked by a powerful database engine providing:

**Efficiency** . All parts of the program understand each other. What is done in one area (for instance, a change in an object method inside a form) automatically reflects in any method referring to that method.

**Interactivity** . Programming and testing are interactive. For example, changes in a form are immediately visible in the form usage window.

**Extensibility** . External programs and Web browsers benefit from all features of the 4D architecture.



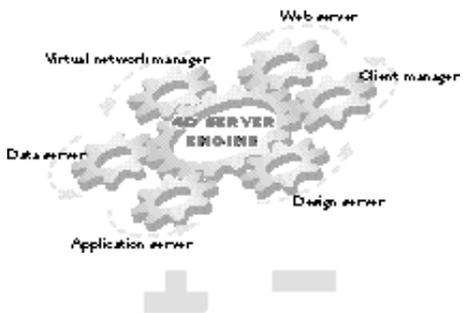
### ZOOMING IN ON 4D SERVER

4D Server fills the gap between low-end, file-sharing-based systems and complex, SQL-based relational database management systems. 4D Server is easy to install, easy to use, and easy to administer. 4D Server activity is displayed on one screen. All other administration tasks are handled automatically.

The multi-threaded 4D Server architecture delivers a wide range of integrated services:

**Development Server** . 4D Server manages tables, forms, methods, and plug-ins for multi-user development, and dynamically updates client workstations.

**Client Manager** . 4D Server has built-in capabilities for automatic control and administration of client connections.



**Web Server** . 4D Server is a complete Web server, including a "persistent connection" scheme and automatic management of multi-user access.

**Data Server** . In addition to sending and receiving data, 4D Server manages record selections and provides automatic record locking and release. Stored procedures allow fast execution of I/O intensive tasks.

**Protocol Manager** . 4D Server automatically manages connections to both local and remote heterogeneous protocols asynchronously.

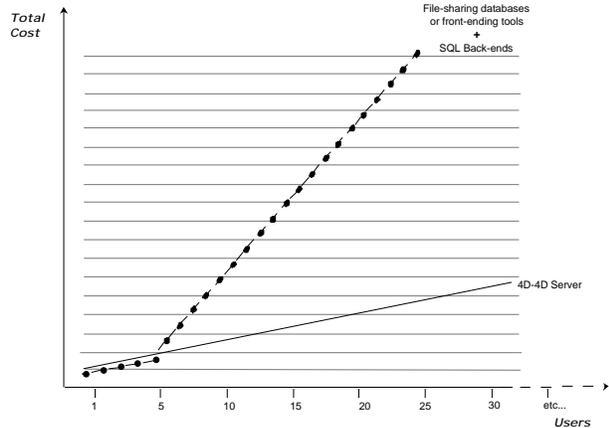
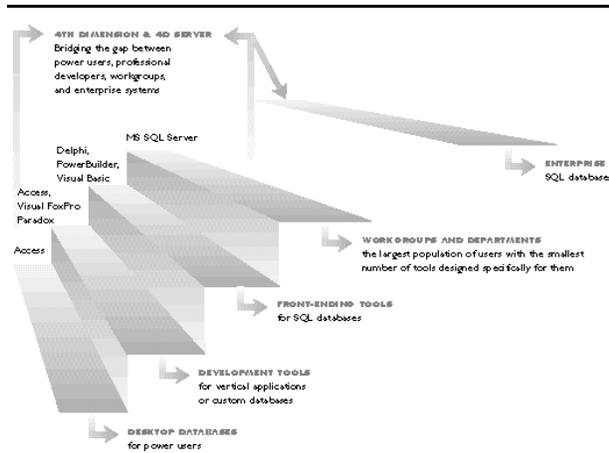
**Application Server** . 4D Server includes an application distribution engine that automatically tailors application code for each user's platform and work-pattern. Combined with the 4D Connectivity Plug-ins, 4D Server is an ideal way to maintain three-tiered architectures. 4D Server integrates a cross-platform application server, allowing immediate deployment in multiple environments (Windows 95, Windows NT, Macintosh, and Power Macintosh). The combination of 4D Server and 4D Open allows fully distributed workgroup architectures. In conjunction with 4D Connectivity Plug-ins, 4D Server is an ideal gateway to corporate information repositories, enabling easy data population from heterogeneous databases.

4D Server implements Windows NT services and can launch as a Windows NT service.

# Scalable, cost-effective architecture

Data management is compartmentalized, with hardly any interaction between various tools. For example:

- ▶ Power user databases are usually self-contained.
- ▶ Front-end tools for enterprise databases do not communicate with desktop databases.
- ▶ Enterprise databases are disproportional to departments and workgroups, and are rarely connected with local database systems shared by small groups.



The 4D product line encompasses a wide variety of needs, equally serving:

- ▶ Power-users wanting to create personal applications
- ▶ Vertical application developers, within large- or small-to-medium size businesses
- ▶ Departments and workgroups
- ▶ Enterprise database systems

As a a database management system for workgroups, the 4D product line facilitates team building by:

- ▶ Creating a smooth continuity between the personal productivity and the workgroup environments. By implementing the 4D Server client/server architecture, IS managers do not require users to change the personal working style gained with desktop computing.
- ▶ Naturally reappportioning tasks and promoting cooperation between users, business unit managers and IS managers.
- ▶ Enabling communication, facilitating acceptance and encouraging feedback inside a business, thus reducing support, training, and administration costs.

The 4D solution is the most economical choice on the market. A 4D application created for a single-user environment can be reused in a client/server context with no redesigning or discarding as the platform and number of users change. Because the same tool can be used in many contexts, a company can save extensive management expenses associated with coordinating several teams.

## A new dimension of RAD

Now that every vendor claims to support rapid application development (RAD), it is not enough to be only RAD. The questions are how, at what extent, and to do what. With 4D, rapid application development reaches a new level by:

- ▶ Applying to a fully relational database system deployable in a client/server architecture, not only to front-end interface design for SQL back ends developed independently.
- ▶ Integrating all areas of database development, such as compilation, code reuse, maintenance, and administration.
- ▶ Addressing cross-platform needs: Macintosh, Windows 3.1, Windows 95 and Windows NT. A single development automatically enables client/server deployment on any of these platforms individually or simultaneously.
- ▶ Enabling simultaneous development and testing by providing a straightforward team-development system with fully automated management of developer workgroups.
- ▶ Allowing straightforward multi-user development, eliminating the need for cumbersome check-in, check-out systems.

4D and 4D Server RAD power excels in these six main areas:

- A powerful Explorer enables smart navigation within the various modules of the development architecture.
- An intelligent design environment allows users and developers to focus more on business data management and less on table management.
- An object-based form editor dramatically simplifies user interface creation.
- An efficient programming language and powerful debugger reduce development time and constraints.
- High quality tools support the development environment—4D Compiler for multiple platforms and 4D Insider, for code management, maintenance and reusability.
- The graphical user interface facilitates administration of the client/server architecture.

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### 4D EXPLORER



The 4D development architecture is composed of closely interacting parts accessible through the 4D Explorer. The 4D Explorer displays tables, forms, methods, constants, commands, and user-defined hierarchical lists. It can be resized vertically and horizontally and includes an expanding/collapsing preview area.

## Designing a database

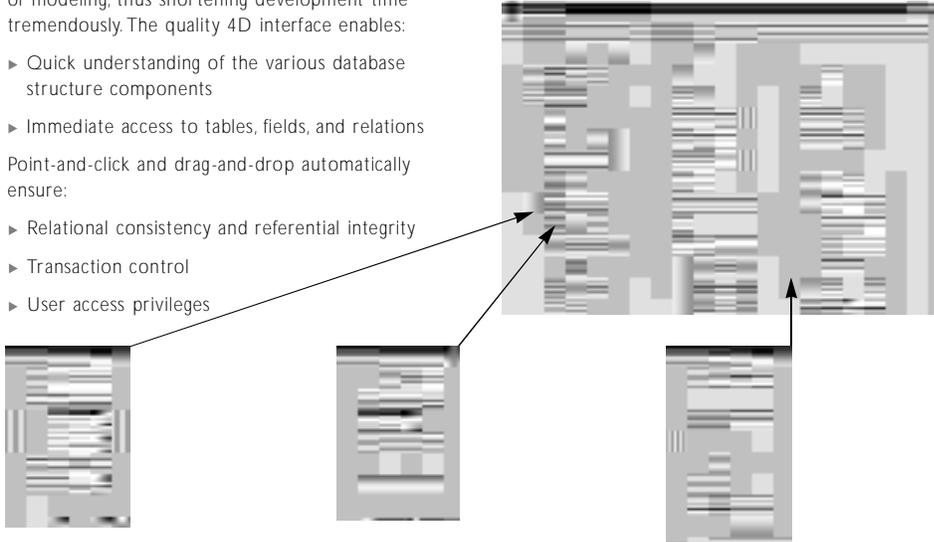
Designing a 4D database structure graphically represents the business context in which the database will be used. With its graphical engine, 4D combines RAD efficiency with the power of modeling, thus shortening development time tremendously. The quality 4D interface enables:

- ▶ Quick understanding of the various database structure components
- ▶ Immediate access to tables, fields, and relations

Point-and-click and drag-and-drop automatically ensure:

- ▶ Relational consistency and referential integrity
- ▶ Transaction control
- ▶ User access privileges

Color is the most intuitive way to create and manage classes of tables, fields, and relations. Different colors allow immediate visualization and understanding of the various parts or modules of an application.



### TABLE PROPERTIES

**Privileges.** Managing access privileges for loading, saving, adding, or deleting records in a table. Privileges work in conjunction with the integrated 4D password system.

**Triggers.** Automating trigger management. Global attributes to the table, such as invisibility or deletion, can also be assigned.

**Color .** Defining the color of the table text or background.

### FIELD PROPERTIES

**Attributes.** Selecting the data type (Alpha, Text, Date, Numeric, Time, Boolean fields, Picture, BLOB and Subfile fields, for creating multi-valued areas.

**Controls.** Users can simultaneously select data entry automatic controls and attributes for the field, including: Indexed, Mandatory, Unique, Display Only, Can't Modify, Invisible, and assign. For a field, a predefined list of values or ranges of values can be defined. For images, compression methods can be chosen.

**Help.** Enabling users to create tailored help messages associated to fields.

**Color .** Defining the field color.

### RELATION PROPERTIES

Users create relations simply by drawing lines between fields in tables. If the relation is drawn graphically, references to the related tables are dynamically updated. Many-to-one and one-to-many relations are established without programming. Selecting the Auto-assign Related Value check box automatically assigns related values in the Many file when records are entered into an embedded table in the One Table.

Using the Wildcard Choice list selects an additional field to be displayed in the selection window during data entry. Selecting a Deletion Control option provides relational integrity.

# Powerful form wizards

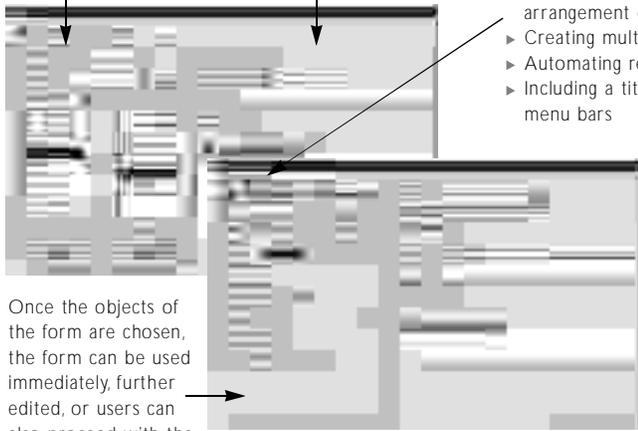
Once a database structure is created, the application can run immediately because 4D generates default forms. For more elaborate forms, 4D delivers an extensive object-based form manager, sparing hours of programming by facilitating the reuse of forms and form templates.

4D Wizard creates very simple forms for immediate use. The Advanced 4D Wizard creates sophisticated templates allowing template building by example.

## 4D FORM WIZARDS

Choosing fields and related fields

Viewing modifications in real time



Once the objects of the form are chosen, the form can be used immediately, further edited, or users can also proceed with the Advanced Wizard.

### Options

- ▶ Choosing the form size (width and height)  
Adjusting a form to a target window or monitor
- ▶ Automating label placement (on top, in front, or no label)
- ▶ Displaying one field per line (forcing vertical arrangement of fields)
- ▶ Creating multiple and master pages, if necessary
- ▶ Automating record numbering
- ▶ Including a title, background picture, and associated menu bars

### Styles

- ▶ Defining font, size, and style for each type of textual object for the current or related tables
- ▶ Objects and object groups can use database style sheets. Modifying style sheets simultaneously modifies all objects.
- ▶ Choosing a platform interface and colors for background and foreground

### Buttons

- ▶ Placing buttons on the form, selecting a family of buttons, and defining the action to perform



## Object-based form editor

The 4D Form Editor is a complete tool palette capable of competing with advanced drawing programs. It is fully object-based, allowing point-and-click and drag-and-drop control on all events, objects, fields, variables, graphics, related tables and subforms.

General form properties include the name of the form, its platform interface, a default window title, access group, owner group, events handling, default windows size (automatic, manual, from an object), and resizing options (resizing vertically, horizontally or both; minimum and maximum size).

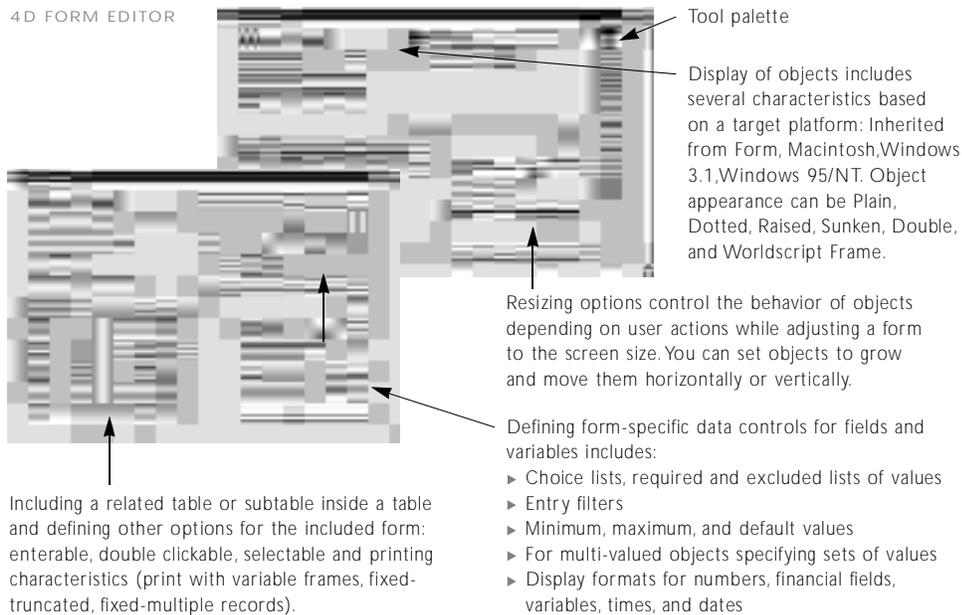
4D allows complete control over each object within a form, ranging from its platform appearance to the execution of scripts attached to that object. Each object is identified by a name.

General specifications include:

- ▶ Three measurement systems (pixels, inches, metric)
- ▶ Customizable grid
- ▶ Drag-and-drop

- ▶ All alignments (right, left, top, bottom, vertical center, horizontal center, to grid, vertical, and horizontal object distribution)
- ▶ Smart object duplication
- ▶ Smart "reduce to fit"
- ▶ Object layering control
- ▶ Style sheets
- ▶ Master page
- ▶ Transparent objects
- ▶ Hide/show objects
- ▶ Automatic framing
- ▶ Undo of last operation
- ▶ Cut, copy, and paste maintain object properties
- ▶ Revert to saved
- ▶ Automatic creation/numbering of variable arrays
- ▶ Smart object grouping for scrollable areas

4D FORM EDITOR



## Smart programming environment

The 4D programming environment saves development time by delivering a high-quality interface, providing outstanding readability for writing and debugging code. 4D modular programming capabilities adapt to the wide variety of programming needs that occur when using a powerful relational database for mission-critical applications locally, remotely, and on the Internet.

4D implements four method types:

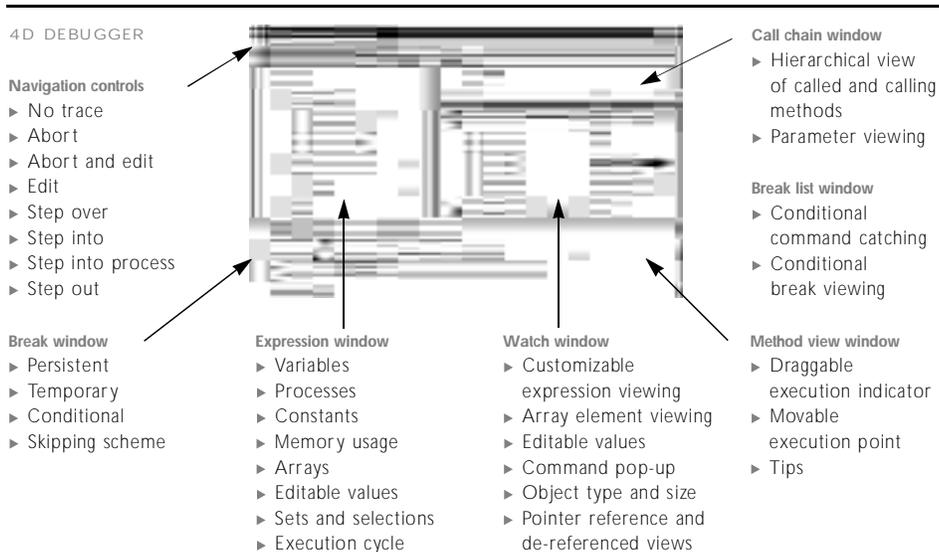
- Object methods
- Table methods or triggers
- Database methods
- Project methods

Each method type manages the part of the database for which it is responsible. The technique for writing each type of method is identical, providing power users and developers with coherent code throughout the database.

The strength of a fourth-generation language is its drastic reduction in code required to perform a task.

The 4D language excels in five main areas:

- The same code runs on the client and the server (triggers and stored procedures). The user can choose how thin he/she wants the client.
- Transparent encapsulation of any graphical object, whether built-in or user-defined, inside the 4D language.
- Compact all-inclusive commands.
- Easy blending with external applications.
- A strong, extensive architecture, providing over 550 high-level commands presented alphabetically or by theme in hierarchical menus; up to 32,767 local, process, and interprocess global variables supporting all data types; true one- and two-dimensional arrays unlimited in size; parameter passing with optional parameter passing scheme; full recursivity support; and pointers to data objects, allowing generic programming and code reusability.



## Powerful tools of the 4D environment

Along with a wide variety of built-in tools for database repair and localization, the 4D development environment includes two key components for professional development, 4D Compiler and 4D Insider.

### MULTI-TARGET COMPILER

4D Compiler is a machine language compiler for 4D databases. It has the unique ability to allow 4D developers and customers to create compiled, executable, double-clickable applications, and client/server and Web server applications. 4D is optimized to support a wide range of processors:

- ▶ 80386, 80486, and Pentium
- ▶ Macintoshes 68020, 68030, 68LC040, 68040, and 68881/68882 math coprocessors
- ▶ PowerPC 601, 603, 603e, and 604



Using 4D Compiler is extremely simple. Choose a database, select your options, and sit back as 4D Compiler generates a compiled version of the application and controls the quality of your code. Range checking displays a clear message including the method name, the line, and the complete description of errors. Your original database is never altered. And, because 4D Compiler is from the publishers of 4th Dimension, you are assured it works consistently with your database. 4D Engine, when used with 4D Compiler, creates merged, stand-alone applications.

### DATABASE MAINTENANCE AND CODE REUSABILITY

4D Insider is a point-and-click, drag-and-drop code servicing system enabling components builders or users to modularize or merge existing databases. 4D Insider provides:

- ▶ A complete structural dictionary of 4th Dimension databases. 4D Insider displays the various database objects, all the interdependencies between objects, and provides a sophisticated navigation and global search and replace capability. 4D Insider can also print a complete cross reference, simplifying documentation of your application.
- ▶ The ability to move table definitions, forms, and methods across databases while retaining all object properties, and to create new databases with previously created components and interdependent components.
- ▶ The ability to create a 4D database structure from SQL files generated by CASE tools. The corresponding 4D database contains tables, fields with their types, and relations between tables.
- ▶ Easy translation of 4D databases. To ease translation of databases into different languages, 4D Insider enables developers to export all textual elements and re-import them after translation.



## Administration and security

Maintenance of a system initially depends on the internal quality of the database engine, its capability to provide feedback to IS managers and users, and the number of existing security devices. One of the most obvious 4D strengths lies in the quality of its development tools and engine design. In each area of the product, the 4D engine delivers immediate and automatic feedback to users and application developers. While delivering error messages, 4D also indicates ways of solving problems, delivering practical solutions in a large number of circumstances such as simple syntax errors, disconnection from the server, and disk space management.

### GRAPHICALLY ADMINISTRATING 4D SERVER

The 4D Server interface consists of one main screen, displaying server activity:

- ▶ Name of the database and data file
- ▶ Total memory allocated to 4D Server
- ▶ Amount of memory 4D Server has allocated to the data cache
- ▶ Number of connected users and their names
- ▶ Number of processes for each user, including the status of each process
- ▶ Two thermometers indicating server activity and cache hit ratio

All other database administration tasks are managed automatically and dynamically by 4D Server. These include object management, size control, dimensioning of files, and balancing of indexes. 4D Server also provides automatic and procedural control for managing data integrity and transactions. For example, if a client accidentally disconnects, 4D Server automatically removes its processes, cancels its transactions, and unlocks all its objects.

### THE 4D PASSWORD EDITOR

The 4D Password Editor is a complete environment. The password system reflects the exact authority that groups or individuals have inside a company and handles interaction between these groups. With the password system you can:

- ▶ Specify database users, create groups of users with different levels of database access, and create a hierarchy of users
- ▶ Specify the group ownership of the objects each user creates
- ▶ Assign a start-up procedure for each user
- ▶ Specify a group owner
- ▶ Control access to the design environment, table definitions, record operations, forms, methods, and menu items

### 4D BACKUP

The various 4D Backup features include full backup and restore capabilities, log file, recovery system, and database mirroring. 4D Backup also delivers:

- ▶ **Complete procedural control.** Over 30 commands let you automate every aspect of 4D Backup, from initiating a full backup to integrating a log file.
- ▶ **Multi-set backups.** 4D Backup will automatically cycle through several "sets" when creating full backups. If a database error goes undetected for a period of time, users can choose the appropriate backup set to use when rebuilding the database. Database sets can be archived and even moved off-site for the most sensitive applications.
- ▶ **Multi-volume backups on any media.** 4D Backup saves to any mounted volume, including floppy disks, hard disks, tape drives, and more. When writing to a volume, 4D Backup verifies available space and splits files across several volumes as needed.
- ▶ **Error detection and repair.** If the database, log file, or media is damaged, 4D Backup uses a system of checksums to locate and correct the problem. 4D Backup can also erase the destination media before beginning a backup and verify a backup after it is written.

## A new age of Internet database access and publishing

4th Dimension Version 6 is an integrated database and Web server. No CGI or additional software is required to serve your data via the Web. Ensuring Web access to your application is as easy as clicking a check box in the Preferences dialog. No code changes are necessary. 4D and 4D Server view any Web browser as a 4D client, extending built-in 4D database features. Because 4D supports external products and HTML formats, users can add any external product, JavaScript application, or Java applet to built-in 4D features.

### ACCESSING 4D FROM A BROWSER

Any 4D form is converted to an HTML page on-the-fly, and all images automatically convert. Users access 4D transparently under the conditions chosen by the Webmaster or the database designer. Conversely, HTML documents created with any HTML page editor can be used as interfaces to 4D databases, because HTML variables can be associated to 4D variables and methods. When a browser accesses a 4D database, 4D creates a process enabling the connection. The number of processes opened by 4D is virtually unlimited. 4D integrates a persistent connection scheme that can be customized by the Webmaster.

### DATA ACCESS

You can select, insert, update, and delete relational data in both 4D and SQL databases connected via 4D ODBC, 4D SQL Server, and 4D for ORACLE. Web browsers benefit from all powerful 4D features: Population of several records within a current selection, transparent manipulation of the current selection without additional queries, double-clickable records within the selection, and more. 4D Server automatically maintains the current selection on the server side as long as the process is kept alive. The duration of a process can be customized by the Webmaster or the database administrator.



### DATABASE INTEGRITY AND TRANSACTION MANAGEMENT



Web users benefit from 4D and 4D Server built-in transaction management capabilities. 4D records in use are automatically

locked and released when appropriate. A message is automatically delivered to the Web user in case he/she wants to modify a record in use by someone else. If errors are encountered during data manipulation, changes are cancelled by the 4D automatic rollback management system.

### DATABASE ADMINISTRATION AND ERROR HANDLING

Database administration is as simple and transparent in a Web context as in the regular 4D client/server environment. Webmasters can easily view statistics on number of connections and average connection time, analyzing nature and content of transactions processed over the Internet.

Web users benefit from elaborate built-in error handling and 4D automatic messaging. Additional messages can be added as needed.

See the ACIU's white paper "4th Dimension: The New Dimension of Internet Database Access and Publishing" for a complete description of 4D integrated Web capabilities.

## Data access and navigation

The powerful, user-centered 4D interface facilitates data access, manipulation, and navigation, featuring:

- ▶ Built-in wizards and editors
- ▶ Powerful and transparent management of selections of records

In the 4D environment, selection of records is as intuitive as it is in everyday life. Data displayed in lists is not simply information represented on the screen—it is a live object. For instance, double-clicking can display more detailed information or enable data modification in a multi-level drill-down technique. Additionally, users can click on rows to create discontinuous selections on the fly.

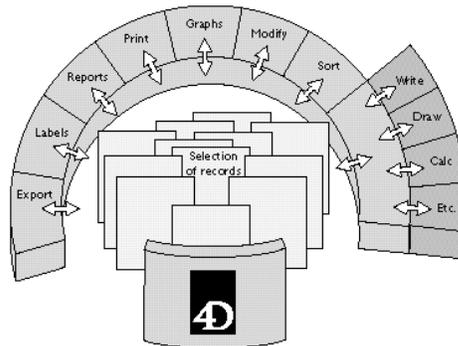
Built-in point-and-click and drag-and-drop wizards and editors include:

- ▶ Four query wizards and a multi-lingual sort editor
- ▶ Export and import editors associated with an intuitive ASCII mapping scheme
- ▶ Quick report editor
- ▶ Chart editor
- ▶ Label editor that surpasses dedicated packages



4D wizards and editors can be used inside fully customized applications. One line of code immediately brings each editor, with all its functionality, to an application.

When a query is processed, 4D automatically maintains the resulting selection of records and treats it as a database object without data duplication. Because current selections are maintained, a single search can be used in a variety of operations without requiring the query to be re-executed. The same selection can be used in various contexts, such as quick reports, labels, charts, exports or subqueries. Since current selections are randomly accessible users can create, and conveniently manipulate, thousands of records within one or many simultaneously active windows.



The 4D management of current selections eliminates network traffic jams caused by report generation in a multi-user situation. 4D Server automatically manages each client query environment and maintains several concurrent selections, automatically and transparently acting as an application server.

In multi-user situations, 4D Server maintains a current selection for each user process and automatically handles record locking inside the selection. Once the record is released, it becomes available for modification for any other current selection containing that record. 4D Server current selection management avoids the dangers of database replication and synchronization changes in multi-user situations.

# ACI 4D Compiler: The new dimension of fast, cross-platform development

**4**D COMPILER is a multi-target compiler developed for 4th Dimension and 4D Server applications. It is designed to be both powerful and easy to use—thus allowing both beginners and power users to benefit from its feature set. As a true machine-language compiler, 4D Compiler allows you to compile applications for a wide range of processors including:

- ▶ Intel 80486, and Pentium
- ▶ Motorola 68020, 68030, 68LC040, 68040, and 68881/68882 math co-processors
- ▶ PowerPC 601, 603, 603e, and 604

Because compiled 4D applications take full advantage of the processor speed, it is not uncommon to see compiled applications execute at speeds three to 1,000 times faster than the interpreted counterpart.

In addition, 4D Compiler provides extensive diagnostic warnings and error messages not found in conventional compilers. 4D Compiler also provides:

- ▶ Systematic analysis of your database and extensive diagnostic warnings and error messages
- ▶ List of all the variables used in the database with their compiler directives
- ▶ Automatic typing of active objects, numbers, and character strings
- ▶ Dynamic runtime error checking of the compiled database
- ▶ Interactive debugging with 4th Dimension
- ▶ Standalone executable applications using 4D Engine

## COMPILATION MAIN OPTIONS

4D Compiler is a complete point-and-click application. The 4D Compiler main window presents the most common options immediately. Additionally, more advanced options are available at the user's request. The main goal of 4D Compiler is to provide native compiled code for all the available 4D platforms. In addition, the 4D Compiler design was created very carefully, such that its power was not intimidating to the new user. In most cases, users can simply launch 4D Compiler and compile their database application in a few clicks of the mouse. Alternatively, a more advanced user can fine tune several settings to extract the best performance possible from his or her database.

### Main window

Each icon can be selected or deselected. Your 4D Compiler product may have some or all of these options enabled.



### Compiled database status

A compiled database is a replica of the original database; it operates exactly like the latter, except that you cannot access the Design environment and it executes native compiled code for the processor for which it was compiled. Unbeknownst to the user, 4D Compiler always works with a copy of your target application to ensure that your original source code is protected.

# Compilation main options

## Create executable applications

You can merge your compiled database with 4D Engine and create a standalone executable application. On Macintosh, 4D Compiler merges 4D Engine and the compiled database application into a single, double-clickable application. On Windows, the compiler generates three files: DatabaseName.EXE, DatabaseName.4DC, and DatabaseName.RSR. The resulting application icon can be customized to give your application a polished look and feel.

## Error file

This option generates a text file containing a list of errors and warnings detected during the compilation process. 4D can open this file directly and use it for interactive debugging and error correction. The error file may also include additional warnings that assist the programmer in locating potential software bugs.

## Symbol table

4D Compiler generates a text file containing information about all database objects, their data types, and the name of the method the data type was determined automatically (if this option was selected). The symbol table also includes a complete list of your methods and functions, the data types of their parameters and, for functions, the data type of the value returned. The symbol table allows the programmer to optimize use of database variables to reduce memory requirements, optimize certain operations, and locate potential application bugs.

## Range checking

Range Checking provides a particularly powerful set of diagnostics used during testing and debugging. A database application that is compiled with Range Checking includes code that will check memory and variable access dynamically during the execution of your compiled code. Range checking errors are reported to the user with specific information

relating to the type of error, method where the error occurred, and the line number of the error. The programmer can then use this information to fix bugs in his or her code that might not have been otherwise found during normal testing procedures.

## Script manager

This option applies when your database is used in conjunction with a 4th Dimension version that involving the Script Manager on Macintosh or two-bytes systems on Windows. The Script Manager and two-bytes system enable programs to function with non-roman alphabets and characters, such as Japanese, Chinese, Arabic, or Hebrew.

## Warnings

Warnings are more extensive diagnostic messages created during the compiling process. Warnings allow the programmer to locate potential source code problems. A line of code that produces a warning will not necessarily result in an error, but attention should be noted by the programmer. Warnings are especially helpful for users just starting to learn the 4D language as it will locate coding techniques that may result in potential problems. It is common to see Warnings used as a learning aid while new users are developing their first 4D applications.

## Processor type

4D Compiler allows you to choose the coprocessor on which your application will execute. In addition you can specify compile options that will optimize your code for particular chipsets within a coprocessor family. You can choose from:

- ▶ Intel 386, 486, and Pentium (Windows)
- ▶ Motorola 680x0 (Macintosh)
- ▶ Motorola PowerPC (Power Macintosh)

You can compile simultaneously for several platforms

thus reducing the amount of time necessary to deploy your application.

You can access the more advanced Options window by clicking the More button which is located at the bottom of the Main window.



#### Optimization

4D Compiler allows you to choose between two code generators:

- ▶ The normal option compiles your application more quickly though creates less optimized code.
- ▶ The optimized option takes longer to compile your database, although with good reason. During the process of compiling with optimization, 4D Compiler evaluates your code and fine tunes its compiling process intelligently to ensure the resulting code is as fast as possible, while at the same time reducing memory and hard disk space requirements.

#### Initialize local variables

When a method is executed, space for local variables is reserved. These local variables are destroyed at the end of method's execution. 4D Compiler allows the programmer to decide how these local variables should be initialized:

- ▶ Initialize each variable to a null value by default.
- ▶ Initialize each variable to a random value. This option is used only for debugging purposes.
- ▶ Do not initialize each variable. If your code initializes variables programatically, this option saves time during compiling and code execution.

#### Typing file

4D Compiler generates a file containing compiler directives for all your application variables. If you want to use these declarations in your database, you can copy these directives easily into your methods. 4D Compiler can type all variables used within your application automatically. If you choose to type variables manually, this will speed the compile process.

#### Compilation path

- ▶ Execute all passes: 4D Compiler executes all required stages for compiling, including the automatic typing of all variables used within the database.
- ▶ Process and interprocess have been typed: 4D Compiler accelerates compilation using compiler declarations in your code to determine process and interprocess variable types. Any process or interprocess variable not declared programatically will result in a compiler error.
- ▶ All variables have been typed: This option assumes that you have programatically typed process, interprocess, and local variables. If any variables have not been declared programatically, a compiler error will result. Compiling with this option results in the fastest compile process.

#### Default button type

By default, 4D Compiler will assign untyped variables to the type with the greatest scope. With this option, you can force the type of the button objects to real or longint. This option does not override compiler directives in your database.

#### Default number type

By default, 4D Compiler will try to type untyped numeric variables to the type with the greatest scope. With this option, you can force the type of numbers to real or longint. This option does not override compiler directives in your database.

#### Default alphanumeric type

By default, the compiler will try to type untyped alphanumeric variables to the type with the greatest

scope. With this option, you can force the type of character strings to text or fixed-length strings. This option does not override compiler directives in your database. If you choose to set the default alphanumeric type to fixed string, an enterable area appears and you can set the default string length.

#### Automatic version numbering

If you select this option, 4D Compiler assigns the compiled database a version number automatically. This number is saved in the project and is incremented at each new compilation. This version number allows the you to track the installed versions of your application easily.

#### Help

On Windows, 4D Compiler includes an extensive help file which can be accessed through the Compiler Help Menu.

Compiling is simple. Once you select compilation options, you click the OK button in the Main window to start the compilation process. 4D Compiler automatically checks:

- ▶ Your password
  - ▶ If the database uses any plug-ins or extensions
- 4D Compiler then continues without need for user intervention, displaying a window with the following diagnostic information:
- ▶ In the upper part of the window, method names scroll as they are processed by the compiler.
  - ▶ In the lower part of the window, 4D Compiler displays a list of messages and, possibly, errors that are generated.
  - ▶ At the top of the compiler window, the error and warning counters are incremented throughout the compilation process.
  - ▶ Pause and Abort buttons allow you to interrupt the process temporarily or permanently.
  - ▶ A small moving icon on the left side of the upper window informs you of various compilation phases.
  - ▶ 4D Compiler indicates errors and warnings in three ways and uses them according to the nature

of the message:

When 4D Compiler detects an error in a method, the compiler sets its name in **bold**.

When it issues a warning about a statement in a method, the compiler sets its name in *italics*.

If a method contains both errors and warnings, its name is set in ***bold italics***. After compiling is complete, you can select the method to view the errors or warnings found. Errors or warnings are described in the lower panel, including the Line number, the actual line of code containing the error or warning, and an explanation of the error or warning.

The 4D Compiler main purpose is to create fast executable application code. However, it also serves as source code monitoring assistant. During the compilation process, 4D Compiler acts as an intelligent monitoring system for code consistency, code improvement and as an efficient technical debugging tool.

#### Intelligent code consistency system

A major strength of the 4th Dimension interpreter is to be forgiving. Using 4D, you are not required to be a programming expert. Certain kinds of semantic and syntactic inconsistencies are accepted and taken care of automatically by 4D in the interpreted mode. 4D Compiler includes a powerful code analysis engine that evaluates your source code. For instance, while 4D Compiler cross-references all the elements within your source code, it can also sort out possible missing information such as type declaration problems with variables. In such cases, 4D Compiler examines the context in which the variable occurs, and determines the variable type based on its use in the source code. In case of possible ambiguity, 4D Compiler generates a detailed error message that allows the programmer to correct the problem easily.

#### Extensive diagnostic system

The 4D Compiler diagnostic system includes a detailed description of the errors and warnings that may result from the compiling process. Here are some examples:

- ▶ The error file messages generated during compilation include clear definitive information. Error messages not only include the line number and the line of code, but also a complete description of the error.



- ▶ Warnings are not errors and do not prevent database compilation. They simply point out potential code errors. The information in the warning displays the line number, the line of code, and a complete explanation.



- ▶ Range checking is a sophisticated tool for monitoring code execution within your compiled applications. Range checking is an additional phase in the process of developing and debugging your databases. There are cases where your application can be compiled with no obvious errors. Asking 4D Compiler to locate range checking errors allows you to double-check the reliability of your compiled application while it is running. This capability is especially valuable when pointers, arrays or strings of characters are processing. 4D Compiler can detect execution errors that might not otherwise be located easily during a code review or interpreted testing.



- ▶ The symbol table generated by 4D Compiler displays complete columnar information on your database objects. For instance, 4D Compiler will not only list your interprocess variables, but also present them in alphabetical order, the methods they are using, the number of dimensions of the array if this variable is an array, and eventually the context in which the compiler has established the data type, if you have not declared it programatically.



#### Interactive debugging

A unique 4D Compiler feature is that the error file can be used to debug a database interactively. In 4D, both the error file and the uncompiled database can be opened simultaneously. A 4th Dimension menu command and Next Compiler Error opens the first procedure or script automatically where



4D Compiler found an error or warning. At the top of the window the error or warning is described. In the method, the affected line is highlighted.



From a database standpoint, 4D and 4D Compiler handle cross-platform management transparently.

- ▶ You can compile a database for Windows on a Macintosh—or the reverse. You can then use the application with 4D for Windows or 4D for Mac.
- ▶ You can compile a database for all platforms at once. The compiled application will then include the necessary code for the platform with which you open the database. If in a client/server situation a platform tries to open an application which has not been selected during compilation, the user of that platform receives a message informing them of the problem.
- ▶ No extra work is required to operate Web services in a compiled environment.

# ACI 4D Insider: The new dimension of efficient code management

**4**D INSIDER is a point-and-click, drag-and-drop code management system enabling component builders and users to modularize or merge existing applications and to examine database objects and their dependencies. 4D Insider provides:

- ▶ A complete dictionary of your application
- ▶ A display of the application objects and their interdependencies
- ▶ A global search and replace tool
- ▶ A cross-referencing and documentation tool
- ▶ A code management system allowing you to create new applications easily from previously created components by moving table definitions, forms, and methods across applications while retaining all object properties and relationships
- ▶ A structure generator that creates a 4D structure from SQL files generated by common industry CASE tools
- ▶ A localization manager allowing you to adapt and to execute your application easily in different languages

4D Insider addresses the most cumbersome and indispensable needs for professional database development in a simple and efficient manner.

## 4D INSIDER BROWSER WINDOWS

After opening the database, 4D Insider begins to build a cross-referenced database objects table. Once 4D Insider has cross-referenced the database, it displays the objects in a browser window. The 4D Insider Browser Window is a complete graphical environment providing an organized, intelligent display of the database objects. The browser window contains the following:



- **Lists of database objects and their relationships.** Each list within the browser window identifies objects by name and by type. The type of an object is indicated by the icon appearing to its left.
  - ▶ The Main List section displays the database objects
  - ▶ The Used By section displays the objects that use the object selected in the Main list
  - ▶ The Uses section displays the objects used by the object selected in the Main list
- **Information area.** Information about the object selected in the Main list is displayed in this section of the window. Information includes:
  - ▶ Name of the object or name of the table and form to which the form method belongs in the format [Tablename].FormName
  - ▶ Size of the object
  - ▶ Last modification date
  - ▶ Internal ID or reference number
- **Object Contents area.** The Object Contents area displays the contents of an object. For a database method, the area displays the method text as it appears in the 4th Dimension Method editor. You can select and copy this text. A form appears as it is in the Design environment or as User/Custom Menus environment.



#### Customizing the browser window

You have complete control of the browser windows appearance. You can adjust the size of the lists relative to the Object Contents area, change the location of the lists, or specify the default size of browser windows.



- ▶ **Multi-windowing:** 4D Insider completely exploits the multi-window capabilities of modern operating systems. This allows you to have multiple views into your database where each window can display different information. This allows you to follow more easily object interdependencies, and manage the modularization of your source code.
- ▶ **Organizing multiple browser windows:** You can display as many browser windows from as many databases or libraries as you want. Your only limitation is the amount of memory on your computer. The Windows menu organizes all open windows. During a work session, you may have many windows on the screen at the same time. You can place them in an organized pattern on the screen or let 4D Insider organize them for you automatically.
- ▶ **Object filtering:** By default, the Main list contains all the objects in the database, sorted by type. For any list in the browser window, you can determine

which types of objects to display.

- ▶ **Moving the Used By or Uses list to the Main list:** To analyze objects in the Used By or Uses list more closely, you can make either list the new Main list. In this way, you can view the cross-references for objects currently in the Used By or Uses lists.
- ▶ **Changing the location of the lists:** You can easily change the location of the lists in the browser window.
- ▶ **Changing the default size of the browser window:** You can specify the browser windows default size by entering a specific height and width.

#### SEARCHING, REPLACING, RENAMING, AND FILTERING

Searching for objects in a database or library enables you to quickly locate objects based on specific or non-specific criteria. If you find you are executing the same searches frequently, you may choose to define filters using these criteria. In addition to searching for objects, you can easily rename all the objects throughout a database or library.



#### Searching and replacing



- ▶ You can select whether you want to search for

objects based on a name, last modification date, or number of occurrences.

- ▶ Comparator choices vary based on the object:
  - Object Name: is exactly, contains, does not contain, begins with, ends with
  - Object Date: is before, is equal to, is after, is different from
  - Number of Occurrences: is equal to, is greater than, is less than, is different from
- ▶ Search in Contents allows you to specify whether the search will include the contents of the objects as well as their names.
- ▶ You can select whether you want the search to include documented, unused, and delimiter objects.
- ▶ You can also define multiple search criteria. For instance, you can search for objects whose names start with "M" and contain the string "New Process".

#### Renaming

You can use the "Replace" features in the Tools menu to rename objects in your database or library. To rename objects, you can use one of several techniques depending on your needs. 4D Insider enables you to:

- ▶ Rename an object by substituting a user-defined name.
- ▶ Rename multiple objects simultaneously by replacing a substring of characters in their names with user entered substring of characters. You specify the objects to be renamed by selecting them in the Main list. The selection can contain multiple object types.
- ▶ Replace a sequence of characters in the names of any number of objects with another string of characters.
- ▶ Add a prefix to the names of any number of

selected objects. This option allows you to create a more readable structure by giving objects meaningful names. Using prefixes also helps you to group related objects together. For example, in a database, all project methods associated with menus could begin with the characters "M\_"; these methods appear together in the Main list. Once you have given a set of objects the same prefix, you can easily take advantage of custom filters.

#### Filters

You can choose the type of object you want to view in each list. For example, you might want to view methods in the Main list in order to see where each method is used and what objects each method uses.

- ▶ You can add your own filters to find common objects or to find objects meaningful to your particular database. For example 4D Insider provides a filter for finding variables but you can create additional filters for finding local variables or interprocess variables.
- ▶ In addition to adding new filters to 4D Insider, you can customize built-in filters and controls
- ▶ Filtering criteria include filtering on name, date, and number of occurrences. Filter options let you execute a search on object contents as well as name.

#### MOVING OBJECTS ACROSS DATABASES

When moving an object from one database to the another, 4D Insider allows both automatic and user defined integrity control.

##### Automatic integrity control

When you move an object, 4D Insider identifies all object dependencies. This list of dependencies includes all objects that the moved object uses.

Since objects in a database are interdependent, when you move one object you may need to move others to conserve object integrity. For example, if you

create a custom search dialog box, you could copy the form for that search dialog box with any methods or other objects that it uses. You could copy the form to another database or you could add it to a library of objects commonly used in your databases.

Because some objects cannot be moved by themselves, 4D Insider has determined the dependencies automatically and manages it for you automatically when moving objects from one database to another. For example, when you copy a form, 4D Insider automatically copies the form methods and object methods attached to the form elements.

#### User-controlled object move

At other times, you may want to copy some or none of the dependencies. When you move an object, you can choose to move:

- ▶ The object itself
- ▶ The object with some of the objects it uses
- ▶ The object with all of the objects it uses.

You can control how the object is moved at the time of the move. If you choose to perform a rapid move where you move an object with all of the objects it uses, 4D Insider will perform the move immediately. Otherwise, 4D Insider displays a wizard that guides your choices and informs you about the consequences of your choices.



4D Insider allows you to define delimiter objects. A delimiter declared object stops the propagation of references during a move. By default, 4D Insider considers menus and menu bars to be delimiter

objects. Menus are central to an application—in most cases, they refer to all the major methods in a database. If menus were not delimiter objects, 4D Insider would propose that you copy all referenced objects before moving a menu. You can modify the list of delimiter objects based on your interface and your programming style.

#### CREATING LIBRARIES AND GROUPS

4D Insider supports the development of modular, reusable code enabling you to organize design objects into libraries and groups. Libraries and groups can be exchanged regardless of their platform of origin.

#### Libraries

Using libraries, you can maintain a copy of a set of objects. These objects are reusable later in other databases. When you move an object to a library, 4D Insider also moves any dependent objects. For example, if you move a method, 4D Insider moves all methods that it calls and the commands, variables, and other items that method uses.

When you update objects, you can copy the updated objects to the library and then use the library to update your other databases.

#### Groups

Using groups, you can reorganize objects according to their function. This reorganization can help simplify structures viewed within 4D Insider. When grouping objects together, they move into a folder with the same name of the group.

You can use groups to:

- ▶ Organize objects within the database.
- ▶ Make it easier to move objects associated with a particular aspect of your database's functionality. For example, you might place objects of an invoicing module in one group and objects of an inventory system into another group. You could then also create subgroups for the different parts

of the invoicing and inventory modules. To reuse a part of a database, you would simply move the needed group or groups into another library or structure.

- ▶ Within groups you can create as many levels of subgroups as you want.
- ▶ You can group objects with their dependencies—meaning with the objects they use. In this case, the group created by 4D Insider contains the selected objects and the objects that they use.
- ▶ 4D Insider treats objects contained in groups as it does all other objects. You can perform any operation on grouped objects. In the case of a selection where you have applied a filter, the group will display only those objects corresponding to the filter.

#### CREATING NEW DATABASES

In addition to opening an existing database locally, 4D Insider enables you to create a new empty database from existing components. Once created, the new database can be used with either 4D or with 4D Server. With this capability it would be possible to build completely new databases from components or modules found in existing databases, all without writing a single line of code.

#### WORKING WITH DEVELOPMENT SERVERS

Not only can 4D Insider open up local copies of databases, but it can also access databases operating in a multi-user development environment using 4D Server. Using TCP/IP, IPX, or ADSP you can open a structure over the network and take advantage of all 4D Insider features. This offers a very powerful solution for companies with many or large development groups. Project managers can maintain a 4D Server database holding all base modules, routines, and methods that are common, standard, and/or reusable. Programmers can then use 4D Insider to access these routines via the network and move them very easily into their current project,

regardless of the development platform. This way, a centralized code server can be created, maintained, and updated for your group or entire company.

#### CREATING A 4D DATABASE FROM A SQL DESCRIPTION FILE

4D Insider can parse a SQL description file generated by many common CASE tools, and create a 4D database matching the SQL description. The generated 4D database contains the tables, typed fields, and relations between the tables.

#### CROSS-PLATFORM MANAGEMENT

4D Insider manages cross-platform requirements transparently, just as all products within the 4D Product Line.

- ▶ Libraries created on one platform can be used on another platform.
- ▶ Like the 4D Form editor, 4D Insider includes a feature for rescaling form objects. In addition, 4D Insider also lets you rescale multiple forms, enabling you to modify a group of forms or to make global changes.



- ▶ You can scale several database forms at the same time.
- ▶ 4D Insider allows you to open Windows and Macintosh servers concurrently. Using this feature, you can also transfer objects easily between different databases on different platforms.

#### GENERATING DOCUMENTATION

##### The documentation window

4D Insider includes complete documentation capabilities. This allows developers to document

the application source code easily so that other programmers can easily understand the techniques used by the original programmer. Documentation incorporates the following capabilities:

- ▶ You can enter up to 32,000 characters in the documentation window.
- ▶ You have complete control over documentation font, font size, and text style.
- ▶ Documentation modification date is consistently maintained. The date appearing in the Documentation window refers to the date that the object was last modified in the 4th Dimension or 4D Server Design environment.

#### **Documenting objects**

To facilitate development by multiple programmers, 4D Insider allows you to document objects contained in a structure or library. This documentation is saved in the structure of the database. You can use this documentation with the single-user 4th Dimension and with the multi-user 4D Server.

#### **Creating global documentation for your database**

To facilitate code maintenance, you can also generate complete printed documentation containing a description of the database structure or set of libraries.



## ACI 4D Productivity Plug-ins: The office system inside 4D and 4D Server

**4**D PRODUCTIVITY PLUG-INS are a complete cross-platform office system operating inside 4th Dimension or 4D Server. They behave as compound database objects and include:

- ▶ **4D Calc** , a spreadsheet designed for analysis, simulation, review, and forecasting of numerical data.
- ▶ **4D Draw** , a drawing plug-in that creates diagrams, floor plans, technical illustrations, engineering documents, architectural blueprints, and more.
- ▶ **4D Write** , a simple, elegant tool for creating and modifying all types of textual documents, from simple letters to multi-part contracts.



ACI incorporated a 4D Write area within this production database to create the PDF and HTML documentation for all 4D commands.

### FEATURES

All 4D Plug-ins are complete products and are designed to provide the most needed features in their respective product categories.

#### 4D integration

4D Calc, 4D Draw, and 4D Write can be used in their own windows or placed on 4D forms. The contents of a 4D Plug-in can be saved as a document

or stored directly in a record as a 4D field. Plug-ins can directly reference 4D objects such as fields, variables, commands, methods, and other plug-ins.

#### 4D Server integration

The 4D Server integrated application services provide immediate automatic updates of all plug-ins contained within a 4D Server database for any 4D client connected to 4D Server.

#### Communication between 4D Plug-ins

4D Plug-ins communicate with each other using the internal 4D hotlink system. With hotlinks, changes in the original formation are reflected everywhere dynamically.

#### Programmability

When a 4D Plug-in is added to a database, a complete suite of commands is installed that enable designers to control all aspects of plug-in usage. Combined with the 4D language, these additional plug-in commands allow you to create sophisticated office applications within your database or your client-server architecture.

4D Draw is a drawing plug-in that creates diagrams, floor plans, technical illustrations, engineering documents, architectural blueprints, and more. And since it is completely integrated into 4th Dimension, 4D Draw diagrams can be created from, dependent on, and integrated with database information. You can even create hybrid solutions that allow drawings to act as user interfaces.

4D Draw features include:

- ▶ File formats: 4D Draw, read/write PICT, read EPSF
- ▶ Drawing size up to 120" x 120"
- ▶ Reduction/enlargement up to 800%
- ▶ Custom rulers (units, divisions, scale, and notation)
- ▶ Templates

- ▶ Print merge
- ▶ Hide/show rulers, ruler lines, page breaks, coordinates panel, menu bar, tool palette, and scroll bars
- ▶ Object types: text, lines, ovals, rectangles, polygons, arcs, bitmaps, hot-links, pictures, and groups
- ▶ 256 colors and 36 patterns
- ▶ Object rotation in 1° increments
- ▶ Search for objects by attribute (color, fill, type, name, etc.)
- ▶ Custom corner rounding and line widths
- ▶ Place, size, and scale objects by mouse or keyboard
- ▶ Flip, align, group, and smooth objects
- ▶ Lock objects on individual attributes (size, color, location, etc.)
- ▶ Object attribute dialog for each object
- ▶ Multiple fonts, size, styles, and colors per text block
- ▶ Interface entirely modifiable by programming
- ▶ Live references to 4D variables, fields, commands, methods, and other plug-ins
- ▶ Hotlinks to and from other 4D Plug-ins
- ▶ Over 140 4D Draw commands

4D Write is a simple tool for creating and modifying all sorts of textual documents, from simple letters to multi-part contracts. 4D Write provides file translation capabilities and the most complete mail-merge system available on a personal computer. 4D Write is ideal for database related documents.

4D Write features include:

- ▶ Translators for most common file formats
- ▶ Page view mode
- ▶ Print preview
- ▶ Document statistics

- ▶ Templates
- ▶ Style sheets
- ▶ Search and replace based on content and/or style
- ▶ Headers and footers
- ▶ Page numbering
- ▶ Date and time stamping
- ▶ Left, right, center, and decimal tabs with character fills
- ▶ Variable line spacing
- ▶ Left, right, center, and full justification
- ▶ Complete control over font, size, style, and color
- ▶ Graphic scaling
- ▶ Visual indicators for margins and tabs
- ▶ Paragraph-based rulers with copy and paste
- ▶ Soft hyphens
- ▶ Show/hide invisible characters and pictures
- ▶ Live references to 4D variables, fields, commands, methods, and other plug-ins
- ▶ Hotlinks to and from other 4D Plug-ins
- ▶ 4D Write debug system
- ▶ Nearly 100 4D Write commands

4D Calc is a spreadsheet designed for the analysis, simulation, and forecasting of numerical data. It provides all basic capabilities you expect from a spreadsheet, and adds new capabilities through its close integration with 4th Dimension.

Cell formulas in 4D Calc can include references to database components while entire spreadsheets can be created directly from information in a database. Combined with 4th Dimension, 4D Calc provides a unique and powerful set of capabilities.

4D Calc features include:

- ▶ Variable spreadsheet size up to 256 columns and 8,192 rows
- ▶ Templates
- ▶ More than 40 built-in functions
- ▶ Manual or automatic calculations
- ▶ Row and column sorting
- ▶ Discontiguous range selection
- ▶ Variable row height and column width
- ▶ File formats: 4D Calc, SYLK, and TEXT
- ▶ Font, size, style, and color for each cell
- ▶ Show/hide grid by range
- ▶ Show/hide row and column titles
- ▶ Show/hide menus and scroll bars
- ▶ Customizable row and column titles
- ▶ Cell rotation in 90° increments
- ▶ Search by values, formulas, and attributes
- ▶ Named cells
- ▶ Headers and footers with date, time, and page numbers
- ▶ Print preview
- ▶ Print formula
- ▶ Fill right and down
- ▶ Left, right, centered, top, and bottom cell alignment
- ▶ Frames and borders with custom colors and line thicknesses
- ▶ Pasted graphics can be scaled and made transparent
- ▶ Multiple lines in one cell
- ▶ Different colors for positive, negative, and zero numbers
- ▶ Cell formulas with live references to 4D variables, fields, commands, methods and other plug-ins
- ▶ Hotlinks to and from other 4D Plug-ins
- ▶ Over 100 4D Calc commands



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