

# DATA File



## Desk-Top Database Management Systems

Glenn I. Ouchi

Getting to know the features of desk-top database management systems is the best way to learn the basics of database management.

In my last "Data File" column I discussed the various types of database management programs (1). In this installment, I will introduce specific features of desk-top database management systems by showing how various tasks are performed using Microsoft Access (Redmond, Washington), a popular desk-top database management system. Even if you do not use Access, you will be able to follow these examples and see the various components of a database management application. In this column I'll discuss tables, queries, and forms.

Microsoft Access can be purchased as an individual program and or bundled in a suite of programs in the Microsoft Office professional edition. If your company has the Microsoft Office suite of programs and your computer does not have the Microsoft Access program, ask your information technology group about its availability. Microsoft recently introduced the Office 2000 suite of programs, which includes a new version of Microsoft Access called Access 2000. The most common version currently in use is Access 97.

Microsoft Access is a very versatile program for managing data. I particularly like it because it can be used for nearly any scale of data management. It can work as a single-user desk-top system in which data are stored on your local computer. It can work for a small group of users that share a local computer as a server to store data. It also can be used as a part of an enterprise-wide system in which

data are stored in several databases. In an enterprise-wide system, the database can function in the file formats of nearly any vendor, including Oracle and SQL Server.

Microsoft Access has a rich programming environment using Visual Basic for Applications, so the development of custom applications is very direct. With Access' powerful programming tools, I can use the program to create working prototypes of database applications so users can get a real look and feel of their application before it is implemented.

### GETTING YOUR FEET WET

Let's review the features of this desk-top database management system. The best way to learn about a program is to open it up and try it out. Microsoft Access has useful guides for viewing the various features of the program. They are called database Wizards. When you start Access 97, the first screen you will see gives you the opportunity to create a new database or open an existing one (Figure 1). When you click on the Create a New Database Using Database Wizard button and click on the OK button, the screen displays 22 prefabricated databases for various applications. Each of these databases uses the major features in Access to create an application, so it shows you very quickly how an application is built and used.

The applications include both simple and relatively complex database functions. Some of the applications are Address Book, Asset

Tracking, Book Collection, Contact Management, Expenses, Household Inventory, Inventory Control, and Music Collection. The applications even come with sample data in them, so you can see the application in action, if you wish.

Let's look at one of these database applications; in the process I'll show you the main components found in nearly every database management application. I'll select the Resource Scheduling application because this application allows users to schedule resources of any shared items — from projectors and cellular telephones to conference rooms. This application would be of real use in a laboratory that schedules instruments, tools, and conference rooms.

### CREATING THE APPLICATION

The results from database wizards are useful for seeing the various parts of a database application. By answering a few questions, bingo, you have a database application running before your very eyes. I clicked on the Resource Scheduling application icon and then clicked the OK button. Then I was asked where to save the database file. I selected a directory and clicked the Create button.

Then the wizard went to work creating the database and the components of the application. During the creation, the program displayed several forms and asked for information about how I wanted the application created. The first form described what the application would store and asked me to click on the next button. The second form allowed me to select additional fields to be placed in the database tables and provided a check box if I wanted sample data loaded into the database. When I ran the wizard, I did not select any

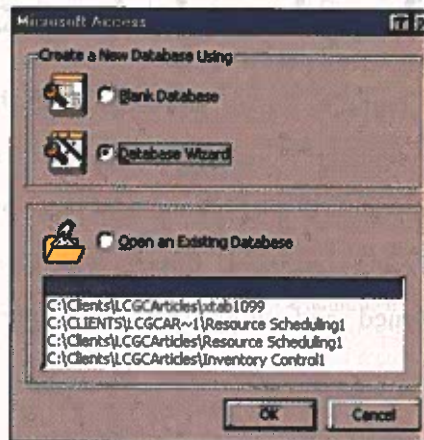


FIGURE 1: Opening screen for Microsoft Access.

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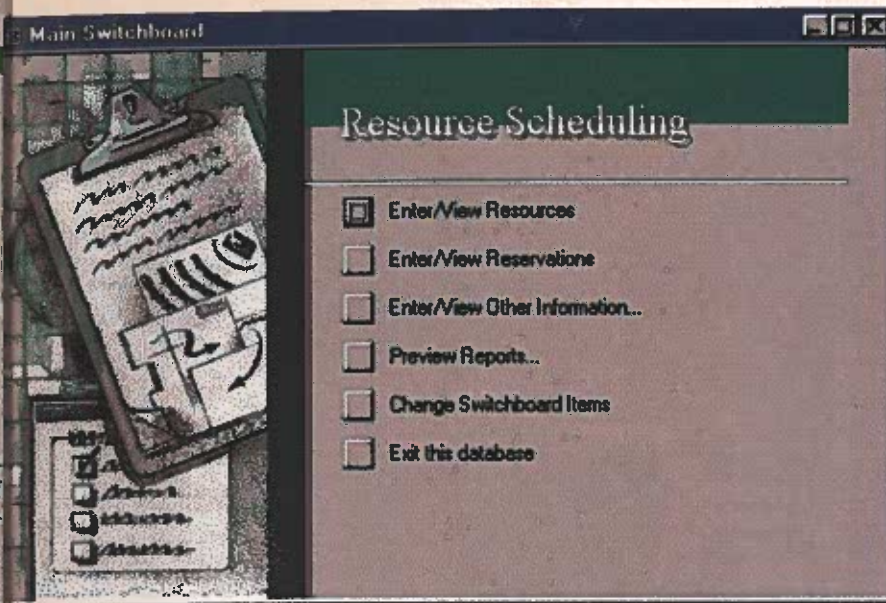


FIGURE 2: Application main switchboard.

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additional fields to be added to tables, but I did check the box to load sample data. Then I clicked on the Next button.

The program next displayed a form for selecting the screen display background. I selected the stone background type and clicked on the Next button. The next form allowed me to select the report style; I selected corporate and clicked on the Next button. The next form asked me to name the application and if I wanted to place a picture on the reports. I left the name Resource Scheduling and did not select to have a picture placed on the reports. Then I clicked on the Next button. The final form asked me if I wanted to start the application now. I checked the Start It Now box and clicked on the Finish button.

The database creation wizard chugs along creating the components for the database application. When it is done, the wizard displays the Main Switchboard screen for the application, as shown in Figure 2. This display is the application's home screen, on which users select a part of the application to use by clicking on a button to select the next activity. For example, when I clicked on the button for Enter/Edit Resources, the program displayed the resources information form shown in Figure 3.

Try viewing each of the activity screens to become familiar with the application. The windows have no special buttons for closing them. To close a window or form, users must click on the X box in the upper right corner of each window.

**WHAT DO USERS SEE IN THE APPLICATION?**

This application allows users to enter shared resources and allows customers to schedule when the resources are used. Users can schedule when a resource will be used so others can make their plans. No doubt, this application

was created to reduce conflicts in scheduling the use of resources. Examples of the shared resources in the sample data are cars, conference rooms, lap-top computers, cellular telephones, projectors, and testing laboratories. To actually use this application, users could change the resources list to match the items they want to track and change the customer names to people who would use the resources. The application prints reports that show the schedule of resource use and what resources are available.

From the main switchboard users can select one of five activities:

- Enter/Edit Resources, which is an edit and entry form for editing or entering resources to track;
- Enter/Edit Reservations, which is an edit and entry form for editing or entering reservations for a resource;
- Enter/Edit Other Information, which changes the switchboard menu to display two buttons for selecting enter or edit forms for customer information and resource types;
- Preview Reports, which displays the Resource Schedule and the Resources By Type reports; and
- Change Switchboard Items, which takes users to the Switchboard Manager and allows them to customize the switchboard.

Instead of describing how to use the application from a user's perspective, I will discuss how an application is created in a database management system.

**WHAT'S UNDER THE HOOD?**

Let's look at the actual Microsoft Access database and the components that go into creating this kind of application but are hidden from application users. Microsoft Access has two modes: The run mode shows forms on the

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screen and allows users of an application to perform the tasks. The design mode allows database developers to manipulate the program components to create the application. I have already discussed the run mode in action, so now I will describe what happens in the design mode.

Close the switchboard form by clicking on the X box in the upper right corner of the window. This action essentially stops the run mode and puts the program into design mode. Now display the Microsoft Access database by clicking on the window named Resource Scheduling: Database. This window should look like Figure 4, if users select the Tables tab.

Microsoft Access databases have six major component types: tables, queries, forms, reports, macros, and modules. In this "Data File" column, I'll discuss tables, queries, and forms in detail; I'll discuss the other components in more detail in a future column. Each of these major components has a tab on the main Access window. By clicking on a tab, the program displays the names of that component in the current database application. Each component tab display has three action buttons. These buttons are Open, Design, and New for tables, queries, and forms.

The Open button opens the selected component on the desk-top. The Design button opens the component in the design view and allows application developers to edit the design of the component. The New button creates a new component.

### VIEWING DATA TABLES

Clicking on the Tables tab shows all of the tables in the application. Tables are the data containers in a database. This relatively simple application has only six tables. Five of the tables hold data for the application and the sixth table holds data for the switchboard form.

Click on the Customer table name to highlight it, and then click on the Open button. Users can view the contents of the customer table, as shown in Figure 5. This table displays several fields of data, including Customer ID, Contact First Name, and Contact Last Name, and the field names are shown at the column tops. To view more of the fields than what is displayed, click on the slider bar at the bottom of the window. Five records or rows of data are displayed automatically. After a user fills in a row of information, the program creates a new record. Users can enter data directly in an open table, but usually they enter data using a form that makes data entry easier and that also checks the data to ensure they are entered properly. Close the open table view by clicking on the X in the upper right corner of the window.

Click on the customer table name to highlight it and then click on the Design button. This sequence will open the design view of the customer table, as shown in Figure 6. The design view shows the field names and field types for each table. This table has 13 fields.

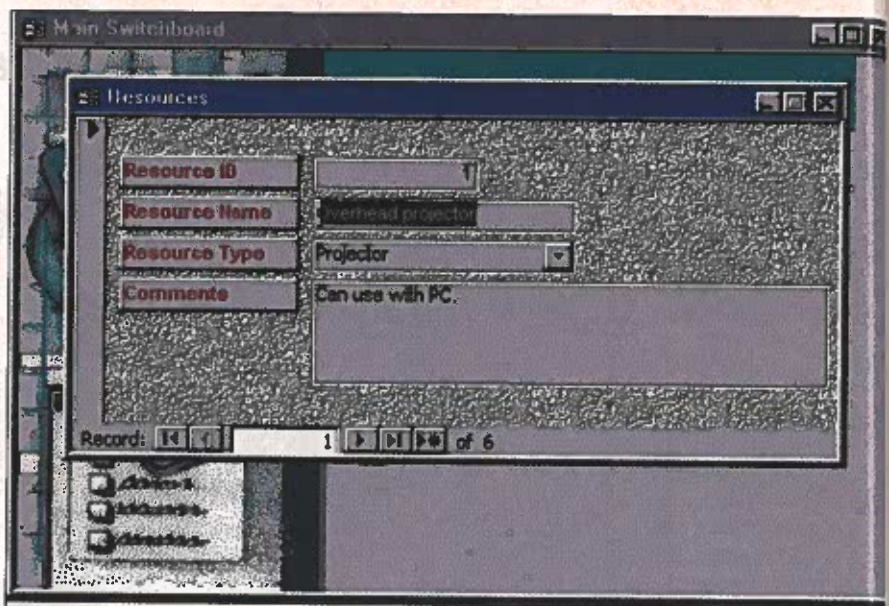


FIGURE 3: Application form to edit or enter data.

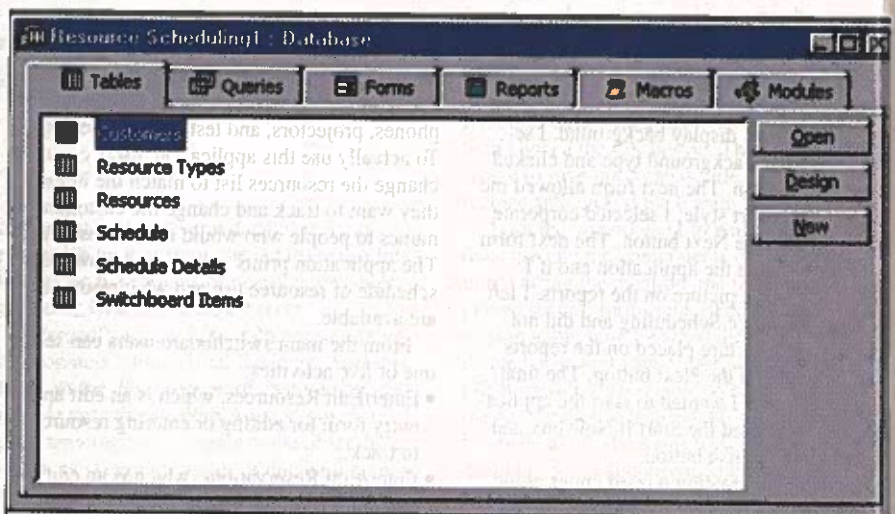


FIGURE 4: Access main database display.

Customer ID	Contact First N	Contact Last N	Company/Dept	Billing Address	City	State/Province	Ph
1	John	Steel	Lazy K Kountry	12 Orchestra T	Walla Walla	WA	9836
2	Jaime	Yorres	Let's Stop N Sh	87 Polk St.	San Francisco	CA	94111
3	Rene	Phillips	Old World Delic	2743 Bering St.	Anchorage	AK	9950
4	Paula	Wilson	Rattlesnake Car	2817 Milton Dr.	Albuquerque	NM	87111
5	Jose	Paverotti	Seven Seas Imp	187 Suffolk Ln.	Boise	ID	8372

FIGURE 5: Table view of the Customer table.

The first field — Customer ID — is an auto number field, which means that each time a new record is entered, this field automatically creates a unique number to identify the record. The Customer ID field also has a key icon next to its name. This icon shows that this

field is a key field that identifies the record uniquely. Key fields and indexed fields relate one table's data with the data from other tables. Key and indexed fields are critical parts of relational databases.



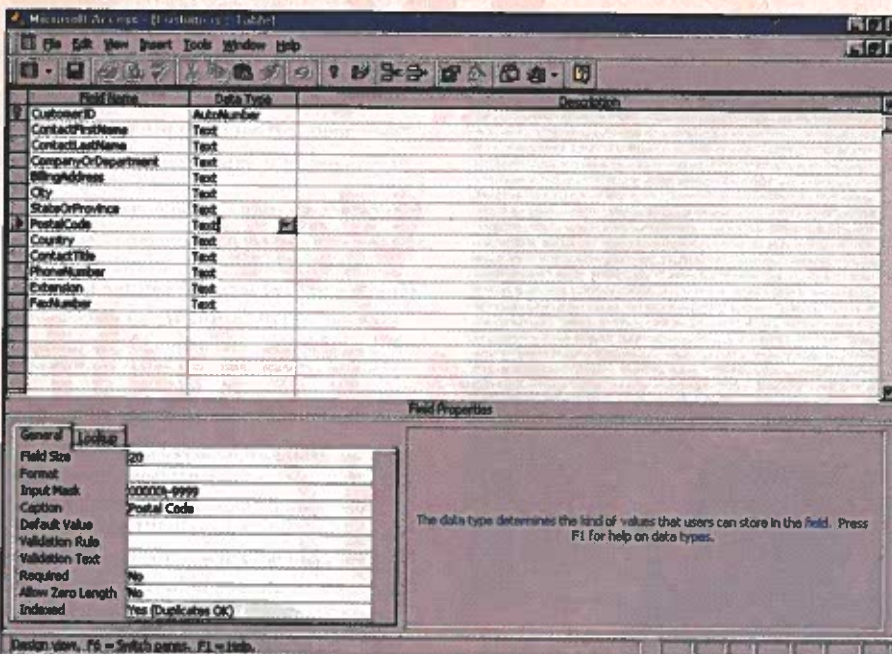


FIGURE 6: Design view of the Customer table.

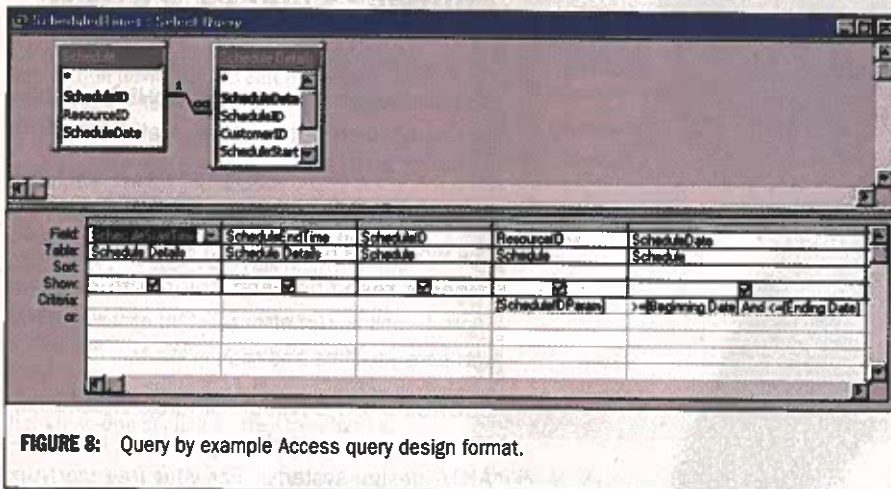


FIGURE 8: Query by example Access query design format.

The lower part of the screen displays a list of properties or parameters. Users can enter values for these properties in each field within a database table. One of these parameters is the input mask. When data are entered into this property, the entered input mask ensures that data are entered correctly. If the data entered do not fit this format, then the program notices an error and asks users to reenter or edit the entry until it recognizes the right type of data. The input mask for the postal code is 00000\~9999, which means this field expects five numbers with an optional dash and four more numbers.

**DATABASE QUERIES**

Database queries retrieve or perform other actions with selected records from database tables. Queries also can be used to connect or

join two or more tables so the related data in those tables can be viewed or reported together. Users can perform six types of database queries in Access. Each one performs a unique action with the records retrieved from the database tables. The six types of Access queries are

- Select, in which selected data are retrieved from specific tables;
- Make Table, which creates a new database table from retrieved records;
- Append, which attaches retrieved records to an existing database table;
- Delete, which removes selected records from one or more database tables;
- Update, which updates selected values in the retrieved records in one or more database tables to specific new values; and
- Crosstab, which calculates a sum, average,

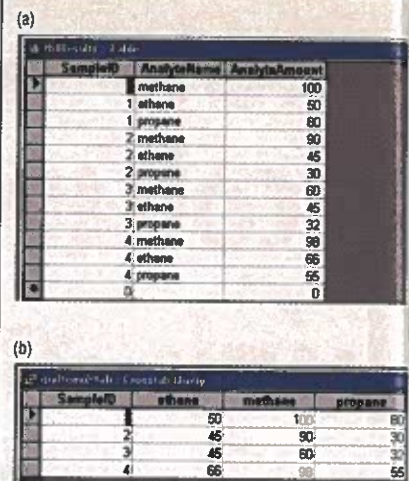


FIGURE 7: Chromatographic data shown as (a) a table and as (b) the results of a crosstab query.

count, or other type of total for data that are retrieved and then grouped by two types of information — one down the left side of a data sheet and the other across the top.

The data in a table of chromatographic results shown in Figure 7a can be reported with a crosstab query, as shown in Figure 7b. The data down the left side are the sample numbers, and the columns across the top are the analyte names. Crosstab queries are valuable for reporting data in a concise table format.

Access uses a helpful query-by-example interface for designing queries. If users click on the query tab, they will see only one query in their application. If they click on the query named ScheduledTimes and then click on the Design button, they will obtain the display shown in Figure 8.

This query retrieves the selected data from two tables: the Schedule and Schedule Details tables. These two table names along with some of their field names are displayed in the upper part of the query design view. Notice that the ScheduleID field in the Schedule table has a line connecting its name to the ScheduleID field in the Schedule Detail table. This shows that these two fields are related, and the relationship will be used in the query. A small numeral 1 appears on the connecting line near the Schedule table, and an infinity symbol appears next to the Schedule Detail table. These characters show that the relationship between the tables is one to many, which means that the Schedule table holds only one unique record and the Schedule Detail table can have many records with the same ScheduleID value.

The lower part of the query design shows the fields this query will retrieve. The field names are shown in the first row of the display. The second row shows the table names. If that field will be retrieved, then the box is checked in the fourth row. The fifth row shows



FIGURE 9:

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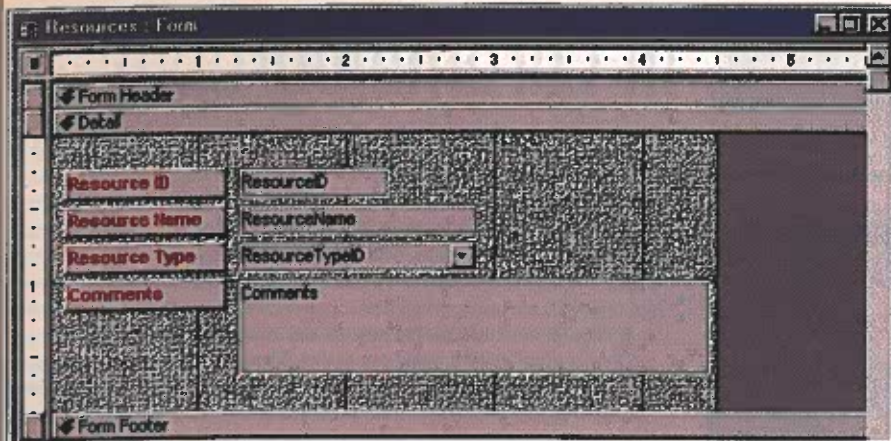


FIGURE 9: Design view of a form.

the criteria that the selected fields must meet for the data to be retrieved.

**USING FORMS**

Forms are the user interface for an application. By designing good forms, a database application developer can create a complete database application user interface. In most Access database applications, users mostly see forms on the screen. If users click on the Forms tab, they will see the 10 forms the application uses. Click on the Resources form name and then click on the design button. The program will display form design view, as shown in Figure 9. This simple form comprises tools called labels that display the names of the data to be entered. Data are entered into another type of tool called a text box. Users can select the ResourceTypeID field by using another tool called a combo box. A combo box displays a list of items from which users can select. The combo box is activated when users click on the combo box down arrow icon.

The form displays a toolbox icon on the left side. The toolbox holds various tools for the form. Each of these form tools has specific properties and methods that can be set or activated. For example, one of a text box's properties is determining the font and size used to display the text. Each tool has an extensive list of properties that database developers can set to have the tool perform in a specific manner.

Tool methods are actions a tool can perform. For example, one of a text box tool's methods is the On Change method. Whenever the text in the text box is changed, the On Change method is performed. A database designer can also include custom program steps to be executed along with the On Change method. For example, when the text box contents are changed within a form, a database designer may want to perform some calculations on the values entered in the text box and display the results. The code to perform the calculation can be attached to the On Change

method, and it will be executed every time a change is made to the text box while the application is running.

Database developers can add additional tools to the toolbox, such as program modules called ActiveX controls. These program modules can be written to act similarly to the other tools in the form toolbox, except they are custom made to perform a specific task. Developers can add nearly any ActiveX control to the

toolbox and use it on a form. Many unique ActiveX controls can be purchased from third-party programming companies. Many useful controls are available as samples from Microsoft on its web site at <http://www.microsoft.com>.

**CONCLUSION**

I described three of the main components that go into creating a database application, including tables, queries, and forms. In a future "Data File" column, I will discuss reports, macros, and modules. I also reviewed some of the tools database application developers have at their command to develop applications. These powerful application development tools can generate both simple and complex applications. Even users with little or no programming knowledge can create database applications using a desk-top database management system.

**REFERENCE**

- (1) G.I. Ouchi, *LCGC* 17(10), 924-929 (1999).

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