FileMaker vs. Access:
A developer's comparison

Wim Decorte
Connecting Data
905-702-0278
wim@connectingdata.com
www.connectingdata.com

FileMaker is a trademark of FileMaker, Inc.
Access is a trademark of Microsoft.

Table of content

1.Introduction

How does MS Access compare to FileMaker? As a FileMaker developer you probably have asked this question yourself or have been asked by others. The goal of this White Paper is to give you a basic understanding of the differences and specifics of Access and FileMaker. This comparison is specifically meant for FileMaker developers and is entirely written from that perspective.

There has been a lot of talk on the various FileMaker lists that Microsoft is dropping Access, as this overview will show you: that is not the case. Access is still very much part of the Office family. Luckily since Office 95 Access is not included by default in the standard MS Office version so working with either Access or FileMaker is now a more deliberate decision.

We will first talk about the building blocks that are available:
- Files
- Fields
- Layouts
- Scripts
- Relationships

Then we will discuss how you would roll-out an Access solution as opposed to a FileMaker solution:
- File sharing / Web enabling
- Security
- Scalability

And how you would maintain that solution:
- Documenting
- Making changes

FileMaker 5.5 and Access 2002[1] are the current releases of both products and these will be used in this comparison:

Let's start with the most obvious differences between FileMaker and Access.

---

[1] Also called Access XP or Access 10.

2. The obvious

There are two very important obvious differences:

- Access is a Windows only product. If there is one Mac computer on the client's network that needs to access the solution, then Access is no good. If your client is all Windows however, then an Access developer can be your competitor. FileMaker is also expanding into the Linux arena with the announced version of FileMaker Server 5.5 for Linux. That is nothing something that Microsoft will likely be doing.

- FileMaker is really a suite of products: FileMaker Pro, FileMaker Server, FileMaker Unlimited, FileMaker Mobile. This distinction will be very important when we draw our conclusions.

3. The not so obvious

How does Access compare with FileMaker under the hood : what can be done, and which is better . . .

3.1.   General specifications

As a general rule any solution will consist of more than one file and will have more than one user. What then are the limits?

	Microsoft Access	FileMaker
File size	One file (*.mdb) cannot exceed 2 GB. However, because your database can include linked tables in other files, its total size is limited only by available storage capacity.	2 GB per file. Here too, the only real limitation is disk space.
Number of concurrent open files (from the users perspective)	1 visible. Access can used info from linked tables by loading them in memory	Max 50 at any time. Depends heavily on working with FMS or not.
Number of objects in a database	32,768	Part of the overall file size. See below for an overview of objects.
Number of concurrent users	255	50 database or 25 guests with trade-off for FM standard. 125 files to 250 guests with FMS
Application size	160 MB	26 MB

Let's have a closer look at the real concurrent users/concurrent files limitations.

In a FileMaker Peer to Peer scenario[2] the formula for trade-off between users and guests is

Total Sockets 254
Host retains 7
Leaves.................................... 247

---

[2] Regular FileMaker Pro version hosting the files, not using FileMaker Server version.

Socket Consumed = Number of files x number of users x 2 (with a maximum of 247)

This gives us following real limitations (remember that number of users includes the host!).

The left side of the table tells us how many files we can have open for a given number of users: one user can have 50 files open, 3 users sharing a solution can only have 41 files open, 9 simultaneous users are limited to 13 files, and so on.

The right side of the table looks at the equation from the other side. If your solution has 50 files than only 2 users can use it at the same time. 30 files can be shared by 4 concurrent users, etc.

# users	# files	# files	# users
1	50	50	2
2	50	45	2
3	41	40	3
4	30	35	3
5	24	30	4
6	20	25	4
7	17	20	6
8	15	15	8
9	13	10	12
10	12	5	24

These limitations do not apply in a scenario where FileMaker Server is used. The only real limitation there is the overall performance of the network, workstations and server. These factors will determine if the users find the performance of the solution acceptable.

In this aspect Access falls in-between FileMaker Pro and FileMaker Server. There are no sockets limitations as in FileMaker Pro, but it does not have the "server" capabilities of FileMaker Server either.

FileMaker Server will allow you to share your solution to 250 people, Access has a theoretical max of 255 users. But as we will discuss later Access in a workgroup is difficult to deploy and maintain.

3.2.   Objects?

Access does have a limitation on the number of objects in a file and FileMaker doesn't. What are those 'objects' and what do we have in FileMaker?

Microsoft Access Objects	FileMaker "Objects"
Tables	Very similar to the Table view of a layout showing all fields
Queries	Criteria for finds & found sets
Forms	Layouts
Reports	Layouts with summaries
Data Access Pages	Layouts
Macros	Scripts
Modules	scripts & plug-ins

We'll get into details for those objects later. Let's talk about the different modes you can find a FileMaker or Access database in:

Microsoft Access Modes	FileMaker Modes
Datasheet view	Browse
Design	Layout
Non-existent: closest would be Query design mode.	Find
Print Preview	Preview

The "Find" process in Access is similar to a scenario in FileMaker where you would let the user input search criteria in globals, then take use those globals to perform an actual find. More about Queries later.

Or more accurately Queries in Access are SQL based queries against the open database.

3.2.1. Table

In Access the Table is where you define your fields and where you could see the data as in a spreadsheet, or similar to a list mode in FileMaker.

Some of the most important limitations of an Access Table:

	Microsoft Access	**FileMaker**
Number of characters in a field name	64	60
Number of fields in a table	255	Unlimited.
Number of open tables	2048. The actual number may be less because of tables open internally by Microsoft Access.	Not applicable. One Access Table would really be one FileMaker file.
Table size	1 gigabyte. Remember the 2 GB file size limit.	FileMaker doesn't have tables. Or rather one FileMaker file is one table. 2GB.
Number of characters in a record (excluding Memo and OLE Object fields)	2,000	Unlimited.

As mentioned above you would define your fields in this table. So let's have a look at some of the field types and their specifications.

Field types in red do not exist in FileMaker. Field types in Blue do not exist in Access.

	Microsoft Access	**FileMaker**
Text	Up to 255 characters	Up to approximately 64,000 letters, symbols, and numbers used as text
Memo	Lengthy text and numbers, such as notes or descriptions. Up to 64,000 characters.	Text field
Hyperlink	Up to 64,000 characters. Field that will store hyperlinks. A hyperlink can be a UNC path[3] or a URL[4]	Text field. You would use the Open URL script step to activate a text string as hyperlink.
Number	Numeric data to be used for mathematical calculations, except calculations involving money (use Currency type). 1, 2, 4, or 8 bytes. 16 bytes for Replication ID only. 1 byte = 256 values (0-255) 2 bytes, 65.535 values 4 bytes, 4 billion+ values …	Up to 255 numbers, letters, or symbols. (In most cases, only the numbers are treated as numeric.) Number fields can't contain carriage returns. Only 15 significant digits will be used in calculations.
Currency	Currency values. Use the Currency data type to prevent rounding off during calculations. Accurate to 15 digits to the left of the decimal point and 4 digits to the right. 8 bytes	Part of the field formatting options.
AutoNumber	Unique sequential (incrementing by 1) or random numbers automatically inserted when a record is	Creation option

---

[3] Universal Naming Convention, follows the format: \\serverName\shareName
[4] Uniform Resource Locator, follows the format : http://…

	Microsoft Access	FileMaker
	added. 4 bytes = 4 billion values.	
Boolean	Fields that will contain only one of two values, such as Yes/No, True/False, On/Off. 1 byte.	Value list – input validation option
Date	Dates and times. 8 bytes.	Dates only.
Time		Times only. A time field can contain the hours, minutes, and seconds portion of a time.
Container	Objects (such as Microsoft Word documents, Microsoft Excel spreadsheets, pictures, sounds, or other binary data), created in other programs using the OLE protocol that can be linked to or embedded in a Microsoft Access table. Up to 1 GB.	A picture, multimedia file, or OLE object (Windows only). You can reference container fields in calculations and summary fields. You can't find or sort records based on container fields, but you can define text fields to describe or identify them. Then, you can find or sort records based on the description or identifying number in the text field.
Calculation	Non existent as field type Part of any field definition (Validation or Default Value).	The result of a formula that uses field values from the current record or related records. The result can be one of these types of data: text, a number, date, time, or container.
Summary	Non existent as field type	A value that's produced by summarizing field values from more than one record in the same file.
Global	Non existent	One value to be used in all records of the file. A global field can contain text, number, date, time, or container data.
Lookup Wizard	Creates a field that allows you to choose a value from another table or from a list of values using a combo box.	Option for field formatting

At first sight, not too much different. But defining number fields in Access is a **lot** more complex than in FileMaker. For instance: you really have to know how many values a certain number field type can hold. If you choose Integer for instance you field is limited to values up to the number 32,767. Very important because mistakes at this point can come back and haunt you later.

The absence of globals is also very significant. You can set temporary values in unbound controls, but they are lost when the form or report is closed. Or you have to revert to Visual Basic to use solution-wide variables. Certainly not easy as a FileMaker global.

As in FileMaker, there are certain options you can set while defining fields:

	Microsoft Access	FileMaker
Field Size	Yes	Part of the validation options, where you can specify the maximum number of characters.
Input Mask	Some very interesting ones such as: Phone Number (206) 555-1212 Postal Code A1B 2C3 Social Insurance Number 555 333 555 Password	Most are not built-in, workarounds needed.

	Microsoft Access	FileMaker
	******* And you can even define your custom input mask.	
Caption (label)		On Layout only.
Default Value	Yes. This is where you could specify a calculation. ± 160 functions to choose from.	Yes. ± 100 built-in functions. (Not counting the Status functions).
Validation Rule	Expression builder	Most frequent ones are offered as easy choices (range, unique, …). Calculated validation possible.
Validation Text	Customisable error message if validation fails.	Same.
Required		Part of the validation rules
Allow Zero Length		Part of the validation rules
Indexed		
Unicode Compression	Uses two bytes for each character. Allows for up to 65,536 characters instead of 256.	No.

3.2.2. Query

In Access, you use a query to do a find or to operate (update, add, …) on the data in your tables.

With a query, you can display the records that match certain criteria, sort the data, and even combine data from different tables.

You can edit the data displayed in a query (in most cases), and the data in the underlying table will change.

FileMaker does not make a Table/Query distinction. In FileMaker you always work with and within the table. A query compares to setting find & sort criteria then viewing the found set.

A query has much of the same specifications as a Table:

	Microsoft Access	**FileMaker**
Number of tables in a query	32	Compare this to doing a find using related fields from other files. 50 (max open files).
Number of fields in a record-set	255	Unlimited
Record-set size	1 gigabyte	2 gigabyte (found set).
Sort limit	255 characters in one or more fields	20 characters per field.
Number of levels of nested queries	50	
Number of characters in an SQL statement	Approximately 64,000	SQL statements are stored in a text field, so 64,000 is be the max length.
Number of characters for a parameter in a parameter query	255	You would use standard fields to ask a user input.

Think of a Query as a visual user interface for building SQL statements. In fact, you can "save" your query either as a separate object by itself or as an SQL statement in a form or report.
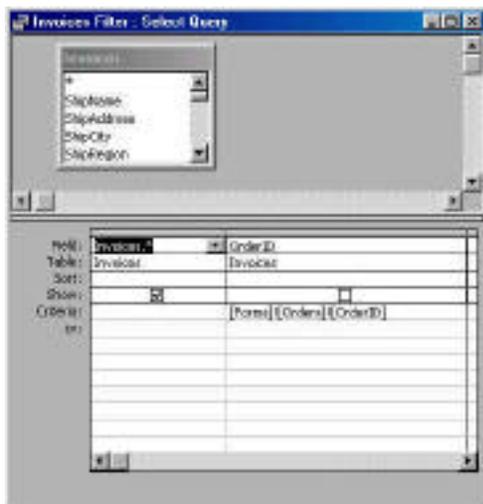
A query can also bring data from separate tables together as a basis for a report a form or a data access page.

Types of queries.

There are two basic types of queries: those that merely select or summarize the data, and those that modify the data (called Action Queries).

Select...............................Your basic find. Ideal for showing and updating subsets of data.
Xtab ....Like a pivot table in Excel.

Delete ....
Update............................like the replace function
Append ....like the import function
make-table.......................creates a new table instead of merely a subset of the data. A find & export combined.

Parameter........................Some criteria are predefined, the user is prompted for other inputs (two dates, …)

3.2.3. Form

3.2.3.1. What is it?

A Form is what FileMaker would call a Layout. Access makes a distinction between Forms and Reports (see 2.2.4 below).

The biggest differences between an Access Form and a FileMaker Layout are:

- In Access you can use "fields" on your form that are defined nowhere else. How? All information on a Form is stored in controls (think of it as a data placeholder). A control can be bound (basically a defined field) or unbound (just a storage space to hold values, calculations, …). In that, an unbound control is a bit like a global, except that it is not defined in any table, but belongs to a form. When the form is closed, the value is lost.

- Special forms can be created as pop-up dialog boxes for requesting user input, displaying information, …

	Microsoft Access	FileMaker
Number of characters in a label	2,048	64,000
Number of characters in a text box	65,535	Same.
Form or report width	22 in. (55.87 cm)	111 inches (283 cm)
Section height	22 in. (55.87 cm)	
Height of all sections plus section headers (in Design view)	200 in. (508 cm)	111 inches (283 cm)
Number of levels of nested forms	3	2 (data from the file itself and data from a related file)
Number of fields or expressions you can sort or group on in a report	10	As many as there are fields
Number of headers and footers in a report	1 report header/footer; 1 page header/footer; 10 group headers/footers	
Number of printed pages in a report	65,536	Unlimited?
Number of controls and sections you can add over the lifetime of the form or report	754	Unlimited?

Does Access have something like Portals? Yes, They are called Subforms. A form/subform combination is often referred to as a hierarchical form, a master/detail form, or a parent/child form. Note than in access you can have a portal within a portal.

One of my favourite controls is the Pivot table. (in Access 2000 it uses MS Excel to create the pivot table and inserts it on a form as an OLE object, in Access 2002 pivot tables are native). This allows the users to do a lot of on-the-fly data analysis without a lot of programming.

OLE objects is an area where Access - as a member of the Office family - makes a difference. There are a ton of Office objects you can put on a form, including a complete web browser.

3.2.3.2. Layout design & Interface design

3.2.3.2.1.   Built-in Forms designs

Access offers these types of built-in Forms:

- Columnar (standard layout, lists all fields top to bottom)
- Tabular (columnar layout, lists all fields left to right) & Justified (special Tabular report, justifies fields over the full length and width of the layout).
- Datasheet (table view)
- Pivot table & Pivot chart (new in Access 2002).

Except for the pivot table & chart, you'll find the same in FileMaker.

3.2.3.2.2.   Layout formatting

In FileMaker a layout is still very much an integral part of the file. In Access a Form opens separately from the database in a new window. Because of this Object oriented approach Access allows more built-in control over the interface than FileMaker does. Some examples:

- Disabling close box
- Adding or removing scroll bars
- Size a form to the content
- Position a form on the screen
- Full control of menu bars, can change dynamically with any event. Including the right-click shortcut menu.
- Conditional formatting

FileMaker is somewhat limited in this respect. Menu items can be disabled (greyed out) based on the access privileges and since 5.5 the developer has scriptable control over the tool bars.

More power is offered through plug-ins[5].

3.2.3.2.3.   Field formatting

FileMaker has value lists. How do those translate in Access? There you have Combo boxes and List boxes. The values in those lists can either be the result of:
- A function
- A table
- A query
- Or hard coded values

Not so different than FileMaker, except for the number of columns you can show in a value list.

3.2.4. Reports

A report is basically the same as Form but mainly used for printing. This is where you would do your grouping, subtotals and summaries, mailing labels, …

The approach is slightly different in Access than in FileMaker. Remember that in Access you can use unbound controls that belong only to a form or report. So you could make those your subtotal & summary calculations as part of the Report instead of defining them in your Table.

---

[5] Display Toolbox by David McKee and SecureFM by New Millennium.

This is an important design decision: define those fields in your table or define them on a Form? Designing them on a Form doesn't clutter up your table, but it might make your solution more difficult to maintain because you have to remember where those definitions are …

Access offers built-in charting in Reports – FileMaker currently does not, unless a third party plug-in is utilised.

One big drawback in Access is that exporting data from forms and reports does not work very well. Only exports from Tables and Queries work all the time.

3.2.5. Data access page

A Data access page is a special "form", a web page to enter/edit data or view reports on the Internet. It can also be used as the body of a mail message.

To view and work with the data access page on the Internet or an intranet, users need Microsoft Internet Explorer 5 and a Microsoft Office 2000/2002(XP) license. It's not just a license issue, the technology uses MS Office resources to make this work.

More about web-enabling in a later section.

Access 2002 stepped up the support for Data Access Pages by providing better design tools.

3.2.6. Macros

Like ScriptMaker in FileMaker, Access offers a collection of pre-programmed actions. But you'll notice that there are a lot less of these actions defined in Access.

Access Macro Actions		FileMaker script steps	
FindRecord	OpenDiagram	Allow User Abort	Modify Last Find
Maximize	OpenForm	Beep	New
OpenDataAccessPage	OpenModule	Change Password	New Record/Request
RepaintObject	OpenQuery	Check Found Set	Omit Multiple
Restore	OpenReport	Check Record	Omit Record
RunMacro	OpenStoredProcedure	Check Selection	Open
RunSQL	OpenTable	Clear	Open Application Preferences
SetMenuItem	OpenView	Close	Open Define Fields
SetValue	OutputTo	Comment	Open Define Relationships
SetWarnings	PrintOut	Copy	Open Define Value Lists
AddMenu	Quit	Copy All Records	Open Document Preferences
ApplyFilter	Rename	Copy Record	Open Help
Beep	Requery	Correct Word	Open ScriptMaker
CancelEvent	RunApp	Cut	Open Sharing
Close	RunCode	Delete All Records	Open URL
CopyObject	RunCommand	Delete Portal Row	Page Setup (Mac OS)
DeleteObject	Save	Delete Record/Request	Paste
Echo	SelectObject	Dial Phone	Pause/Resume Script
FindNext	SendKeys	Duplicate Record/Request	Perform AppleScript
GoToControl	SendObject	Edit User Dictionary	Perform Find
GoToPage	ShowAllRecords	Else	Perform Script
GoToRecord	ShowToolbar	End If	Print
Hourglass	StopAllMacros	End Loop	Print setup (Windows)
Minimize	StopMacro	Enter Browse Mode	Quit Application (Mac OS)
MoveSize	TransferDatabase	Enter Find Mode	Recover
MsgBox	TransferSpreadsheet	Enter Preview Mode	Refresh Window
	TransferText	Exit Application (Windows)	Relookup
		Exit Loop If	Replace
		Exit Record/Request	Revert Record/Request
		Exit Script	Save a Copy As
		Export Records	Scroll Window
		Flush Cache to Disk	Select All
		Freeze Window	Select Dictionaries
		Go to Field	Send Apple Event

Access Macro Actions		FileMaker script steps	
		Go to Layout	Send DDE Execute
		Go to Next Field	Send Mail
		Go to Portal Row	Send Message
		Go to Previous Field	Set Error Capture
		Go to Record/Request/Page	Set Field
		Go to Related Record	Set Multi-User
		Halt Script	Set Use System Formats
		If	Set Zoom Level
		Import Records	Show All Records
		Insert Calculated Result	Show Message
		Insert Current Date	Show Omitted
		Insert Current Time	Sort
		Insert Current User Name	Speak (Mac OS)
		Insert From Index	Spelling Options
		Insert From Last Record	Toggle Status Area
		Insert Movie (Mac OS)	Toggle Text Ruler
		Insert Object	Toggle Window
		Insert Picture	Undo
		Insert QuickTime (Windows)	Unsort
		Insert Text	Update Link
		Loop	View As
		And the new FileMaker 5.5 script steps :	
		Allow Toolbars	
		Execute SQL	
		Open Hosts	
		Set Next Serial Value	

There are a few "reserved" macro names that add additional functionality. Probably the most useful one is "AutoKeys". A macro where you specify keystrokes that are associated to macro names.

The macro window in Access resembles a spreadsheet and consists of 4 columns:
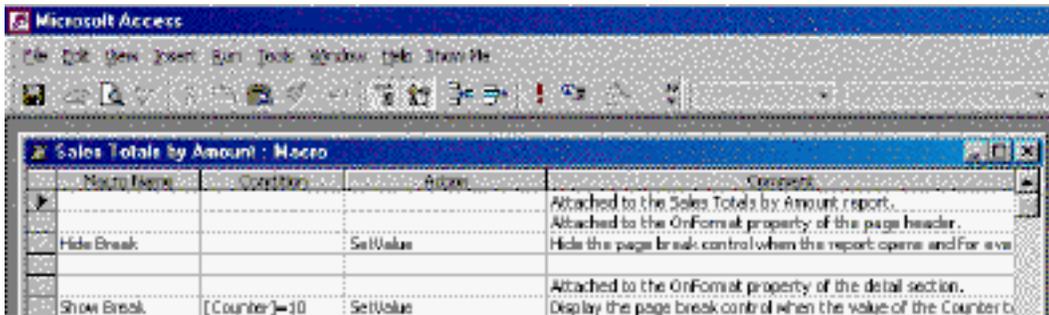
Except for the layout, there doesn't seem to be much difference between FileMaker and Access.

However, remember that some "actions" can be set directly in objects without the need for a Macro. For instance: opening a Form for data entry so that it never displays existing data, but opens up on a new blank record.

Despite all this, the number of Actions is a lot more limited than the available script steps in FileMaker. It is obvious then that you will need excellent Visual Basic for Applications knowledge to make a robust Access solution.

In FileMaker if you want to accomplish something that is not feasible with the available script steps, you have to rely on plug-ins for the additional functionality.

Which approach is better?

The downside of FileMaker's approach is that you have to pay for the added functionality by purchasing plug-ins. Upside is that once you have paid, you'll be working in 30 mins or less.

The upside of Microsoft's approach is that you give the developer a lot more tools. Downside is the steeper learning curve / longer development cycle and both translate into a higher price for the solution.

I believe FileMaker's approach is the most cost effective approach.


3.2.7. Module

As mentioned above if the predefined actions are not enough, you can create your own actions with Visual Basic for Applications. VBA is collection (subset) of VB declarations and procedures that allow you to write your own functions.

For those with no experience with VB/VBA: it is really powerful. You can access the entire Win32 API with this. Some examples:

- Create, delete, and rename files & folders
- Retrieve network login name, computer name
- Disable close/maximize/restore box on a window
- Send keys to another application

Access can have up to 1,000 modules (including those embedded in forms and reports). FileMaker is unlimited, although someone reported on the Dartmouth email list recently that he couldn't add another script beyond 1,300.

The programming interface in Access is the Visual Basic Editor that is shared among all Office applications and includes colour coding, syntax checking, debugging tools, and an 'immediate' windows to see what values variables currently have.
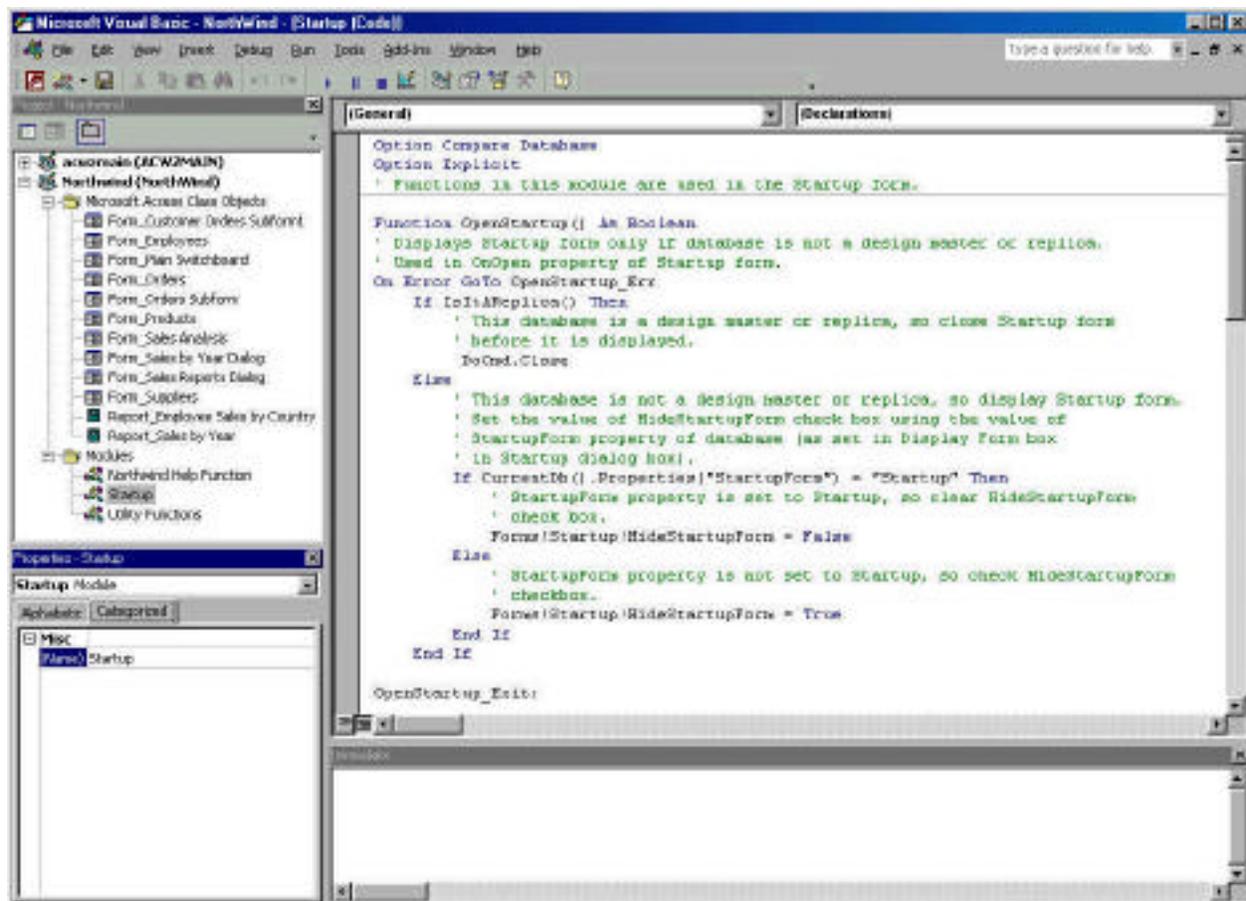
Most FileMaker developers are looking forward to the new FileMaker Developer 5.5 edition where some of these case tools will be implemented.

Coding is not as centralized in Access as it is in FileMaker. You can find VBA code attached to Objects such as Forms and Reports as well, so that makes harder to maintain.

3.3.   Relationships

Now we know all the building blocks to make a file, most likely with multiple tables. But how do we create relationships between files/tables?

3.3.1. Types of Relationships

It is not my intention to explain the basics of relationships; we all know the three types there exist:

- 1-1
- 1-many
- many-many

Both Access and FileMaker support the all three types of relationships. In both applications a join file can achieve a many-to-many relationship.

So no surprises there.

3.3.2. What about Referential integrity?

Referential integrity is all about protecting data. It is a system of rules to ensure that relationships between records in related tables are valid, and that you don't accidentally delete or change related data.

You have referential integrity when all of the following conditions are met.
- Unique keys (in the parent file, no two records should have identical keys).
- Keys in related tables are the same data type (which is stricter in Access than in FileMaker. Remember the different number formats?)

When defining the relationship in Access, you can set "Enforce Referential Integrity" to "yes". This means that you:
- Can't break the relationship by modifying the key in one of the two files.
- Can't delete parent records if children exist.
- Can't create child records without parents.
- Can't enter a key value in the child file that does not exist in the parent file (except a null value)

You can override this in Access by using the "Cascade Update Related Fields" and "Cascade Delete Related Records" options. This last option exists in FileMaker as well; the first doesn't and needs to be scripted.

Overall, Referential integrity control is not as strictly implemented in FileMaker. Relationships can easily be broken if you're not careful. "Special Edition Using FileMaker Pro 5" by Rich Coulombre and Jonathan Price presents an excellent overview of Referential Integrity in FileMaker and how to enforce it. Reflecting I think the FileMaker community's ability to build very robust solutions.

3.3.3. ER diagrams

Access allows you to see the files, key fields and the type of relationships that exist in a file:
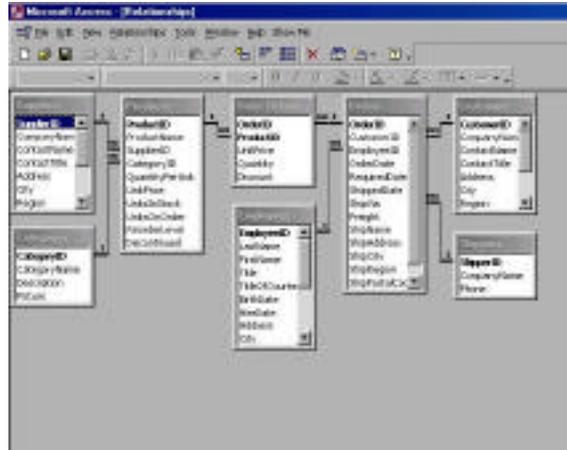
Something we all wish for in FileMaker, no doubt. FileMaker Developer edition 5.5 will have some documenting features.

3.4.   Event Triggers

An event trigger lets you choose a set of actions when a particular event is happening or has just happened. It is not the user that triggers an action (by clicking on a button) but something that happens, an event.

Having event triggers lets you automate your solution further than is possible in FileMaker where the user needs to start a script for action to take place.

Below is a list of event triggers as they are implemented in Access. FileMaker has some event triggers of its own, but not nearly as extensive as those available in Access.
- •   Data Events
- •   Error and Timing Events
- •   Filter Events
- •   Focus Events
- •   Keyboard Events
- •   Mouse Events
- •   Print Events
- •   Window Events

Not all triggers apply to all objects. The tables below indicate for what objects the trigger event can be set. We are listing them all below to give you an impression of the power you can expect from event triggers. But remember that with that power comes also the increased possibility of things going wrong. FileMaker "simplicity" is often your protection.

In Access you have to give a lot more thought to the flow of the user. An unintended macro (script) triggered by a user or other event that you had not foreseen might wreck your data. Think about a user tabbing back in a field he just left, then tabbing back out (ending up running the macro twice), the user accidentally closing a form, or accidentally clicking on a form in the background causing a "focus" event trigger, or a user holds a key longer than usual and causes the macro to run more than once, …

Event triggers also require a very thorough understanding of the sequence of events. When is a record updated? When you move out of a field? When you exit the record? If you want something to happen just before the record updates you have to know.

3.4.1. Data Events

Data events occur when data is entered, deleted, or changed in a form or control, or when the focus moves from one record to another.

Event	When exactly ?	Event	When exactly ?
AfterDelConfirm (forms)	After you confirm record deletions or after the deletions are cancelled.	**OnDelete** (forms)	When a record is deleted, but before the deletion is confirmed and actually performed.
AfterInsert (forms)	After a new record is added to the database.	**OnDirty** (forms)	When the contents of a form. It also occurs when you move from one page to another page in a tab control.
AfterUpdate (forms, controls)	After a record is updated with changed data. This event occurs when the control or record loses the focus.	**OnNotInList** (controls)	When a value is entered in a combo box that isn't in the combo box list.
BeforeDelConfirm (forms)	After one or more records are deleted, but before Microsoft Access displays a dialog box asking you to confirm or cancel the deletion. This event occurs after the Delete event.	**OnUpdated** (controls)	When an OLE object's data has been modified.
BeforeInsert (forms)	When you type the first character in a new record, but before the record is added to the database.	**OnChange** (controls)	When the contents of a text box changes; for example, when you type a character in the control
BeforeUpdate (forms, controls)	Before a control or record is updated with changed data. This event occurs when the control or record loses the focus.	**OnCurrent** (forms)	When the focus moves to a record, making it the current record, or when you requery a form's source of data. This event occurs when a form is first opened, and whenever the focus leaves one record and moves to another.

3.4.2. Error and Timing Events

The following events are used for error handling and synchronizing data on forms or reports.

Event	When exactly ?	Event	When exactly ?
OnError (forms, reports)	When a run-time error is produced in Microsoft Access while you are in the form or report.	**OnTimer** (forms)	When a specified time interval passes, as specified by the **TimerInterval** property of the form. You can use the Timer event to keep data synchronized in a multi-user environment by requerying or refreshing data at specified intervals.

3.4.3. Filter Events

Filter events occur when you apply or create a filter on a form.

Event	When exactly ?	Event	When exactly ?
OnApplyFilter (forms)	When you click **Apply Filter** on the **Records** menu or on the command bar.	**OnFilter** (forms)	When you click **Filter By Form** or **Server Filter By Form** after pointing to **Filter** on the **Records** menu, or on the command bar.

3.4.4. Focus Events

Focus events occur when a form or control loses or gains the focus, or a form or report becomes active or inactive.

Event	When exactly ?	Event	When exactly ?
OnActivate (forms, reports)	When a form or report becomes the active window.	**OnExit** (controls)	Just before a control loses the focus to another control on the same form. This event occurs before the LostFocus event.
OnDeactivate (forms, reports)	When a different Access window becomes the active window, but before the window becomes the active window.	**OnGotFocus** (forms, controls)	When a control, or a form with no active or enabled controls, receives the focus.
OnEnter (controls)	Before a control actually receives the focus. This event occurs before the GotFocus event.	**OnLostFocus** (forms, controls)	When a form or control loses the focus.

3.4.5. Keyboard Events

Keyboard events occur when you type on a keyboard.

Event	When exactly ?	Event	When exactly ?
OnKeyPress (forms, controls)	When you press and release a key or key combination that produces a standard ANSI character For keystrokes not recognized by KeyPress, such as function keys or navigation keys, use the KeyDown and KeyUp events. If you hold down a key, the KeyPress event occurs repeatedly.		
OnKeyDown (forms, controls)	When you press any key on the keyboard . If you hold down a key, the KeyDown event occurs repeatedly.	**OnKeyUp** (forms, controls)	When you release a pressed key . If you hold down a key, the KeyUp event occurs after all the KeyDown and KeyPress events have occurred.

3.4.6. Mouse Events

Mouse events occur when a mouse action, such as pressing down or clicking a mouse button, occurs.

Event	When exactly ?	Event	When exactly ?
OnClick (forms, controls)	When you press and then release (click) the left mouse button on a control.	**OnMouseDown** (forms, controls)	When you press a mouse button while the pointer is on a form or control.
OnDblClick (forms, controls)	When you press and release (click) the left mouse button twice on a control or its label.	**OnMouseMove** (forms, controls)	When you move the mouse pointer over a form, form section, or control.
		OnMouseUp (forms, controls)	When you release a pressed mouse button while the pointer is on a form or control.

3.4.7. Print Events

Print events occur when a report is being printed or is being formatted for printing.

Event	When exactly ?	Event	When exactly ?
OnFormat (reports)	When Access determines which	**OnPrint** (reports)	After Access has formatted the data in

Event	When exactly ?	Event	When exactly ?
	data goes in a report section, but before Access formats the section for previewing or printing.		a report section, but before the section is printed.
OnNoData (reports)	After Access formats a report for printing that has no data, but before the report is printed. You can use this event to cancel printing of a blank report.	**OnRetreat** (reports)	When Access must "back up" past one or more report sections on a page in order to perform multiple formatting passes. This allows you to undo any changes you have made during the Format event for the section.
OnPage (reports)	After Access formats a page for printing, but before the page is printed.		

3.4.8. Window Events

Window events occur when you open, resize, or close a form or report.

Event	When exactly ?	Event	When exactly ?
OnClose (forms, reports)	When a form or report is closed and is removed from the screen.	**OnResize** (forms)	When the size of a form changes. This event also occurs when a form is first displayed.
OnLoad (forms)	When a form is opened and its records are displayed. This event occurs before the Current event, but after the Open event.	**OnUnload** (forms)	When a form is closed and its records are unloaded, but before it's removed from the screen. This event occurs before the Close event.
OnOpen (forms, reports)	When a form is opened but before the first record is displayed. When a report is opened but before it prints.		

3.5.   Rolling out the database

3.5.1. Multi-user

If it were just for using on your own desktop then this comparison wouldn't be very important, it would be up to your personal preference to use FileMaker or Access. However, in business, the scalability of the solution is a very important aspect. How do FileMaker and Access handle sharing the databases in a growing workgroup?

There are different ways to share a database. We will discuss each of them in turn:
- Replication or offline sharing
- Peer-to-peer sharing
- Client/Server sharing
- Web enabling

3.5.1.1. Replication – offline sharing

In this scenario, several users work in different locations on their own copies of the database at the same time. Changes made by them are not automatically reflected in the other user's databases. These databases need to be synchronized from time to time for all users to have an up-to-date database.

Access comes with a full-blown Replication Manager with Conflict Viewer. One copy of the database is the design master all others are called replicas. Only the Design Master can change forms, macros, … changes made to a replica (other than data) will be lost when synchronizing.

Local performance (working on the database) is very fast since there is no networking involved. But everybody is basically always working on old data.

FileMaker Pro 5 introduced some synchronisation built-in by choosing "match fields" on the import and this functionality was improved in FileMaker 5.5 (with Dynamic Field Name Matching). But it takes a lot of scripting and additional fields to build a robust synchronization process.

A special form of offline sharing is on a PDA. Access does not have its own solution for this. However Microsoft recently released SQL Server CE edition for Pocket PC. FileMaker has its own product called FileMaker Mobile (that is basically a plug-in). Although it lacks in feature set and is currently only available for the Palm OS it shows that FileMaker is taking this market seriously and they have announced versions for Pocket PC and I-mode.

SQL Server CE is only available as part of the SQL Server developer edition (800$) and when connected to the desktop requires its own SQL Server client licence.

3.5.1.2. Peer-to-peer sharing

Peer-to-peer sharing is where you would put the files on one machine and let other users access those files. In this section we will be talking about using the standard Access or FileMaker product.

3.5.1.2.1.   File Sharing

For Access this means copying the Access file to a shared volume and setting the file to allow sharing (which is the default setting). Operating System file sharing must be on at all times. Users locate the file in their Windows Explorer and can create a shortcut directly to the file. Another aspect that needs to be taken care of sharing privileges (as part of the user domain authentication).

Files you want to share in FileMaker have to be set to multi-user (not the default setting) and may not be located in a shared volume. Operating System file sharing must be turned off, users have to access the file through the HOST procedure. This is a very big and very important difference. One that is difficult for MS oriented staff to understand because it is the exact opposite of all Microsoft file sharing rules.

Quoting from Jimmy Jones (FMI engineer) on this issue[6]: "[…] Sharing the FM folder that the files reside in can cause a FM crash. My understanding is that the cause is the very complex interaction between the TCP/IP network layer (typically this occurs only in TCP/IP), OS file sharing interaction with the OS security, interaction between FMP file data requests using the TCP/IP stack and the OS security trying to prevent inappropriate file access of a shared volume.
Scenario;
1. The folder in which the FM files reside is shared by the OS.
2. FM is sharing the file(s) using the selected protocol.
3. The OS is charged with preventing inappropriate access of the files on the hard drive (but the FMP program is running locally!).
4. Now the OS detects a request for data using a file access over the network, since the file is in a shared volume the OS thinks it is supposed to read/write to the file it tries to authenticate the access. However, there is no 'real' network access going on and there is no user interface and (remember FMP is running locally) no way for FMP to tell the OS the access is OK. The OS gets confused and crashes FMP. Since FMP has its own sharing stack using the protocol the OS shouldn't get in the way, but if the folder is shared the OS will try to authenticate file access privileges. The problem seems to occur because the OS level security thinks the network request for file 'data' should be authenticated even though it came through the FMP stack and the local copy of FM will do the actual file access. Go figure."

So what happens when FileMaker files are located on shared volumes? Network performance degrades and there is risk of file & data corruption.

Another implication of FileMaker's approach is that it doesn't care about network privileges. Even a user that is not logged in on a NT / Windows 2000 domain can still access hosted FileMaker files. Another aspect that is very foreign to most IS people. Since Access files are put on network shares, the privileges and security settings for that share apply before you can open the files.

FileMaker 5.5 & FileMaker Server 5.5 introduced optional domain authentication through LDAP directory services.

---

[6] Note: this is his personal opinion on this matter. FileMaker Inc has not released an official statement on this.
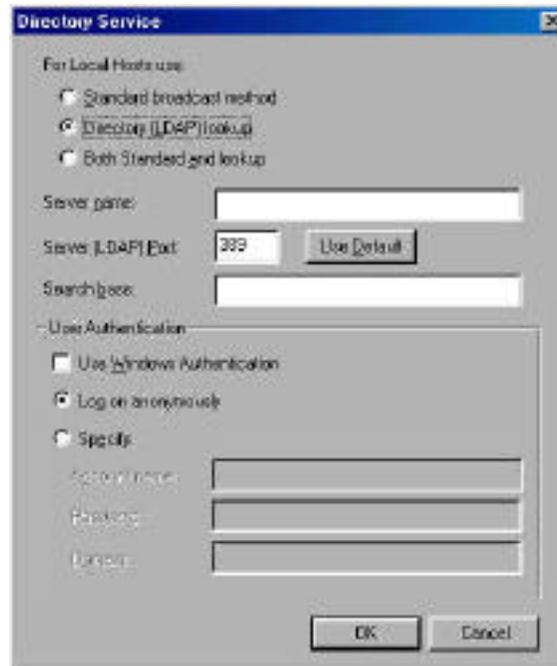
Both FileMaker and Access recommend a dedicated machine for the host and that makes a lot of sense.

3.5.1.2.2. Behind the scenes

Sharing an Access file automatically creates some additional files that you must be aware of.

A   The locking file.

When you open an Access database file (*.mdb) in shared mode, Access also creates a locking information file (.ldb) with the same file name and in the same folder as the database file. This locking information file stores the computer name and security name of each shared user of the database. Access uses this information to control concurrency. In most cases, Microsoft Access automatically deletes the locking information file when the last user closes the database file.

FileMaker locking information is not stored in a separate file. More about locking later.

B   The Workgroup Information File

In addition to a locking information file, Access also creates a workgroup information file (.mdw), also known as the system database. (The default name is System.mdw.). It stores information about the users, groups, and passwords for a secured database.

The location of this file in multi-user environments is important. The workgroup information file can be placed on the local workstation or shared on a network drive. However, if it's stored locally, you must take the steps necessary to update it when security settings change.

Filemaker stores security information directly in the files, so there is no need for additional files or separate updates when something changes.

3.5.1.2.3. Client software

To access the shared Access database from another computer, you must have one of following on the other computer:

- • a local installation of Microsoft Access,

- • or a run-time application.

Access allows for royalty-free networkable runtimes, but you need to buy the Office Developer Edition to do this. This is a much-debated point in the FileMaker community. Since FileMaker 4, there is no possibility of distributing networkable runtimes of a solution. Each client needs a full version of FileMaker.

3.5.1.2.4. Speed considerations

A   Network traffic

Inspired by an earlier comparison by the people at fmconnect.net I decided to test the network traffic generated by two identical databases: one in FileMaker the other in Access.

I created two files with 5,000 records each. Since I wanted to maximize the file size I populated one field in each record with 64,000 characters.

First surprise was the file size:
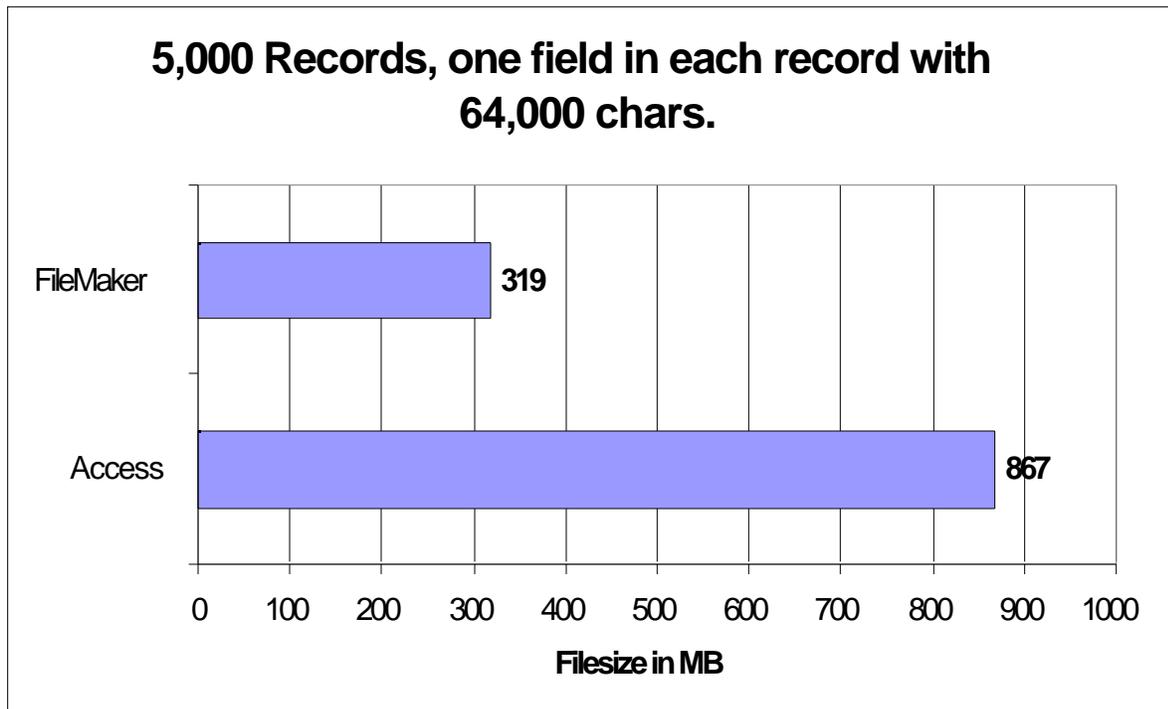
So I decided to compress both databases. The size of the FileMaker database didn't change, the Access database shrank to 640 MB.

That the Access database would generate more network traffic is a no-brainer. It is double the size. So I decided to delete half the records in the Access database, bringing it down to 2,500 records. Second

surprise: file size stayed the same. Oh, that's right: Access doesn't automatically reclaim free space. So I compressed the database again (takes all of 5 minutes on a PIII 550 MHz with 256 MB of RAM).
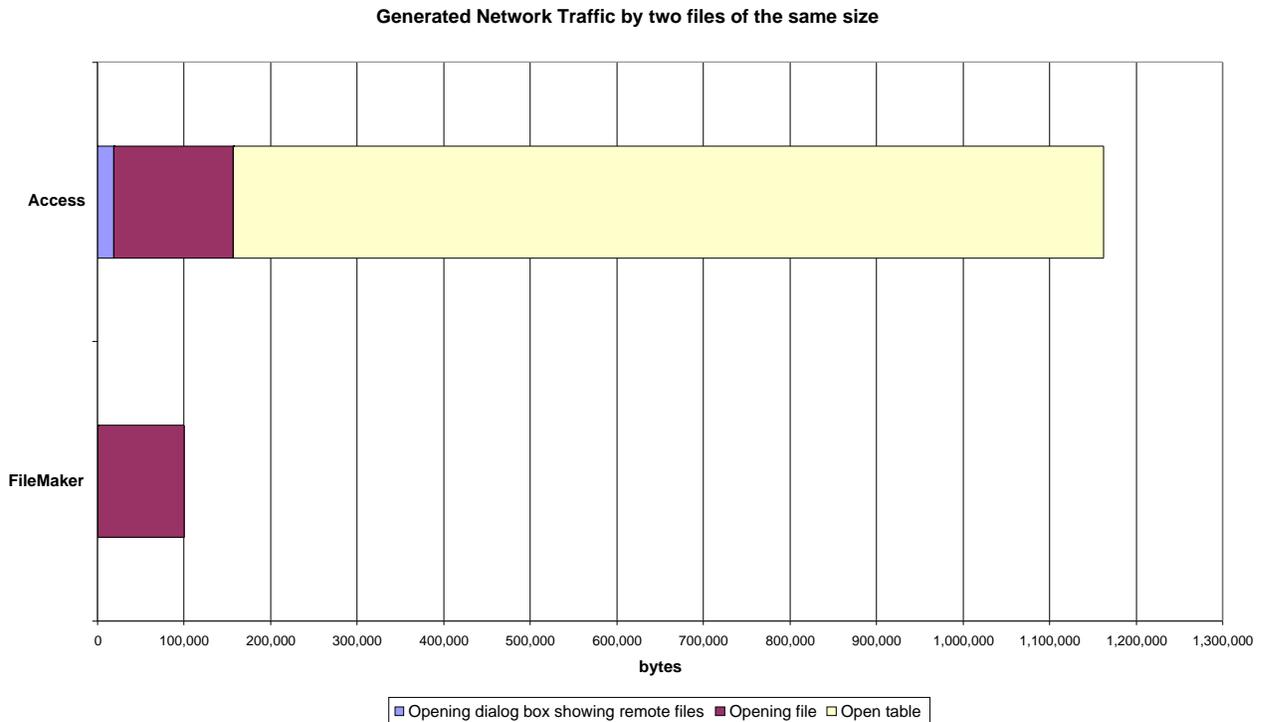
The Access database now came in at 320 MB of RAM for 2,500 records. About the same size as the FileMaker database with 5,000 records.

I put the Access database in a shared folder on a Windows 2000 Server and accessed it with a Windows 98SE client. I used the same machines to open a hosted FileMaker file (FileMaker Server 5.0v2 and FileMaker Pro 5.5v1). The network analysis was done with an iMac DV+ running Wildpacket's Etherpeek 4.0.2. Protocol used : TCP/IP at 100bT.

The table below shows the total bytes and the number of packets that both applications needed to open the remote files.

	Bytes		Packets	
	FileMaker	Access	FileMaker	Access
Opening dialog box showing remote files	1,012	18,991	13	62
Opening file	99,035	138,192	205	248
Opening table	0	1,005,956	0	1,091
Total	**100,047**	**1,163,139**	**218**	**1,401**

A graph expresses it better:

Generated Network Traffic by two files of the same size

Legend: □ Opening dialog box showing remote files ■ Opening file □ Open table

Since both applications open the file in about the same timespan, Access uses a lot more network bandwith than FileMaker. On the test network, FileMaker used max 0,75% of the total bandwith, Access needed 3,5%.

In the above graph, FileMaker does not have data on opening the table because the file and the table are the same. Access opens up on a screen showing the tables. Opening the table generates a lot of network traffic.

When both files were open, FileMaker sent about 71,000 bytes every time a new record was accessed, Access needed close to 140,000 bytes.

In this lies the reason for Access' poor multi-user behaviour.

B   Splitting the database

Microsoft highly recommends to put only the tables on the network host, and keep other database objects (queries, forms, reports, macros, modules) on users' computers. The database's performance will be faster because only data is sent across the network.

The consensus in the Access newsgroups seems to be that if you have more than a few (3-4) users, you need to do this. This is obviously something you have to have in mind before you start designing the solution. Luckily if you didn't, you can separate the tables from other database objects by using the Database Splitter Wizard.

Maintenance wise, this can be a real nightmare. You'll probably need to have some sort of server based distribution tools (such as Microsoft SMS) to tackle this. But even with a tool like that, it takes a lot of time to set up a distribution and to check if everything went according to plan. That pretty much rules out making quick changes to a running system. Something that is very much possible with FileMaker.

FileMaker Pro also has its limitations in a peer-to-peer situation, but the consensus seems to be that 5-8 users can share a solution before speed really becomes an issue. And even then you don't need to do anything drastic as splitting your databases.

C   Indexing

Indexing is very important for both Access and FileMaker. But indexing in Access is much more complex and nowhere as intuitive as in FileMaker.

In Access, indexes are not part of the field definition but have to be set separately, have to be named, one index can include up to 10 fields and indexes cause record locking.

3.5.1.3. Client/Server Sharing

To overcome the limitations in peer-to-peer file sharing, Access offers easy connection to an SQL server backend. The Access file is then no longer called a database (*.mdb) but a project (*.adp). A project does not contain data, only objects (forms, code, reports) that link to SQL Server stored data.

But in this scenario you to be proficient in both Access in SQL Server for this to work. And then there is the cost.

SQL Server 2000 costs about 2,250$ for 10 users. If you want more licenses then the cost goes up to 5,000$ (and that is for just one Server machine). Add another 5,000$ if you need SQL Server on another box. Adding clients to the network can cause real jumps in expenses.

With FileMaker, once speed becomes an issue, you buy FileMaker Server (1,000$), set it up on a server machine and away you go. Adding clients to your network is a gradual cost of 100$ to 187$ per client (based on VLA prices for non-upgrade versions).

As we saw in our overview of Access objects, there are always limitations:

	Microsoft Access	**FileMaker**
Number of objects in a Microsoft Access project (.adp)	32,768	Max 125 files with everything that includes.
Modules (including forms and reports with the **HasModule** property set to True)	1,000	Unlimited scripts

So basically with Access, you start out designing with the Access / SQL Server combination (or only SQL Server) or you hit a wall when your workgroup grows. Even with the Access / SQL combination you will still have to maintain all those files on the user's workstation. FileMaker will let you cater to that growing workgroup with very minimal changes.

Access includes an "Upsize Wizard' to convert an Access solution to SQL server. But then, if you need SQL server it's really because of its speed and scalability. The upsized database will not be an efficient SQL Server design. So the Wizard might be a good selling argument to the uneducated but that's about the usefulness of it.

Access as a frontend to SQL server seems to be the strategy for Access' future. A lot of he new features and improvements in Access 2000 and 2002 are geared toward that goal:
- introduction of access projects
- Stored Procedure builder

So how does FileMaker measure up on that front? FileMaker 5.5 is now fully two-way ODBC compliant (you need a plug-in to do this in FileMaker 4 and 5) and allows you to store SQL statements in fields (so you can make them dynamic by calculation) and has the Execute SQL script step to launch the SQL query.

It is safe to say that FileMaker has enough functionality to compete with Access in this market segment, especially in those situations where some data must still be stored outside SQL server and shared among the workgroup.

3.5.1.4. Important aspects of networking data

3.5.1.4.1. Record Locking

Record locking is the mechanism whereby if one user is making changes to particular record, that record is temporarily unavailable to other users.

That mechanism is fully automatic in FileMaker and there are no settings you need to toggle or you can change.

Access provides no automatic record locking. There are three settings you have to choose from:
  • No Lock (when two people edit the same record, a message will appear on one set of changes must be chosen).
  • Edited records Locked
  • All Records

Can be set on a file level, but also on a query, form level.

However, if you implement record locking in Access you can make use of the automatic checking of locked records. You can set a refresh interval on releasing your records, or retry intervals on the side of the one who is trying to access the files. The equivalent in FileMaker is do a loop for a certain period and catch the error locking error.

Older versions of Access use Page Locking mechanism instead of record locking. A fixed chunk of data (2-4Kb) is locked and this can include multiple records if the records are smaller than that chunk. Something to be aware of.

3.5.1.4.2. Design changes

In Access, you cannot save design changes while other users are sharing the Access database with you. The only way to ensure that changes are saved is by opening the Access database in exclusive mode.

In FileMaker you can make a lot of changes while the file is in multi-user mode. It's not always advisable to do so, though.

3.5.1.4.3. Code compilation

Every Access database needs to be compiled before being put in use. If the database is not compiled, Access has to load every control (especially the macros and modules) in memory, check all syntax, compile it in memory, and then execute it. A long process. So compiling is a good thing.

Once compiled, an Access database can become de-compiled. For instance when you rename the database. Remember this if you restore a backup and you had it saved under another name!

FileMaker needs no compiling. Scriptmaker is a line-by-line execution thingy and needs no compilation.

3.5.1.5. Web enabling

We will take the different ways that Access allow web-enabling as the basis for this section.

3.5.1.5.1. Data access pages

As described in the Object overview, a data access pages is a database object that contains a shortcut to the location of the page's corresponding HTML file.

Those pages can then be used to view, edit, update, delete, filter, group, and sort live Access data on the internet. Provided you have Office 2000 or XP license and Microsoft Internet Explorer 5 or later.

To make your pages available on the World Wide Web, you'd publish the pages to a Web server, and make the Access database available to users of the page.

Internet Explorer needs to download the page only once from the Web server to let you view and interact with the data on the page. Because a page uses Dynamic HTML, access to the database is generally very efficient in a client/server environment.

Access 2002 improved Data Access Pages (DAP) by allowing existing Forms or Reports to be saved as DAP. Much like the Instant web publishing in FileMaker. But Instant Web Publishing is not as browser-platform picky as DAP.

FileMaker offers XML technology that allows you to do the same thing. XML is a much larger standard and more widely implemented than the MS approach. XML technology is not supported by all browser though.

3.5.1.5.2. Server-generated HTML

You can create server-generated HTML files, (such as Active Server Pages) from tables, queries, and forms.

Server-generated HTML files are displayed in a table format in a Web browser. Advantage: any web browser will do. But the data is read-only.

Once you output the ASP files, you must publish these files to be processed on a supported Web server product and platform. Each time a user requests a page, the web server looks at the data and compiles the HTML pages using the latest data.

This is similar to making HTML pages with CDML-tags in FileMaker.

3.5.1.5.3. Static HTML

In Access you can create static HTML files from tables, queries, forms, and reports. In a Web browser, reports display in a report format, and tables, queries, and forms display in a datasheet format.

To do this, you select HTML when exporting a table, query or form. The page will reflect the data as it was when the HTML page was created.

FileMaker offers the same functionality where you can export a found set as HTML.

3.5.2. Security

3.5.2.1. File Password

Access allows you to set a password to open the file. This acts as a master password, completely unlocking all objects. Databases with a password cannot be synchronized.

As an added security, you can compile the whole database into an MDE file. This Compiles all the code and prevents changes to modules, forms and reports. You still need a full copy of Access to open it. But even with the master password, you cannot make changes. You have to go back to the original file to make changes.

In FileMaker the password is linked directly to the permissions. Lets have a look at the permissions.

3.5.2.2. Permissions

Permissions can be set for a specific user or a group. At start-up Access will ask for an ID and a password. Permissions define how users are allowed to work with each table, query, form, report, and macro in a database.

Access comes with a set of predefined groups (admin, new data users only, … but you can set up customized control by creating your own group accounts, assigning appropriate permissions to those groups, and then adding users to those groups.

FileMaker has basically the same system although the user interface for defining groups and passwords is not very intuitive.

The following table summarizes the permissions that you can assign in Access and what their FileMaker counterpart would be.

Access permissions		FileMaker priviliges	
Open/Run	Open a database, form, or report, or run a macro.		
Open Exclusive	Open a database with exclusive access.		
Read Design	View objects in Design view		
Modify Design	View and change the design of objects, or delete them.	Design layouts / Edit scripts	
Administer	For databases, set database password, replicate a database, and change startup properties. For tables, queries, forms, reports, and macros, have full access to these objects and data, including ability to assign permissions.	Access the entire file	This is the only level of access that lets you change field definitions, or change groups and access privileges in the Access Privileges Overview dialog box.
Read Data	View data.	Browse records	Can be limited by calculation / validation
Update Data	View and modify but not insert or delete data	Edit records	Can be limited by calculation / validation
Insert Data	View and insert but not modify or delete data.	Create records	
Delete Data	View and delete but not modify or insert data	Delete records	Can be limited by calculation / validation
		Print records	

Access permissions			FileMaker priviliges	
			Export records	
			Override data entry warnings	
			Change password	
			Define value lists	

In FileMaker you also have to choose a category of menu commands that users can use with his password. In Access this has to be coded, but you can give the user a fully customized menu bar.

3.5.3. Maintenance

3.5.3.1. Renaming an object.

When you rename an object, Access does not automatically change it throughout the file. But in Access 2000 there is now an "Name Autocorrect" wizard.. But this does not update references in modules (VB) or menu bar macros and it does not synchronize (does not push changes to replicated databases). There are some confirmed bugs with the 'Name Autocorrect' function however, so using it can be dangerous.

Renaming can be tricky in FileMaker as well, especially with stored filenames. Renaming file names can safely be done with the FileMaker Developer tool.

3.5.3.2. Compacting and repairing a database.

Access recommends compacting the database regularly and lets you set an option to do so each time you close the file. Access does not however reclaim unused space automatically as FileMaker does. Beware however that compacting a good sized database can take long minutes and these are the things that can drive the users crazy.

FileMaker also offers an option to compact the database. The big difference between both approaches is that access overwrites the database, FileMaker doesn't. It saves the compacted database under a new file. This allows you to revert back instantly if something went wrong while compacting.

Access compacts and repairs the database at the same time, but it is not very clear what the repair process really does. FileMaker offers a "recover" process separate from the compacting functionality.

3.5.3.3. Finding duplicates

Access has a built in Find Duplicates Query wizard, very similar to doing a "!" find in FileMaker. Cleaning out duplicates in both products involves quite a bit of work and a lot of logic.

3.5.3.4. Database Documenter

Access has a built-in database documenter that allows you to print out or save a highly detailed overview of all relevant aspects of the database: field definitions, form settings, user privileges, relationships, all macros & modules.

FileMaker allows you to document your database by using the Design functions, printing field definitions and scripts. But it is not centralized in one "Documenter". FileMaker Developer 5.5 is scheduled to change that.

4.Conclusion

No doubt you will have noticed that Access forces you to know a lot more about the theory of 'database design' than you need to get started in FileMaker. That why it has a longer learning curve. Access also has more built-in tools and functionality than FileMaker. But the extra functionality require a larger programmer skill set.

Most importantly when it comes to putting the solution to work Access lacks the strength and efficiently to be deployed efficiently for anything but a small workgroup. Writing a solution in Access for a rapidly expanding or larger workgroup will rapidly put you up against a wall and will force you to upgrade to SQL server.

FileMaker allows you grow with your workgroup without major costs (in development hours and software upgrades), changes in skill sets or delays.

For me this far outweighs the "bells & whistles" that FileMaker lacks.

But where are my event triggers!? ☺

Wim.