How to Build a Web Database: A Case Study

Introduction

This paper shows you how to build a simple Web application using ColdFusion. If you follow the sample case study of the multimedia resources database in this paper, you can create a small Web database application you want.

Significance of the topic

Most of commercial Web applications are developed using a server technology. The server technology is a technology such as ASP, ColdFusion that gives the Web server the ability to modify a Web page at run time. A Web application is a collection of static and dynamic pages that interact with each other and with various resources on a Web server, including databases. A dynamic page means a Web page modified at run time by the Web server before being sent to a browser.

About databases

A database is some sort of collection of organized facts and we can use it for any Web applications. The building block of a database is the record. A record is a collection of related data treated as a single entity. A collection of records that share the same fields is called a table because this kind of information can easily be presented in table format: each column represents a field and each row represents a record. In fact, the word column is synonymous with the word field, and the word row is synonymous with the word record. (Fig. 1)

![Figure 1: A schematic overview of a database](image)

A database can contain more than one table, each with a unique name. These tables can be related or independent from one another. A subset of data extracted from one or more tables is called a recordset. A recordset is also a table because it’s a collection of records that share the same fields.

Before you started
To establish a Web database system, you need a server (Windows NT) including ColdFusion Server software, and you may use any editors, either ColdFusion Studio or Dreamweaver UltraDev, on your desktop. This is the following case study of the paper, “Building a Multimedia Web Database Using Director and ColdFusion,” written by Jungwha Hong last summer semester, and you may refer to the system setup from it.

Building a Web database: A case study

To build a Web database, first of all, you need to define the problem or objective: how the database will be used and what information needs to be stored in it. In this case, we want to build a Web database for manipulating Internet multimedia resources.

Second, it is necessary to research the current databases, which are similar, good, or bad. It will be helpful for you to be able to imagine a good design for your database.

Third, design the data structures. You have to define each entity for making each table. In this case, we need only one table. In this case, I named by “tblmmdb2” as a multimedia database resource table.

Fourth, we have to construct relationships between tables (entities). We called data modeling. For the data modeling, we usually use E-R Diagram (ERD) for conceptual schema, which describes the relationships between each two entities such as one to one, or one to many. In this case, we do not have to worry about the data modeling because there is only one entity in our database. And then, for each entity, we need to define the logical schema. For example, in this case, we can define the logical schema like this.

\[
\text{mmdbtbl} \{ \text{mmID, mmURL, mmTitle, mmDescription, mmKeyword, mmMedia, mmPostName, mmPostDate} \}
\]

Each table should have a primary key. In this case, mmID is a primary key.

Sixth, now we can define the implementing rules and constraints for each table, we called data dictionary, using Microsoft Access tool, like below.

\[
\text{tblmmdb2:}
\]

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Field Size</th>
<th>Caption</th>
</tr>
</thead>
<tbody>
<tr>
<td>mmID</td>
<td>Autonumber</td>
<td>Long Integer</td>
<td>mm ID</td>
</tr>
<tr>
<td>mmURL</td>
<td>Text</td>
<td>200</td>
<td>mm URL</td>
</tr>
<tr>
<td>mmTitle</td>
<td>Text</td>
<td>200</td>
<td>mm Title</td>
</tr>
<tr>
<td>mmDescription</td>
<td>Text</td>
<td>200</td>
<td>mm Description</td>
</tr>
<tr>
<td>mmKeyword</td>
<td>Text</td>
<td>200</td>
<td>mm Keyword</td>
</tr>
<tr>
<td>mmMedia</td>
<td>Text</td>
<td>50</td>
<td>mm Media</td>
</tr>
<tr>
<td>mmPostName</td>
<td>Text</td>
<td>50</td>
<td>mm Post Name</td>
</tr>
<tr>
<td>mmDate</td>
<td>Date/Tiem</td>
<td>mm/dd/yy</td>
<td>mm Date</td>
</tr>
</tbody>
</table>

And then, save the file, named by mmdb.mdb under the directory, like 

../mmdbproject/database/mmdb.mdb

Seventh, create views and reports for each search forms, output result forms, and add/delete/modify forms to display on the screen like below.
Finally, implement and integrate your design using an editor, and then, save all scripts under the directory: ..:/mmdbproject/scripts/

Front page: index.cfm
Title: mmTitle.cfm

menu: mmMenu.cfm

Search: mmSearch.cfm
Search Result: mf_result3.cfm
fullDisplay.cfm
fullDisplay2.cfm

Browse by Keyword: mmBrowse.cfm
Result Display: subjBrowsing.cfm
subjDisplay.cfm

Add Data: mmAdd.cfm
Appending Data: add_execute1.cfm

Update: update.cfm
Update_execute.cfm
Delete: delete.cfm
<CFQUERY DATASOURCE="mmdb" NAME="resource">
SELECT * FROM tblmmdb2
WHERE mmID=mmID
</CFQUERY>

<!--- Query --->
<CFQUERY DATASOURCE="mmdb" NAME="resource">
SELECT * FROM tblmmdb2
WHERE mmID=mmID
</CFQUERY>

<!--- Is there any search text? --->
<CFIF mmURL IS NOT "">
<!--- Loop through the words --->
<CFLOOP INDEX="word" LIST="#mmURL#" DELIMITERS=" ">
<!--- Add the AND clause --->
AND mmURL LIKE '%#word#'
</CFLOOP>
</CFIF>

<CFIF mmtitle IS NOT "">
<!--- Loop through the words --->
<CFLOOP INDEX="word" LIST="#mmtitle#" DELIMITERS=" ">
<!--- Add the AND clause --->
AND mmTitle LIKE '%#word#'
</CFLOOP>
</CFIF>

<CFIF mmkeyword IS NOT "">
<!--- Loop through the words --->
<CFLOOP INDEX="word" LIST="#mmkeyword#" DELIMITERS=" ">
<!--- Add the AND clause --->
AND mmKeyword LIKE '%#word#'
</CFLOOP>
</CFIF>

<CFIF mmdescription IS NOT "">
<!--- Loop through the words --->
<CFLOOP INDEX="word" LIST="#mmPostName#" DELIMITERS=" ">
<!--- Add the AND clause --->
AND mmDescription LIKE '%#word#'
</CFLOOP>
</CFIF>

<CFIF mmPostName IS NOT "">
<!--- Loop through the words --->
<CFLOOP INDEX="word" LIST="#mmPostName#" DELIMITERS=" ">
<!--- Add the AND clause --->
AND mmPostName LIKE '%#word#'
</CFLOOP>
</CFIF>

<CFIF mmPostDate IS NOT "">
<!--- Loop through the words --->
<CFLOOP INDEX="word" LIST="#mmPostDate#" DELIMITERS=" ">
<!--- Add the AND clause --->
AND mmPostDate LIKE '%#word#'
</CFLOOP>
</CFIF>

<CFIF mmMedia IS NOT "">
<!--- Loop through the words --->
<CFLOOP INDEX="word" LIST="#mmPostName#" DELIMITERS=" ">
<!--- Add the AND clause --->
AND mmMedia LIKE '%#word#'
</CFLOOP>
</CFIF>

ORDER BY mmPostDate
</CFQUERY>
<HTML><HEAD><TITLE>mf_results3.cfm</TITLE></HEAD><BODY><font face="Times New Roman" color="Maroon"><H2>Search Result</H2></font><HR><cfoutput query="resource"> <table> <tr><th align =right>Title:</th><td><a href="fullDisplay.cfm?mmID=#mmID#">#TRIM(mmTitle)#</a></td></tr> <tr><th align =right>URL:</th><td>#TRIM(mmurl)#</td></tr> <tr><th align =right valign=top>Description:</th><td>#TRIM(mmDescription)#</td></tr> <tr><th align =right valign=top>Post date:</th><td>#TRIM(mmPostDate)#</td></tr> </table> </cfoutput></BODY></HTML>
<tr><th align=right>Site URL:</th><td><a href="#mmurl#">#TRIM(mmurl)#</a></td></tr>
<tr><th align=right>Keyword:</th><td>#TRIM(mmKeyword)#</td></tr>
<tr><th align=right>Description:</th><td>#TRIM(mmDescription)#</td></tr>
<tr><th align=right>Media:</th><td>#TRIM(mmmedia)#</td></tr>
<tr><th align=right>Post Name:</th><td>#TRIM(mmPostName)#</td></tr>
<tr><th align=right>Post Date:</th><td>#TRIM(mmPostDate)#</td></tr>
</table>

| <a href="update.cfm?mmID=#mmID#">Update</a> | <a href="delete.cfm?mmID=#mmID#">Delete</a> |
|-----------------------------------------------|
<br>
</cfoutput>
</font>
</BODY></HTML>
delete.cfm

<cfquery datasource="mmdb">
DELETE FROM tblmmdb2
WHERE mmID = #mmID#
</cfquery>

<html><head><title>Delete.cfm</title></head>
<body>
<cfoutput>
<h3>Resource Deleted!</h3>
</cfoutput>
</body></html>
<cfquery datasource="mmdb" name="res">
SELECT * FROM tblmmdb2 WHERE mmID=#mmID#
</cfquery>

<FORM ACTION="update_execute.cfm" METHOD="post">
<cfoutput query="res">
<table border align="center">
<tr><th align=right>ID:</th><td><INPUT NAME="mmID" VALUE="#TRIM(mmID)#" SIZE ="50"></td></tr>
<tr><th align=right>Title:</th><td><INPUT NAME="mmtitle" VALUE="#TRIM(mmtitle)#" SIZE ="50"></td></tr>
<tr><th align=right>URL:</th><td><INPUT NAME="mmurl" VALUE="#TRIM(mmurl)#" SIZE ="50"></td></tr>
<tr><th align=right>Keyword:</th><td><INPUT NAME="mmkeyword" VALUE="#TRIM(mmkeyword)#" SIZE ="50"></td></tr>
<tr><th align=right>Desciption:</th><td><INPUT NAME="mmdescription" VALUE="#TRIM(mmdescription)#" SIZE ="50"></td></tr>
<tr><th align=right>Media:</th><td><INPUT NAME="mmMedia" VALUE="#TRIM(mmMedia)#" SIZE ="50"></td></tr>
<tr><th align=right>Post name:</th><td><INPUT NAME="mmPostName" VALUE="#TRIM(mmPostName)#" SIZE ="50"></td></tr>
<tr><th align=right>Post date:</th><td><INPUT NAME="mmPostDate" VALUE="#TRIM(mmPostDate)#" SIZE ="50"></td></tr>
</table>
</cfoutput>

<P>
<INPUT TYPE="submit" VALUE="Update Data">
<INPUT TYPE="reset" value="Clear">

Multimedia Resource Database Search

Update Form...

ID: Established Multimedia Authoring Skills in Higher Education
Title: http://www.elteg.os.ac.uk/EN/MAID/DMAIGIE.html
Keyword: Authorware
Desciption: Established Multimedia Authoring Skills in Higher Education
Media: CD
Post name: Sung Yeon
Post date: 1999-10-21 00:00:00
Update Data  Clear
<FORM>
</BODY></HTML>

update_execute.cfm

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<cfupdate datasource="mmdb" tablename="tblmmdb2">
<html><head><title>Updating_Execute.cfm</title></head>
<body>
<cfoutput>
<h3> Resource: (#mmTitle#) Updated! </h3>
</cfoutput>
</body></html>

mmbrowse.cfm

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<cfquery datasource="mmdb" name="QrySubject">
select distinct mmKeyword from tblmmdb2
</cfquery>
<html><head><title>mmbrowse.cfm</title>
</head>
<body><a name="top"></a>
<font face="Times New Roman" color="Maroon"><H2>Browsing by Keyword...</H2></font>
<cfloop index="LoopCount" from="0" to="25">
<cfoutput>
|<a href="#chr(35)##chr(65+LoopCount)#"><b>#chr(65+LoopCount)#</b></a></cfoutput>
</cfloop>
</body></html>
<HTML><HEAD><TITLE>subjDisplay.cfm</TITLE></HEAD>
<BODY>
<font face="Times New Roman" color="Maroon"><H2>Search Result</H2></font>
<BR><cfoutput query="resource">
<cfquery datasource="mmdb" name="sub">
SELECT * FROM tblmmdb2
WHERE mmKeyword = mmKeyword and mmID='#mmID#'
</cfquery>
<table>
<tr><th align=right>Title:</th><td><a href="fullDisplay2.cfm?mmID=#mmID#">#TRIM(mmTitle)#</a></td></tr>
<tr><th align=right>URL:</th><td>#TRIM(mmURL)#</td></tr>
<tr><th align=right>Keyword:</th>
<td><cfloop query="sub">
|<a href="subjDisplay.cfm?mmKeyword=#mmKeyword#">#mmKeyword#</a>|</cfloop>|</td></tr>
<tr><th align=right>Media:</th><td>#TRIM(mmMedia)#</td></tr>
<tr><th align=right>Description:</th><td>#TRIM(mmDescription)#</td></tr>
<tr><th align=right>Post name:</th><td>#TRIM(mmPostName)#</td></tr>
<tr><th align=right>Post date:</th><td>#TRIM(mmPostDate)#</td></tr>
</table>
</cfoutput>
</BODY></HTML>
select * from tblmmdb2
</cfquery>

<HTML><HEAD><TITLE>mmadd.cfm</TITLE></HEAD>
<BODY>
<CFQUERY>
<FORM ACTION="add_execute1.cfm" METHOD="post">
<table border="1">
<tr><th align="right">Title:</th><td><INPUT NAME="mmTitle" SIZE="50"></td></tr>
<tr><th align="right">URL:</th><td><INPUT NAME="mmUrl" SIZE="50"></td></tr>
<tr><th align="right">Keyword:</th><td><INPUT NAME="mmKeyword" SIZE="50"></td></tr>
<tr><th align="right">Description:</th><td><INPUT NAME="mmDescription" SIZE="50"></td></tr>
<tr><th align="right">Media:</th><td><INPUT NAME="mmMedia" SIZE="50"></td></tr>
<tr><th align="right">Post name:</th><td><INPUT NAME="mmPostName" SIZE="50"></td></tr>
<tr><th align="right">Post date:</th><td><INPUT NAME="mmPostDate" SIZE="50"></td></tr>
</table>
<P><center>
<INPUT TYPE="submit" VALUE="Add Data">
<INPUT TYPE="reset" value="Clear">
</center>
</FORM>
</BODY></HTML>

add_execute1.cfm

<html><head>
<title>add_execute1.cfm</title>
</head><body>
<H1>Resource Added</H1>
<CFOUTPUT>
Multimedia Resource: <b>#mmTitle#</b> Added<br>by #mmPostName#. #mmPostDate#
</CFOUTPUT>
</body></html>

Related links on the web for the Web Database

1. Databases and the World Wide Web, Marianne Winslett, University of Illinois
2. Choosing a Database for your Web site
   http://www.wiley.com/compbooks/ashenfelter/resources.html

3. Web Database ORG
   http://www.webdatabase.org/

4. Webreview.com, John Paul Ashenfelter
   http://www.webreview.com/pace/print/au/Ashenfelter_John_Paul

5. Choosing a Web database
   http://www.builder.com/Programming/ChoosingWebDB/

6. Web database solution
   http://www.canright.com/web_database.htm

7. Web Database Connectivity with Scripting by Z. Peter Lazar.

8. Web Resources Database
   http://199.217.32.75/resources/search.html

9. Web Database Tutorial (PHP & MySQL)
   http://www.blazonry.com/scripting/linksdb/

10. Management Web Resources Database
    http://www.keele.ac.uk/depts/mn/teach/mgtlinks.htm

11. Database-Driven Web Sites
    http://www.smartbooks.com/t-progdatabases.htm

12. Database: Web Database
    http://www.geocities.com/SiliconValley/Bay/5388/webdb.html

13. Developing Web Database Applications Using Active Server Pages (ASP)
    http://cpcug.org/user/houser/asp/

14. Web Database Development for Windows Platforms
    http://www.phptr.com/ptrbooks/ptr_0130139858.html
15. Useful Links For Database-Web Connectivity
   http://developer.netscape.com/docs/manuals/dbresour.html

16. Tools for Web Database Access
   http://ashok.pair.com/webdata.htm

17. Web Database Project
   http://cs1.cs.nyu.edu/ms_students/chia7019/webdb.html

18. Web Database Connectivity with Scripting Languages
   http://www.w3j.com/6/s3.lazar.html

19. Web Database Tools
   http://users.erols.com/foxdm/database.htm

20. Web Database Development Step by Step
   http://www.interlacken.com/webdb/