

Structuring Data Bases

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The structure of a data base inside the computer and the apparent structure of the data base as “seen” by the users that interact with it can be different, and in most cases should be different. These are the physical and logical views of the data base

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Recall ...

- ❖ A *data base* is a set of *tables*
- ❖ The tables are sets of *records* composed of *fields* each which has values that are primitive data types
- ❖ The tables must store the information in a way that avoids redundancy, so as to prevent the possibility that repeated instances of the same data become inconsistent
- ❖ But the best structure for storage may not be the best structure for users ... synthesize a view for users

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CSE 100 Terminology

- ❖ The structure of a data base is called a *data base schema*
- ❖ The schema specifies ...
 - + The list of table names forming the database
 - + For each table, the fields of its records
 - + For each field, its attributes or properties, i.e. data type, key or not key, default value, etc.
- ❖ A data base as the word is normally used, i.e. tables with specific contents, is known as a data base *instance* (of a data base schema)
- ❖ There can be many instances of a single data base schema

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CSE 100 Designing A Data Base Schema

- ❖ Suppose a college wants a data base of their students, faculty, courses taught, student transcripts, and so forth, what things should go into a design and how should it be organized?
 - ❑ Students: first name, last name, home address, transcript ...
 - ❑ Faculty: first name, last name, SS#, home address, rank ...
 - ❑ Courses: class name, number, students attending, grades ...
- ❖ Deciding on the schema is called “data base design” and it takes a little study to do right ... but it’s easy to see the principles in action

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Go To Access ...

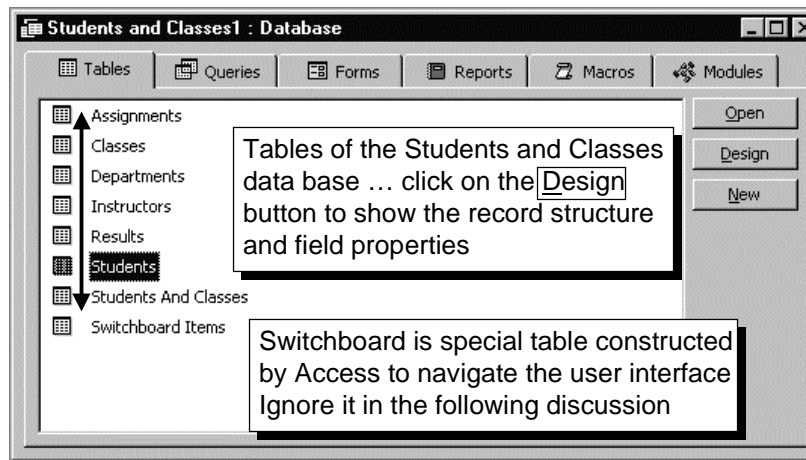
- ❖ Using the Access Data Base System, use the wizard to create a Students and Class data base

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An Example Data Base Schema

- ❖ Consider the Students & Classes DB from Access



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More Of The S&C DB Schema

Classes : Table		Students : Table		Departments : Table		Assignments : Table	
Field Name	Data Type	Field Name	Data Type	Field Name	Data Type	Field Name	Data Type
ClassID	AutoNumber	StudentID	AutoNumber	DepartmentID	AutoNumber	AssignmentID	AutoNumber
ClassName	Text	FirstName	Text	DepartmentName	Text	AssignmentDescription	Text
DepartmentID	Number	LastName	Text	DepartmentNumber	Number	ClassID	Number
SectionNumber	Number	Address	Text	DepartmentManager	Text	Exam	Yes/No
InstructorID	Number	City	Text	DepartmentChairperson	Text	PercentOfGrade	Number
Term	Text	StateOrProvince	Text			MaximumPoints	Number
Units	Text	PostalCode	Text				
Year	Number	PhoneNumber	Text				
Location	Text	Major	Text				
DaysAndTimes	Text	StudentNumber	Text				
Notes	Memo						

The Design windows give the remaining structural information for the data base schema ... notice how Classes, Students etc have unique IDs

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The User's View

Class Name: CSE100, Class ID: 1
 Instructor: Snyder, Section #: 1
 Department: Computer Science & E, Term: Spring
 Days/Times: MWF 2:30-3:20, Year: 1999
 Location: EE1 003, Units: 5
 Notes: All students got whistles to use to interrupt class to ask questions

Student	Major	Phone Number
Smith, Tiffany	Art	() 555-1212
*		

Record: 1 of 1

A database system gives users a view of the DB that is meaningful to them, but may be synthesized from tables actually forming the data base

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Consider A Student's List Of Classes

Though the admin information at the top comes from the Classes table, the class list at the bottom is not stored explicitly in any table. It is synthesized.

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Synthesizing The Class List

Student	Major	Phone Number	Grade
Smith, Tiffany	Art	() 555-1212	
Jones, Brad	Epidemiology	() 555-5555	

- ❖ One table -- Students And Classes -- contains records that associate students with classes

Students And Classes : Table	
Field Name	Data Type
StudentClassID	AutoNumber
ClassID	Number
StudentID	Number
Grade	Text

- ❖ By listing all records with CSE100's ClassID, a table is created of the students in CSE100 by *StudentID*
- ❖ By looking up each student using StudentID, the other fields of the class list can be located

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Why Use This Schema?

- ❖ Associating a student with a class is the logical idea behind *registering* for a class, so Students & Classes corresponds to a real phenomenon -- a plus
- ❖ Having classes listed in the student record violates the fixed length record condition, and makes it cumbersome to create a class list -- minuses
- ❖ Having students listed in the class record violates the fixed length record condition, and makes it cumbersome to create a registration list for each student -- minuses
- ❖ "Registering students" -- what STAR does -- can be done without touching either Students or Classes tables -- a plus

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Not All Views Are Synthesized

- ❖ Most tables will be of interest on their own, too

Instructors : Table	
Field Name	Data Type
InstructorID	AutoNumber
Instructor	Text
PhoneNumber	Text
Extension	Text

Instructors

Instructor ID	1
Instructor	Snyder
Phone Number	(206) 543-9265
Extension	

Record: 1 of 1

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CSE 100 Another Example

The screenshot shows an Access form titled "Students" with a data entry form and a table view. The data entry form contains the following information:

Student ID	2	Address	567 8th St SW
First Name	Brad	City	Bellevue
Last Name	Jones	State/Province	WA
Major	Epidemiology	Postal Code	98244-
Phone Number	() 555-5555		

Below the data entry form is a table view titled "Students And Classes : Table" with the following data:

Class Name	Instructor	Department Name	Grade
CSE100	Snyder	Computer Science & Engineerin	

A text box overlaid on the form asks: "The personal information in this form comes from the Students table, but how is the class schedule created?"

The table view shows the following fields and data types:

Field Name	Data Type
StudentClassID	AutoNumber
ClassID	Number
StudentID	Number
Grade	Text

Record: 2 of 2

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CSE 100 How Was Access Created?

```

Form: Switchboard - Class Module
(General)
Options

End Sub

Private Sub FillOptions()
' Fill in the options for this switchboard page.

' The number of buttons on the form
Const conNumButtons = 8
|
Dim dbs As Database
Dim rst As Recordset
Dim strSQL As String
Dim intOption As Integer

' Set the focus to the first button on the form,
' and then hide all of the buttons on the form
' but the first. You can't hide the field with the focus.
Me![[Option1]].SetFocus
For intOption = 2 To conNumButtons
    Me!["Option" & intOption].Visible = False
    Me!["OptionLabel" & intOption].Visible = False
Next intOption

```

That's right! Its Visual Basic ...
The Access data base application differs from your programming by being larger and more complex.

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