Project 4

The Central District Clinic Database System

This project is intended to expand your understanding of databases, and to provide an opportunity to study how the information system of an organization is created and customized to better serve its needs.

The task is to build the database and information system for an imaginary Seattle health clinic to be called the Central District Clinic (CDC). Though the clinic provides a variety of services and referrals, this assignment will be limited to the clinic's lab testing activities. It performs drug testing as well as testing for a variety of diseases: HIV, AIDS, Hepatitis B, etc. An important aspect of the database system is to assure privacy for the clients. A receptionist and several health professionals staff the clinic. The database system is intended to support their daily activities.

Understanding what is to be done is the first requirement of any problem solving effort. The following discussion describes how the clinic operates. From this process the database requirements will emerge.

Context

The focus of the database support is on processing clients who come to the clinic to have a test performed. During their visit they will give personal information, be seen by a health professional and provide one or more fluid specimens for testing. The actual test is not performed at the CDC, but rather is performed at one or more labs in Seattle. This means that the specimens must be sent out; when they are returned the client is notified. It is assumed that the CDC is a public health clinic, that its testing is free and its employees are volunteers.

These steps in the process can guide the design.

Arrival: When a client arrives, the receptionist interviews him or her to gather a small amount of personal data that is entered into the client's record. If the client has visited the CDC before, the receptionist simply verifies the information in the existing record. The receptionist is responsible for scheduling the client with one of the health professionals.

Meeting With The Health Professional: After the client has waited for the health professional to be free, the health professional interviews the patient to find out a brief medical history and the type of test(s) sought. The health professional fills out a form that is a record of the clinic visit and the discussion. The form has space for "chart" information as well as check boxes for the tests to be given, including an "exceptional" situation.

If tests are ordered by the health professional, i.e. one or more boxes have been checked, then a specimen (urine, blood, etc.) will be collected from the client to be sent to the lab. A label must be generated to attach to the sample. The label must include the pertinent information about the test and the person requesting it. To assure privacy a tracking number is used whenever a client must be identified outside the clinic.

Lab Manifest: Each day the lab test samples will be grouped together by test requested. These are compared against a computer generated "lab manifest" that lists all of the requested tests by tracking number. The test specimens are sent to the appropriate lab with a paper manifest, and an electronic version of the manifest is also sent to the lab. An employee will print the manifest, check that all specimens exactly match, and ship them to the lab with the manifest.

Results Returned: The lab will return the manifest. The results of each test will be filled in. The outcomes are: scientific information representable in 20 characters or less. When the results of all tests are available, the letter to the patient is generated. In the case that the test was inconclusive, the client is encouraged to return to provide another specimen, which will produce a separate visit transaction. Once the letter is generated, the visit is "closed". To assist the clinic's administration and public health officials, summary statistics are generated each quarter. These include the number of clients visiting, and summaries of the outcomes, i.e. number of positives, negatives, etc. in each category.

Analyzing the foregoing description reveals the database components.

Needs Analysis

The processes described above imply the basic database design components needed to support the clinic's daily operation.   These components are numbered in the following description.

From the Arrival description, it is evident that a Client table (1) is required. This contains the client's name, contact information and birth date. Additionally, a form (2) is required to assist the receptionist in recording the information. The form should be attractive, be embellished with the lab's name and look suitably professional. Once the form is completed, the receptionist will schedule the client with a health professional, and so provision must be made for this activity.

From the Meeting description, it follows that there must be a Visit table (3), containing the pertinent information of the visit. This will include the patient's ID from the Client table, fields for each test and the tracking number. The tracking number is not the unique record ID, which is also required, but a multi-digit number used to identify the specimens. This number preserves the anonymity of the client while the specimens and tests are being processed outside the clinic. One tracking number is associated with each visit of a client, and so if more than one test is ordered, the same tracking number will be used on each. There should be a field to record the outcome of the test, once it is returned.   A form (4) for entering the data will be created for this table. It will include a check box for each test to be run. For each test requested, a label (5) must be printed to be affixed to the specimen. This label includes the clinic's name, address and phone number, the date and the tracking number. The "chart" information in the Visit table includes notes fields for "presenting symptoms", "medications" and "remarks". Additionally, the first and last name (with certification designation, as in Bill Jones, MD or Carol Jones, LPN) of the health professional who sees the client is included on the Visit data entry form. This implies that there is a health professional (Doctor) table (6). This table includes a health professional's ID number, which is used in the Visit table. In addition to the ID, there is the professional's name, certification designation, contact information, social security number, license number and a notes field. There is a custom form (7) for entering data for this table that is attractive and consistent in form with the other tables.

From the Lab Manifest description, it is necessary to create (8) a table for each test to be sent to the labs with the specimens. Each table, known as a Lab Manifest, lists the tracking numbers of all requests for that test for a given day. Though a paper copy is sent with the specimens, an electronic copy should also be sent to the labs to be filled out with the results.

The Results Returned description explains that the lab will return the Lab Manifest table for all tests submitted to it. This should be done electronically, but for this assignment, we assume it is not. The Lab Manifest list will come to the receptionist who will enter the results into the database system. Making this convenient and error-free is important.

From the Notification description, there must be a letter (9) generated to the client once all of the tests from a visit have been received. The letter reports the results of each test. If any test's outcome is "fail" or "inconclusive", a paragraph is inserted recommending that the client return to the lab for a retest. Notice that since a single letter is generated for (possibly) multiple tests, sorting the merged Lab Manifest table on the tracking number field will result in grouping together the tests of one visit. Once the letter and a mailing label (10) have been generated, the record can be closed and moved from the Visit table to the Visit Archive table (11). Similarly, all returned Lab Manifest table records that have been reported can also be

moved to the Lab Manifest Archive table (12). The summary statistics report (13) is generated from the Lab Manifest Archive table. The statistics are (a) the number of visits, (b) the number of tests, (c) the numbers of tests of each type and the outcomes. In addition, there should be a summary of the number of visits by month for each month in the quarter.

Finally, because of privacy practices in the medical field and possibly state laws, the database must be password protected. Further, it should contain an "auto close" facility that exits the database when no activity has occurred for a while. This will protect unintended access when the health professional leaves the computer.

Summary

The following components of the CDC information clinic were identified in the Needs Analysis section:

    Client table
    Client table entry form
    Visit table
    Visit table entry form
    Specimen label
    Medical Professional table
    Medical Professional table entry form
    Lab Manifest table for each test, created daily
    Results entered into the database by receptionist
    (Notification letter to client containing test results)   Not part of Project 4
    (Mailing label to client)   "
    (Visit Archive)   "
    (Manifest Archive)   "
    (Clinic quarterly statistics)   "

Part 1: Understanding and Designing the CDC Database

The goals of the first part are to
1)   Understand the information flow through the Central District Clinic.
2)   Create the basic tables and forms that constitute the database.
3)   Establish the relationships among the fields of the database.
4)   Set-up the client processing through the system.

Task 1: **Understanding the Information Flow.** The purpose of this task is to conceptualize the clinic's information and how it should be embodied in a database. Write a narrative description of a client's visit to the CDC, describing the flow of information that takes place. The narrative begins, "A client walks into the CDC, greets the receptionist and sits down at the chair by the reception desk. …" The remainder of the narrative describes what information is transferred, from whom and to whom. The parties involved are the client, the receptionist, the medical professional and the testing lab.

Task 2: **Build the Basic** Database Structures. The purpose of this task is to create the core of the CDC database in response to the information flow of Part 1.   (If you were truly designing the system yourself, you would figure out what tables you needed from your understanding of the information flow.) Define the three tables, Clients, MedPros and Visits. These tables must have (at least) the fields shown in the screen dumps with the same properties. The fields must be given different names. Put four sample entries in the Clients and MedPros tables. For the example medical professional information, you should use names chosen from your family (e.g. make your mother a doctor at the clinic). The sample entries for clients can be anything. Using the Forms wizard, create form for the MedPros table, and make some modifications to it (different font, different color, different titles for the information, etc.) to make it more attractive and useful. Notice that the Visits table has a field for the test request <test>R and the test outcome <test>O.

Task 3: **Build Relationships.** The purpose of this task is to relate the information in the tables to produce an integrated whole. Establish that Client records are in a one-to-many relationship with the Visits records,

and that MedPros records are in a one-to-many relationship with Visits records. That is, a client could participate one ore more visits, and a medical professional will participate in one or more visits.

Clients : Table

Field Name	Data Type	
ClientID	AutoNumber	Automatically generated key
Prefix	Text	Honorific, e.g. Mr. or Ms.; size 5
FirstName	Text	Size 50, required
MiddleName	Text	Size 30, not required
LastName	Text	Size 50, required
Suffix	Text	E.g. Jr, III; not required, size 5
Address	Text	Size 255, not required
City	Text	Size 50, not required
State	Text	Size 2, e.g. WA
PostalCode	Text	Input mask, 5 digit zip
HomePhone	Text	Phone mask, optional area code
WorkPhone	Text	Phone mask, optional area code
Birthdate	Date/Time	Short date; date mask
Date	Date/Time	Default is current date, Required

MedPros : Table

Field Name	Data Type	
MedProID	AutoNumber	Automatically generated key
SocialSecurityNumber	Text	Has the std SS# format; not required
LicenseNum	Text	Must have a structure: yy-dddddd
FirstName	Text	Size 50, not required
MiddleName	Text	Size 30, not required
LastName	Text	Size 50, not required
Degree	Text	Size 5; e.g. MD or LPN
OfficeLocation	Text	Size 30, not required
Address	Text	Size 255, not required
City	Text	Size 50, not required
StateOrProvince	Text	Size 2, e.g. as in WA
PostalCode	Text	Input mask is standard 5 digiit zip code
HomePhone	Text	Mask is std phone, with optional area cd
WorkPhone	Text	Mask is std phone, with optional area cd
Birthdate	Date/Time	Standard short date field

Task 4: **Set-up Client Flow.** The purpose of this task is to support the receptionist and the medical professional in their meetings with the clients. Using the form wizard create a form called Receptionist that contains (a) all of the information from the Client table, as well as the three fields from the visit table, Visit.VisitID, Visit.ClientID, Visit.MedProID. When the wizard asks how you want to view your data, reply "Linked Forms". Call the Second Form "Queue". When the wizard has set up the form, edit it to make it more convenient for the receptionist. Notice that when the receptionist clicks on "Queue" he or she

can create a new row in the Visits table, thus queuing the client for a consultation with the medical professional.

Set up a second form called Consult that will be used to record the interaction of the client and medical professional. Information will be required from all three tables. Decide what information should be displayed from each table. Your choice should limit the information displayed to that which is essential to the consultation activity. For example, displaying the client's first name is essential, but displaying the medical professional's address is not. (Hint: None of the tables will have its information fully displayed in the Consult form.) Using the form wizard, set up the Consult form and edit it to look attractive and be convenient. For example, if the medical professional's name is shown (this is probably necessary so that the professional knows the client is their responsibility), then the name field need not be labeled -- the doctor knows that its his or her name!

Visits : Table

Field Name	Data Type	
VisitID	AutoNumber	Automatically generated key
MedProID	Number	Field for MedPro key
ClientID	Number	Field for Clients key
Date	Date/Time	Date of visit; default is current day
Tracking	Text	Size 20; unique identifier for patient
MedicalHistory	Text	Size 255
PresentingSymtoms	Text	Size 255
Notes	Text	Size 255
DrugO	Text	Drug test outcome; size 20
DrugR	Yes/No	Drug test request; checkbox
HIVO	Text	HIV test outcome; size 20
HIVR	Yes/No	HIV test request; checkbox
AIDSO	Text	AIDS test outcome; size 20
AIDSR	Yes/No	AIDS test request; checkbox
HepatitisBO	Text	Hepatitis test outcome; size 20
HepatitisBR	Yes/No	Hepatitis test request; checkbox
ExceptO	Text	Exceptional information; size 50
ExceptR	Yes/No	Exceptional test; checkbox

Sample MedPros Form

CDC

The Central District Clinic
123 Yesler Way
Seattle Washington 98100

First Name Anne
Middle Name Marie
Last Name Compton
Degree LPN
Office Ballard Hospital
Address 543 Shoreline Ave
City Shoreline   State WA   ZIP 98100-

MedProID 1
Social Security 222-54-6661
License 92-772002
Birthdate 1/19/60
Home Phone (206) 446-2038
Work Phone (206) 592-6614

Record: |◄ ◄| 1 |► ►| ►* of 1

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Option Compare Database
Option Explicit

Private Sub cmdOrder_Click()
On Error GoTo Err_cmdOrder_Click

        Tracking.SetFocus
        Tracking.Locked = False
        Tracking.Text = "CDC" & Hex((12*(Year(Date)-Year("11/20/99"))
                            + Month(Date)) * 1000000 + VisitID)
        Tracking.Locked = True

   DoCmd.DoMenuItem acFormBar, acRecordsMenu, 5, , acMenuVer70

Exit_cmdOrder_Click:
   Exit Sub

Err_cmdOrder_Click:
   MsgBox Err.Description
   Resume Exit_cmdOrder_Click

End Sub
```

Part 1 Turn In: Part 1 is due at noon May 25, 2001. Submit the Paragraph from Task 1 in hardcopy, together with a printout of your Consult form. Also, up-load your Access database file using Eturn-in.
BEFORE TURNING IN YOUR DATABASE BE SURE TO "COMPACT & REPAIR IT

Part 2: Processing Samples in the CDC Database

The goal of this part of the project is to support the processing of the samples and the recording of the information. Specifically
5)   Implement a tracking number so lab testing is anonymous.

6) Understand and implement a query to create a manifest list for each type of test.
7) Using a wizard construct a paper list of all tracking numbers ordered for each test and labels for each specimen.
8) Create a form to assist in recording the test results for each patient.

Before giving the tasks, consider the tracking number further.

The tracking number is a unique number used to label specimens when they leave the clinic for testing. The main goal is to assure client anonymity and so the number should not be easily traced to the client. In the tasks for Part 2, the tracking number will be key in referring to the client. The tracking number is generated when the tests are ordered, i.e. when the client's consultation is over.

Task 5: **Set Tracking Number:** Using the "Tools" facilities, add a command button to the Consult form. The button should be labeled "Order Tests". When it is clicked at the end of the consultation, the tracking number field, which should normally be locked to keep someone from accidentally setting it, is unlocked, set to a letter string using the accompanying code, and relocked. The code is part of the click-event handler, found by doubled clicking on the button during edit mode, and requires only four lines. Notice that it prefixes a hexadecimal number with the letters "CDC". The hexadecimal number encodes the number of months since the system was built times a million plus the VisitID.

Task 6: **Build Manifest Tables with Queries**: Construct a query for each test listing the tracking numbers of clients who have had that test ordered today. The query information comes from the Visit table and requires the tracking number and the date as well as the request field (not displayed) *when the request field has the value yes*. Only Visit records for the current date are to be listed. The query should be called <test>_Manifest, where <test> is one of the five tests. Look at the SQL queries generated for you by the Access system. For one of the queries, write a sentence saying in words what the query says. (This is essentially a direct translation of the SQL; the sentence should be the first item in the document created for Task 9.)

Task 7: **Paper and Labels**: Using the Report wizard create the manifest list for each test from the Manifest tables of Task 6. The lists should give the tracking numbers and dates, as well as the name, address and phone number of the clinic at the top. Using the Label wizard create labels for each specimen. The label should have the tracking number, the date, the time of test requested and the name, address and phone number of the CDC.

Task 8: **Recording Results**: Reconstruct the queries of Task 6 to provide a convenient table for the receptionist to enter the test results returned by the lab. (It's optional to provide a form for this table.) It is assumed that the results are written on the test's manifest at the lab, and that the list is returned one to a few days after it is submitted. Using a query construct a table for each test like the Manifest table but with the added field <test>O. Also, unlike Task 6 the date should not be equal to the current date, but rather be equal to a date typed in by the receptionist. Making the criterion field equal to question mark queries the user.

Task 9: **Reflection**:   Add a paragraph to the document you have created for Task 6 reflecting on how well your system works. Specifically, are there things that you would change (and why), and are there things you could add that would make the system more useful. For example, if the medical professional meets with the client to explain verbally the outcome of the tests, what database support do you think that activity would require?   Finally, add a paragraph discussing the privacy issues in the design of this type a database. How does the design help to protect privacy? From a privacy perspective are there things you could change that would improve privacy. Be specific.

Part 2 Turn In: Part 2 is due at noon June 1, 2001. Submit the Paragraph from Tasks 6 & 9 in hardcopy, together with a printout of your Hepatitis B manifest and labels showing the information for two tests. Also, up-load your Access database file using Eturn-in.

BEFORE TURNING IN YOUR DATABASE BE SURE TO "COMPACT & REPAIR IT