Database Management Systems (CS 422)

Telephone Company Database Project

Project Details

- You need to design a database application for an international telephone company
- Team size <= 4 students
- Each team will have a short presentation (20-25 mins) and demo of all the project parts on Nov 19th.

Given Data Files

- **Calling_Codes.xls: International calling codes**
  - Names and international calling codes for 205 countries.
  - Each country has a unique international calling code. E.g, France is 33, USA is 1, Norway is 47.
- **Customers.doc: Customer information for 20 customers**
- **Rates_yyyymmdd.xls: International calling rates for each service** (regular rate updates will be given)
  - Four rate update files, each beginning with "Rates_" followed by effective date.
- **Calls_Mon_Year.xls: Call details information** (for calls placed by customers)
  - Four call details files, each beginning with "Calls_".
- **Peak_Times.doc: Peak and off-peak times for different services**
- **Sales_Rep.doc: Sales representative info**

Services Offered

Following services are offered by the Telephone company :

- **Spectra, Deluxe, VOIP, Budget, Premium** from USA
- **Spectra and GACB** from Germany, France, Denmark, Italy
- **Spectra and GACB** from England, Netherlands
- **GACB** from Spain, Hungary, Austria

Desired Functionality

Your application must provide all the following functionalities:

1. Update international calling rates
2. Output current international calling rates by creating rate sheets
3. Process call details files
    1. Create monthly customer bills
    2. Generate monthly traffic summary
    3. Generate monthly salesrep commissions
4. Add a new customer

International Calling Rates

(Master Rates Table)

- Service name (e.g. Spectra)
- Source country
- Destination country
- Peak time period rate (per minute)
- Off-peak time period rate (per minute).
  - Each specific service and source country has a starting time for the peak period and starting time for the off-peak period (Peak_Times.doc)
- Effective date of the rate

Rate Updates

(Will be provided to your system at regular intervals)

(One of the functionalities your system must have)

- Rate Update file is an Excel Spreadsheet (Rates_X.xls) with three columns:
    1. Destination Country Name
    2. Peak rate
    3. Off-peak rate
- Merge this file into the Master Rates table using effective date found in the file name.
- Maintain old rates in the Master Rates table for proper billing of calls placed before effective date of new rates.

Export Current Rates

By Creating Rate Sheets

(One of the functionalities your system must have)

- While creating the rate sheets, service name and source country name will be supplied by the user manually.

Rate Sheet Format and Details

- Produce Rate Export file in Excel format with three columns:
  - Destination Country Name
  - Peak rate
  - Off-peak rate
- The exported .xlsx file name indicates the service and source country (e.g. "Spectra_France")

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Export Current Rates

By Creating Rate Sheets

(One of the functionalities your system must have)

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- Each *service* and *from country* has its own individual rate sheet.
- All destination countries are listed in alphabetical order, showing the peak and off-peak rate for each.
- Use multiple columns to get all the rates on a single page. (optional)
- Column headers identifying country, peak, and off-peak rates.
- Page header showing telephone company information, service name, from country, and date.
- Page footer showing starting times for peak and off-peak periods.

New Customers

(One of the functionalities your system must have)

- New customers are entered into the database using an Excel Spreadsheet containing the new customer information.
- The Excel Spreadsheet is imported into SQL Server where it is merged into the Customer Information in the database.
- Try to automate the step to import the Excel Spreadsheet into SQL Server and merging the data into the Customer Information table.
- Optionally also provide the functionality to add a single customer.

Process Call Details File

(One of the functionalities your system must have)

Given file (Calls_Mon_Year.xls)

- Your system will be manually given large numbers of call details files on a daily basis.
- **Call detail file is an Excel spreadsheet file with seven columns:**
  - From country calling code
  - To country calling code
  - From telephone number
  - To telephone number
  - Duration of call (in seconds)
  - Date of call
  - Time of call (using 24 hour notation, e.g. 1700 for 5 p.m.)
- Data from this file must be imported into the database on a daily basis.

Monthly Customer Bills

By processing call details

(One of the functionalities your system must have)

- The call detail information must be joined with the Customer Information, so that a Customer Bill (excel file) can be created at the end of the month.
- All of the calls made by a customer are summarized in a bill that is mailed to the customer at the end of each month.
- Each call is listed individually on the bill, including destination country name, length of call, time of call, and the cost of the call.
- The total cost of all calls made during the month is listed as the “Amount Due”.
- The bill also has a header showing the name, address (including street address, city, state, zip code, and country), and telephone number of the customer.

How to Calculate Cost of a Call?

- Rates are always changing.
- The rate applied to a given call depends on the call date.
- The time of the call is used to determine whether to use the peak period rate or the off-peak period rate.
- Each particular service and from country has its own starting times for the peak and off-peak periods.

D denotes the duration of call (in seconds)

R denotes the per minute rate for this call

Cost = R * D/60

A call could start in the peak rate and end in off-peak rate.

Monthly Traffic Summary

(One of the functionalities your system must have)

- At the end of each month (after customer bills are created), a traffic summary file is created as an Excel spreadsheet file with four columns:
  1. service name
  2. from country name
  3. to country name
  4. total minutes of calls

Salesrep Commissions

(One of the functionalities your system must have)

- Company salesreps are identified by a unique id number. (salesreps names are not given)
- When new customer information is entered into the database, two additional pieces of data are included: the *salesrep id* and a specific *commission* level between 5% and 10%.
- At the end of each month, all salesreps receive commission on all the calls placed by their customers, according to the assigned commission level for each customer account.
- Your system should produce a single file at the end of the month showing the total commission for each salesrep.

Desired Functionality – Need SPs for these

Your application must provide all the following functionalities:

1. Update international calling rates
2. Output current international calling rates by creating rate sheets for a country and service
3. Process Call Details file
4. Create monthly customer bills
5. Generate monthly traffic summary
6. Generate monthly salesrep commissions
7. Add a new customer

Design Principles

- Minimize the number of manual steps required because this makes it easier to use the system and reduces the chances of error.
- When manual input is done, check for User errors (data validation).
- Always maintain the integrity of the database by using error detection and transactions.

Final Testing of the System

Final Testing Sequence

- Add New Customers using 20 customers from Customers.doc.
- Rate Update: Sept 1 rate file.
- Process Call Details: Nov 2019 calls.
- Create Customer Bills for November 2019.
- Generate November traffic summary.

- Rate Update: Dec 15 rate file.
- Process Call Details: Dec 2019 calls.
- Create Customer Bills for December 2019.
- Generate December traffic summary.

- Rate Update: Jan 1 rate file.
- Process Call Details: Jan 15 calls.
- Rate Update: Jan 15 rate file.
- Process Call Details: Jan 2020 calls.
- Create Customer Bills for January 2020.
- Generate January traffic summary.
- Salesrep commissions for January 2020

Final Project Package (to submit)

- SQL Server database description: name, purpose, and list of fields (with comments) for each table.
- For each SQL Server stored procedure: name, purpose, and listing of code.
- Description of manual and automatic steps required for each of the major actions in the system (e.g. Process Call Details).
- Four sample customer bills: Randy Jones (Dec), Anna Stein (Dec), Mary Manning (Jan), Rudolf Torpini (Jan).
- Four sample rate sheets: Spectra USA, Spectra Denmark, GACB Germany, GACB Italy.
- Traffic Summary for January 2020.
- Salesrep commissions for January 2020.

Stages of Completion

- ERD of the system
- Design of Tables
- Design of SPs
- Update Rates
- Export Current Rates by creating Rate Sheets
- Add New Customers
- Create Customer Bills
- Generate Traffic Summary
- Generate Salesrep Commission

User Interface

- It is acceptable for your system to use only SQL Server, with manual steps required for entering new data and generating outputs.
  - Entering new data and generating outputs must be done using SPs which will be executed manually.
- Rate sheets and Customer bills may be Excel Spreadsheets exported from SQL Server by executing your Stored Procedures.
- Optionally, you can use a Report Generator to create professional rate sheets and customer bills.

Helpful Links

- Naming conventions in Databases
- Import/Export data from SQL Server to Excel
- Creating Reports using Report Builder