

Project

Purpose

To analyze the requirements, design, implement, document and test a database application for Mars Realty, Inc. The User Requirements of the database application are given in Appendix A below.

Materials to submit

You will be asked to submit reports at various milestones as major phases of the project are completed. Further, you will also need to demonstrate the database application you designed and developed. Details about the milestones of the project, the phases they include and their due dates will be posted on the class webpage.

Project Report/Phases

The project consists of the following phases. In addition, you will develop and maintain a Project Report. Your Project report should consist of a section for each phase, as well as an executive summary, introduction, and conclusion.

A. Analysis of the requirements of the project and a high-level description of the tasks involved.

B. Conceptual Design.

This stage involves the following

- Develop an Entity-Relationship model detailing the relations involved.
- Identify the attributes of the entities and the relations along with the primary key for each entity.
- List the constraints for each relation and entity.
- You should be able to explain the reasons for the particular design approach you have chosen.

C. Logical Design

This stage involves the mapping of your conceptual design above onto the relational data model. In this stage, you will design the tables for all your entities and relations. You should apply all normalizations you find useful and/or necessary. Ensure that your design still satisfies the user requirements. Justify your design choices.

D. Physical Design

This stage involves the following:

- Design an Oracle database based on the design developed in section B.
- Implement SQL tables for the relations and the constraints. Maintain scripts for the creation and deletion of tables.
- Maintain scripts for loading data into your tables.
- Design the user interfaces for your application.
- Ensure that your design still satisfies the user requirements.
- Justify your design choices.

E. Prototype, Development, and Testing.

This consists of the following:

- Write Java code to access, update and administer the SQL tables made.
- Develop user interfaces, using Java, which satisfy all functional user requirements.
- Create SQL trigger(s) that implement the Adaptive Rents Service (see Appendix A).
- Create indices for the database application. Justify the reasons.

F. Make a user's guide for the database application.

Project Demonstration

Populate the tables with data for

- At least 5 branch offices in three different states
- For each branch, at least three employees, 5 properties, 2 owners, four clients, two leases, one advertisement, and one property viewing.

The demonstration should include all the functional user requirements. The system must also include features for user authentication for the above-mentioned functions, through the use of user-ids and passwords.

Miscellaneous

The final project report should document all the activities with appropriate E-R diagrams, relation schema, etc. It should also give a list of the limitations of the application and give possibilities for improvement.

Features and functions other than specified in the document can also be added but should be documented clearly and demonstrated as well.

Appendix A

Mars Realty, Inc User Requirements

Mars Realty, Inc. (aka Mars) is interested in developing a database application to help it in managing the rental of real estate properties across the United States.

System Scope

The users of the application are the employees of Mars. It is assumed that all users have network computers capable of running IE or Netscape Web browsers and Java applications.

Data Requirements

Branches

Mars has branch offices in cities throughout the United States. Each branch office has employees including a manager to manage the operations of the office. The information held on a branch office includes a unique branch number, address (street, city, state, zipcode), a telephone number, a fax number, and the name of the employee who currently manages the office. Additional information is held on each manager, which includes the date that the manager assumed his/her position at the current branch office, and a monthly bonus payment based upon the branch office's monthly rental income.

Employees

Employees with the role of supervisor are responsible for the day-to-day activities of a group of at most twelve other employees, called associates. Not all employees are assigned a supervisor. The information stored on each employee includes an employee number, name (first and last), sex, date of birth, address, position, salary, name of supervisor, (where applicable), and the details of the branch office at which the employee is currently working. The employee number is unique across Mars.

Properties for Rent

Each branch office offers a range of properties for rent. The information stored on each property includes a property number, address (street, city, state, zipcode), property type (apartment, townhouse, single family house), number of bedrooms and bathrooms, square footage, monthly rent, the monthly management fee (as a percentage of the monthly rent), and the property owner. The property number is unique across Mars. The management of a property is assigned to an associate whenever it is rented or it is required to be rented out. An associate may be assigned a maximum of 30 properties.

Property owners

The information on property owners is also stored. Property owners are of two types: private and business. The information on each owner includes name, address, telephone and fax numbers. For business owners, it includes the business type, as well as a contact name.

Clients

Clients are people interested in renting property. To become a client, a person must first register at a branch office. The information stored on clients includes client number, name, home and work telephone numbers, preferred type of accommodation, and the maximum rent the client is prepared to pay. Also stored is the

name of the employee who processed the registration, the date the client joined, and the branch office at which the client registered. The client numbers are unique across Mars.

Property viewings

Clients may request to view a property for rent. The information stored includes the client number, name, and address, property number and address, date the client viewed the property, comments made by the client regarding the property, and the associate that showed the property to client. A client may view the same property only once on a given date.

Leases

When a property is rented out, a lease is drawn up between the client and the property. The information on a lease includes a lease number, client(s) number, name, and address(es), property number and address, monthly rent, payment method, deposit amount (if any), duration of the lease, the start and finish date of the lease, and the name of the associate that completed the lease. Each lease has a minimum duration of three months and a maximum of 24 months. Lease numbers are unique across Mars.

Newspaper Advertisements

When required, the details of properties for rent are advertised in local and national newspapers. The information stored includes the property number, address, type, square footage, number of bedrooms and bathrooms, asking rent, date of advertisement, name of newspaper, and the cost of advertisement. The data stored on each newspaper includes the newspaper name, address, telephone and fax number, and contact name.

Adaptive Rents Service

Mars, in order to increase its competitiveness in the realtor management market, provides for dynamically adapting the asking rent for a property based on its “popularity” – we call this service the *adaptive rents service*. To enable this service, Mars needs to maintain for each property the date of last update to the asking rent and the minimum and maximum allowable asking rents, as specified by the property owner. The *popularity* of a property is varying with time, and at any period of time is defined to be equal to the number of distinct clients that viewed the property within that period.

In the adaptive rents service,

- the asking rent for a property X is increased by 5%, but to no more than its maximum asking rent, **before a viewing of X** at a time t if X’s popularity is at least 25% larger than the average popularity of all properties of the same type and within the same zipcode for the time period between the last update of the asking rent of X and t.
- the asking price of a property X is decreased by 5%, but to no less than its minimum asking rent, **after the viewing of any property** at a time t if X’s popularity is at least 25% smaller than the average popularity of all properties of the same type and within the same zipcode for the time period between the last update of the asking rent of X and t.

Functional Requirements

Enter the details of

- a new branch
- an employee at a branch.
- a client.
- a property owner.
- a property.
- a lease between a client and property.
- a property advertised in a newspaper.

- a property viewing.

Update/delete the details of

- a branch.
- an employee.
- a lease of a given property
- a newspaper advertisement of a given property.
- a property owner.
- a property.
- a client.

Queries and Reports

- List the details of branches in a given city.
- Find the total number of branches in a given state.
- List name, position, and salary of all employees at a given branch, ordered by name.
- Find the total number of employees and the sum of their salaries.
- List the number of employees in each position at branches in Baltimore, MD.
- List the name of branch managers, ordered by branch address.
- List the names of associates supervised by a given supervisor.
- List the details of properties in a given city, along with their owners's details, ordered by rent.
- List the details of properties for rent assigned to each associate at a given branch.
- List the details of properties provided by business owners at a given branch.
- Find the total number of properties of each type at all branches.
- List the details of private property owners that provide more than one property for rent.
- List the details of apartments with at least two bedrooms in Baltimore, MD with a monthly rent of at most \$1200.
- List the details of clients registered at a branch, together with their preferences, which have not signed a lease yet.
- List the details of the owner of a given property.
- List the comments made by clients that viewed a given property.
- Find those properties that have been advertised more than the average number of times.
- List the details of leases due to expire next month at a given branch.
- For each state, list the total number of leases with rental duration less than 12 months.
- Find the total current monthly rental income, total monthly management fees, total salaries, as well as the maximum possible monthly rental income and management fee.
- List the details of properties that have not been rented out for the last three months.
- List the details of clients whose preferences match a given property.