Database Design for SQL Server - Project 1

Course Title	Database Design for SQL Server
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Project Title	MultiLease Management System: Part 2
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Database Design for SQL Server – Project 1

MultiLease Management System: Part 2

INTRODUCTION

You are a Database Administrator working for a small software solutions firm. You have been assigned to help develop a customer vehicle leasing management system.

MultiLease is a small leasing company that specializes in one particular make of vehicle. The owner, Mike Lee, is considering expanding his inventory to include other manufacturers. Before committing to any new arrangements, Mike wants to improve the sales and account management system. Currently, each department completes its own paperwork and maintains its own records with its own software application. Departments communicate details by telephone or paper. Several costly mistakes have resulted in the loss of too many good customers.

To improve customer service and avoid communication errors, MultiLease' owner wants one system that provides employees with access to all administrative functions. The new application will provide an integrated interface, so Sales Associates can record new vehicle lease contracts, and the Account Managers can easily obtain customer account information. Mike wants access to all features of the new application. Naturally, built-in security features prevent unauthorized individuals from obtaining sensitive information.

Mr. Lee's long term plans include company expansion into new markets. He would like to open new branches in the future.

You are part of a team of IT professionals hired to implement a business solution for MultiLease's administrative problem. Your team understands the importance of integrating current business practices, rules and documentation into any new system.

OBJECTIVES

During this project, you will:

- Design and create a partitioning scheme.
- Create views to streamline security.
- Design and create a trigger to implement an audit control system.
- Create stored procedures to facilitate database programming.
- Implement a security scheme.

TIME REQUIRED

You are given 3 days of class time for this project. However, to complete this project on time, you are expected to work beyond regular college hours. A good estimate is two to three hours of homework per school day, which is 6 to 9 hours of homework over the next three days.

MATERIALS REQUIRED

The following software and textbook resources are required:

Software

- Windows operating system (Windows Server 2000 with SP4, Windows Server 2003 with SP1)
- Microsoft SQL Server 2005 Enterprise Edition (180-day trial version will also run on Windows 2000 Professional, or Windows XP Professional)
- Microsoft Windows Installer 3.1 or later
- Microsoft Data Access Components (MDAC) 2.8 SP1 or later
- AVG Anti-virus (or similar antivirus software)

Textbooks

- Introduction to SQL Server 2005 by James Perry, Gerald Post

PROJECT SPECIFICATION SECTIONS

- Business Requirements – pages 3 to 6
- Your Task – pages 7 to 9
- Source Samples – pages 10 to 15
- Marking Scheme – page 17

Business Requirements Section

General Requirements

The MultiLease Management System enables Sales Associates and Account Managers to effectively manage customer leases. The systems analyst on your team has drafted a system chart that describes the proposed application based on interviews to discover Mr. Lee's requirements, company documents, and employee work habits and requirements.
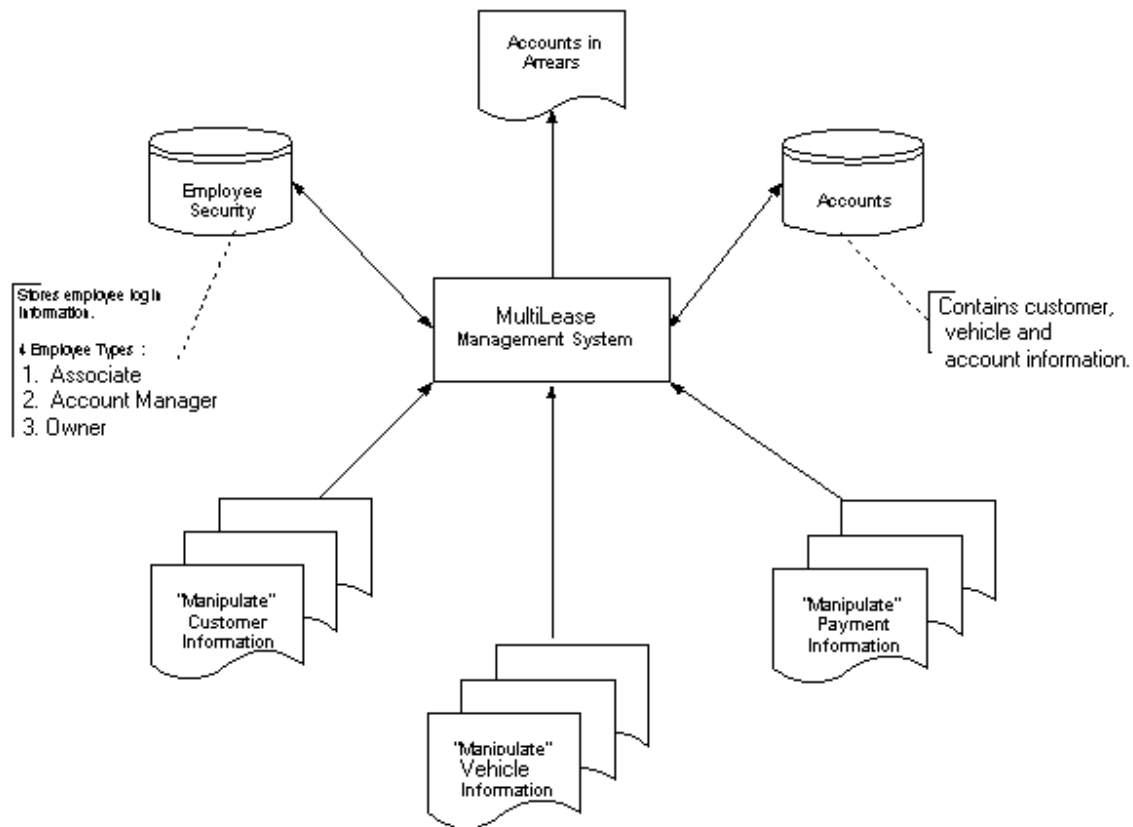

Figure 1: System flowchart for the MultiLease Management System

In this proposed system, Sales Associates will complete the initial paper-based contract, recording vehicle particulars between the customer and MultiLease. Following the contract acceptance, Sales Associates will be responsible for inputting the new customer information, vehicle inventory information and new lease payment information, contained in the original paper-based contracts and documents, into the system.

Account Managers will maintain customer relationships by collecting lease payments, collecting overdue accounts, dealing with customer concerns or complaints, and terminating the lease contract when the car is returned at the end of the lease.

Mike Lee, the owner, will be able to perform all functions.

Data Requirements

This section describes the databases and what information must be stored in each.

The MultiLease Management System consists of the following two databases:

- ML_Employee database
- MultiLease database

Both databases exist on one server.

Data Rules

The following business rules are required in the MultiLease database:

- Lease terms cannot exceed 4 years. The usual is 3 years. Typically leases are 1, 2, 3, or 4 years.

- Number of monthly payments on a lease cannot exceed 48 months. The usual is 36 months.

- Vehicles cannot have power locks if they do not have air conditioning.

- The first payment on a lease must be after the contract date.

- When a customer leases a car, their contract shows the maximum number of kilometres they can drive without paying extra money (this extra money is called a **premium charge**.) If a customer drives the car more than the maximum number of kilometres, they must pay the premium charge when they return the vehicle at the end of the lease. **The maximum distance permitted for any lease cannot exceed 150,000 km.** For example, if a customer signed a lease with maximum 150,000 km, and the customer actually drives 160,000 km before returning the car, they owe MultiLease 10,000 km times the premium charge when they return the vehicle.
- The Vehicle VIN is unique.

Work has started on the accounts database:

> The three main tables include:
>
> > • Customers
> >
> > • Vehicles
> >
> > • Leases
>
> The database includes various lookup tables:
>
> > • LeaseTerms
> >
> > • Models
> >
> > • Colours

• Types

The following information needs to be recorded about Customers:
- First and Last Name
- Address
- City
- Province
- Postal Code
- Phone Number

The following information needs to be recorded about Leases:
- Date the lease contract begins
- First payment date
- Amount of monthly payment
- Number of monthly payments
- Which vehicle the lease is for
- Which customer the lease is for
- The terms of the lease

The following information needs to be recorded about Vehicles:
- Vehicle VIN
- Model
- Type
- Colour
- Year
- Kilometres on odometer
- Whether or not the vehicle has been leased before
- Book value (current value of vehicle)
- Whether or not the vehicle has automatic transmission, air conditioning and power locks

The following information needs to be recorded about lease terms:
- Number of years
- Maximum kilometres
- Charge for extra mileage (cents/kilometre)

The Models, Colours and Types tables store available car models, colours and types respectively. Examples of car types include trucks, sedans (four door), and coupes (two door).

Database Usage

- Since the way the database is described is fairly normalized, joins will be frequently used in the MultiLease application.

- The Leases table will accumulate many records, and over time it will take up more space than necessary. Leases older than 5 years are rarely searched.

- Customers often return to lease vehicles in the future. To assist in good customer service, all customers should be easily accessible.

New Tables

Upon further investigation, the systems analyst has identified two new tables that need to be added to the accounts database:

- payments
- audits

The following information needs to be recorded about payments. A payment is applied to a **lease** rather than to a customer:

- Date

- Amount

- Lease ID

The following information needs to be recorded about audits:

- Date of change

- The Changed field

- The old value for each field

- The new value for each field

- Lease ID

The Changed field is a true or false field. It should hold a 0 if the field's data did not change and a 1 if it did. For example, if only the first payment date changed, a PaymentDateChanged field requires a 1 value but all other fields in the record require a 0 to indicate they did not change.

Payment Procedures

Payments entered into the database incorrectly cannot be deleted. Instead, they are *voided*. A voided payment has a payment value of $0.00. A reason should always be given for a voided payment. By voiding a payment instead of deleting it, MultiLease ensures that it has an accurate record of all payments made, even if some of the entries were originally incorrect. Also, voiding payments prevents employee theft.

Auditing System

In order to keep track of amendments to lease agreements, Mr. Lee would like an auditing system implemented. The auditing system should record whenever changes have been made to the **Leases** table. Specifically, you should record when the changes were made, what fields were affected, and what their old and new values were.

Your Task

You will continue to work with the MultiLease database you created in the previous course.

1. Based on the information discovered by the analyst, create a partition for the table which will grow too large and take up too much space.

2. Create a view to include each lease (include customer name, phone, vehicle VIN, model, vehicle year) as well as each payment. You should base the view on information from the payments, customers and leases tables. Group by the LeaseID. Use T-SQL.

3. Create a FOR UPDATE trigger on the leases table to ensure an audit trail is maintained when changes to a lease are made. Use T-SQL.

   Recall that Mr. Lee wants to keep a record of every change made to the leases table. Create a FOR UPDATE trigger that inserts a new audit record every time a field in a lease is changed. Remember that you created a special table for this purpose in the previous project.

4. Create stored procedures using T-SQL for the following:

   - Insert a new lease

   - Insert a payment

   - Update a lease (update will cause the FOR UPDATE trigger to execute)

   - Select lease by ID

   - Delete customer

5. Table 2 illustrates the security Mr. Lee wants for his database. Use T-SQL to implement this security scheme.

	Vehicles				Customers and Leases					Payments			
Group	**A**	**D**	**E**	**V**	**A**	**D**	**E**	**V**	**T**	**A**	**O**	**E**	**V**
Manager				X			X	X	X	X	X		X
Associate	X			X	X		X	X					X
Owner	X	X	X	X	X	X	X	X	X	X	X		X

Table 2:   Program features and functions available to each user group

Key:

A	Add	V	View
E	Edit	O	Void
D	Delete	T	Terminate lease

NOTE: The project for *Processing Information* requires you to continue working with the database you just created. You may want to keep a backup of your work.

Source Data

MultiLease Lease Company – Lease Agreement

Sold to:
Candie Wrapper
1000 Lollipop Lane
Halifax, NS
B1X 1X1
Phone: (902) 123-4567

Lease Vehicle:

2003 SC-430, VIN: 3W9T1-2Q10D-12D0P-2E1R2
km: 0 / book: $90,000

Transmission	Type	Options
☒ Auto ☐ Manual	☒ 2dr Coupe ☐ 4dr Sedan ☐ Truck ☐ SUV ☐ Van	☒ Air ☒ Power Locks

Exterior	Lease	New
☒ Deep Blue ☐ Racey Red ☐ Lemon Yellow ☐ Lime Green ☐ Silver Grey	☐ 1 year ☐ 2 years ☒ 3 years ☐ 4 years	☒ New Vehicle ☐ Re-lease

Lease Terms

Contract Date: 2004/01/15
First Payment: 2004/02/15
Max. Mileage: 120,000 km
Premium: $0.25 / km
Monthly Payment: $650.00 / 36 payments

MultiLease Lease Company – Lease Agreement

Sold to:

Scalli Wag
80 Plank Walk
Halifax, NS
B2L 1L1

Phone: (902) 812-4567

Lease Vehicle:

2000 Pirate, VIN: 7D901-9W120-Z0029-021P2
km: 100,000 / book: $45,000

Transmission	Type	Options
☐ Auto ☒ Manual	☒ 2dr Coupe ☐ 4dr Sedan ☐ Truck ☐ SUV ☐ Van	☒ Air ☒ Power Locks

Exterior	Lease	New
☐ Deep Blue ☒ Racey Red ☐ Lemon Yellow ☐ Lime Green ☐ Silver Grey	☒ 1 year ☐ 2 years ☐ 3 years ☐ 4 years	☐ New Vehicle ☒ Re-lease

Lease Terms

Contract Date: 2004/03/16
First Payment: 2004/04/16
Max. Mileage: 85,000 km
Premium: $0.20 / km
Monthly Payment: $350.00 / 12 payments

MultiLease Lease Company – Lease Agreement

Sold to:

Inna Chambers
2 Politician Street
Halifax, NS
B3M 1M1

Phone: (902) 341-4212

Lease Vehicle:

2003 Expensive, VIN: Z1221-X129A-KO212-9021J
km: 0 / book: $70,000

Transmission	Type	Options
☒ Auto ☐ Manual	☐ 2dr Coupe ☒ 4dr Sedan ☐ Truck ☐ SUV ☐ Van	☒ Air ☐ Power Locks

Exterior	Lease	New
☐ Deep Blue ☐ Racey Red ☒ Lemon Yellow ☐ Lime Green ☐ Silver Grey	☐ 1 year ☒ 2 years ☐ 3 years ☐ 4 years	☒ New Vehicle ☐ Re-lease

Lease Terms

Contract Date: 2004/04/01
First Payment: 2004/05/01
Max. Mileage: 150,000 km
Premium: $0.20 / km
Monthly Payment: $600.00 / 24 payments

MultiLease Lease Company – Lease Agreement

Sold to:

Candie Wrapper
1000 Lollipop Lane
Halifax, NS
B1X 1X1

Phone: (902) 123-4567

Lease Vehicle:

2001 Rock, VIN: M21L1-3129S-V1292-L12X1
km: 0 / book: $85,000

Transmission	Type	Options
☐ Auto	☐ 2dr Coupe	☒ Air
☒ Manual	☐ 4dr Sedan	☒ Power Locks
	☒ Truck	
	☐ SUV	
	☐ Van	

Exterior	Lease	New
☐ Deep Blue	☐ 1 year	☒ New Vehicle
☐ Racey Red	☐ 2 years	☐ Re-lease
☐ Lemon Yellow	☐ 3 years	
☐ Lime Green	☒ 4 years	
☒ Silver Grey		

Lease Terms

Contract Date: 2002/02/20
First Payment: 2002/03/01
Max. Mileage: 130,000 km
Premium: $0.15 / km
Monthly Payment: $450.00 / 48 payments

MultiLease Lease Company – Lease Agreement

Sold to:

Inna Chambers
2 Politician Street
Halifax, NS
B3M 1M1

Phone: (902) 341-4212

Lease Vehicle:

2001 Rock, VIN: M21L1-3129S-V1292-L12X1
km: 127,000 / book: $45,000

Transmission	Type	Options
☐ Auto ☒ Manual	☐ 2dr Coupe ☐ 4dr Sedan ☒ Truck ☐ SUV ☐ Van	☒ Air ☒ Power Locks

Exterior	Lease	New
☐ Deep Blue ☐ Racey Red ☐ Lemon Yellow ☐ Lime Green ☒ Silver Grey	☒ 1 year ☐ 2 years ☐ 3 years ☐ 4 years	☐ New Vehicle ☒ Re-lease

Lease Terms

Contract Date: 2004/07/01
First Payment: 2004/07/15
Max. Mileage: 150,000 km
Premium: $0.35 / km
Monthly Payment: $300.00 / 12 payments

One Model Motors Corp. - Invoice

Sold to:

MultiLease Corp.
1200 Motor Way
Halifax, NS
B5A 1K1

Phone: (902) 821-4319

Lease Vehicle:

2003 Speedy, VIN: K219M-K129P-V12BP-210G4
km: 0 / book: $60,000

Transmission	Type	Options
☐ Auto ☒ Manual	☒ 2dr Coupe ☐ 4dr Sedan ☐ Truck ☐ SUV ☐ Van	☒ Air ☒ Power Locks

Exterior
☐ Deep Blue ☐ Racey Red ☐ Lemon Yellow ☐ Lime Green ☒ Silver Grey

PROJECT ENHANCEMENTS

If you have time, you may wish to add some of the following enhancements to your project. You will not be awarded any additional marks for adding these enhancements, but completing them increases your knowledge and expands your skill set by giving you additional practice.

If you are working in a group, your instructor may assign one or more of these enhancements as additional requirements.

- Create a view that will be used for viewing vehicle information. This view should include *all* vehicle information, including any information from lookup tables (such as model name, colour name, type name, etc.) Mr. Lee would also like you to limit the vehicles in the view to those worth less than $100,000. This technique, known as *horizontal partitioning*, will ensure employees cannot view leases worth more than $100,000.

- Create additional stored procedures. Choose any from the list below or create your own:

o Insert customer	o Select terms
o Insert vehicle	o Select colours
o Insert colour	o Select type
o Insert model	o Select customers
o Insert type	o Terminate lease
o Select customer	o Update customer
o Select model	o Update vehicle
o Select payment	o Void payment

MARKING SCHEME

You are graded on the following components:

Project component	Points
T-SQL Scripting	**100**
• Correct script for step 1	20
• Correct script for step 2	20
• Correct script for step 3	20
• Correct scripts for step 4	20
• Correct scripts for step 5	20
Total Number of Points Possible:	**100**

WHAT TO SUBMIT

For full marks, you must submit the following items:

- A title page, including your name, student number, instructor's name, and course name in an appropriate cover.

- A print-out of the partition T-SQL script you created in step 1.

- A print-out of the view T-SQL script you created in step 2.

- A print-out of the FOR UPDATE trigger T-SQL script you created in step 3.

- Print-outs of all the stored procedure T-SQL scripts you created in step 4.

- Print-out of the security T-SQL scripts you created in step 5.

- A diskette containing the T-SQL scripts for steps 1 through 5.

Before submitting your work, scan your disk using anti-virus software.

PENALTIES

- Late submissions receive a penalty of 5% per day.

- Projects that are more than three days late can be submitted for a maximum grade of 60%.

- Projects contaminated with a virus must be resubmitted and will receive a maximum grade of 60%.