

Project Report

Title: SQL Database Management

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Introduction

HerculesMotoCorp is a leading automobile retailer and garage service provider in the United States, dealing with a wide range of vehicles, including custom-made models. Due to the complexity of its operations, the company requires a robust **Microsoft SQL Server** database to efficiently manage customer records, orders, employees, payments, and inventory.

As the **Database Administrator**, my task is to design and implement a database named **MotorsCertification** that meets the business requirements of HerculesMotoCorp. This project involves:

- **Designing an ER Model** and creating necessary tables with relationships.
- **Inserting, updating, and managing data** across multiple tables.
- **Performing database operations**, such as deleting unnecessary columns and retrieving key insights.
- **Creating views, stored procedures, and triggers** to enhance database efficiency.
- **Implementing user roles and permissions** for Admin, HR, and Employees.
- **Scheduling database backups** and monitoring activity for optimization.
- **Migrating the database to Azure** for better scalability and security.

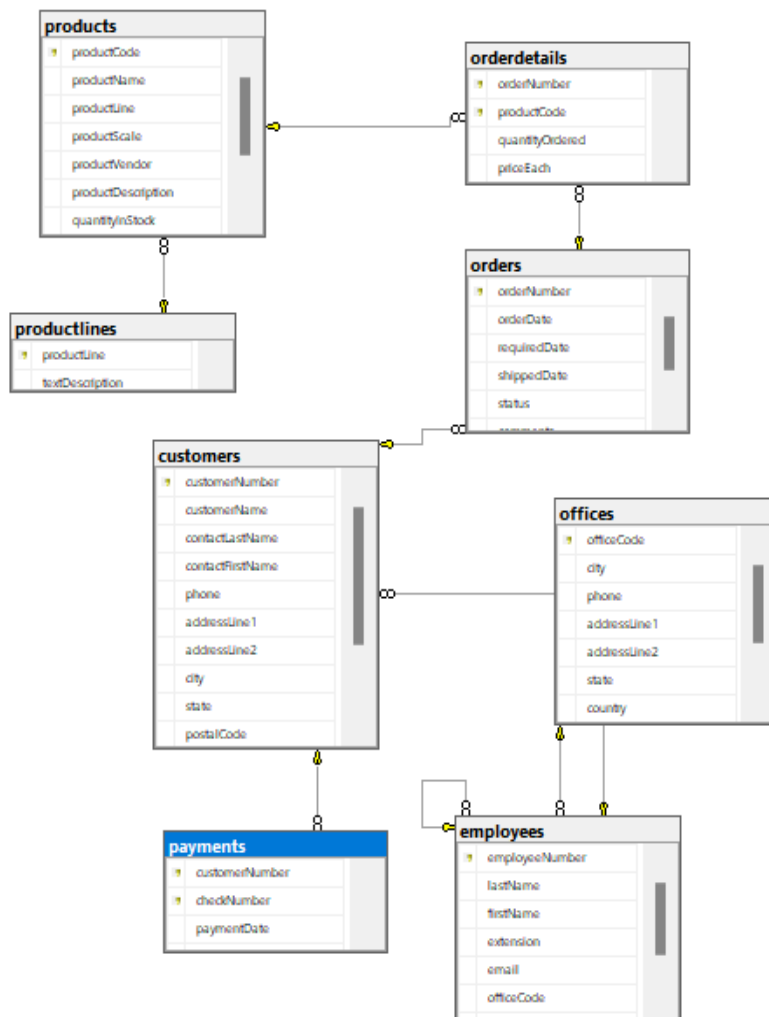
By successfully implementing these tasks, this project ensures **data integrity, security, and performance optimization** for HerculesMotoCorp's database system.

PROBLEMS = THERE WERE MINOR PROBLEMS IN DATA TO BE INSERTED LIKE DATA TYPE MISMATCHES, INCORRECT DATA FORMAT. BUT THESE ISSUES WERE SOLVED LATER AND INSERTED.

Screenshots & Results

STEP 1

ER Diagram



STEP 2

After designing the table I insert records in the following **orderdetails**, **employees**, **payments**, **products**, **customers**, **offices** and **orders** table. I have attached my SQL files.

STEP 4

I didn't add the two columns in **productlines** which are useless that do not infer anything and all rows has null values. Before creating the table. Those two columns are:-

a) htmlDescription NULL

b) image NULL

```
CREATE TABLE productlines (  
    productLine VARCHAR(50) PRIMARY KEY,  
    textDescription VARCHAR(4000)  
);  
INSERT INTO productlines VALUES  
('Classic Cars', 'Attention car enthusiasts: Make
```

STEP 5

Used a select statement to verify all insertions as well as updates.

DESKTOP-OFFQBQ4\ation - Diagram.0" SQLQuery1.sql - (L...OFFQBQ4\ACER (53)) * x DataToBeInserted...OFFQBQ4\ACER (65)

```
-- STEP 4: QUERY TO VERIFY  
SELECT * FROM customers;  
SELECT * FROM orders;  
SELECT * FROM products;
```

115 %

Results Messages

customerNumber	customerName	contactLastName	contactFirstName	phone	addressLine1	addressLine2	city	state	postalCode	country	salesRepEmployeeNumber	creditLimit
112	Signal Gift Stores	King	Jean	7025551838	8489 Strong St.	NULL	Las Vegas	NV	83030	USA	1166	71800
114	Australian Collectors, Co.	Ferguson	Peter	03 9520 4555	636 St Kilda Road	Level 3	Melbourne	Victoria	3004	Australia	1611	117300
119	La Rochelle Gifts	Labruno	Janine	40 67 8555	67, rue des Cinquante Otages	NULL	Nantes	NULL	44000	France	1370	118200
121	Baane Mini Imports	Bergulfsen	Jonas	07-98 9555	Erling Skakkes gate 78	NULL	Stavem	NULL	4110	Norway	1504	81700
124	Mini Gifts Distributors Ltd.	Nelson	Susan	4155551450	5677 Strong St.	NULL	San Rafael	CA	97562	USA	1165	210500
125	Havel & Zyszek Co.	Piestzeniewicz	Zyszek	(26) 642-7555	ul. Filbowa 68	NULL	Warszawa	NULL	01-012	Poland	NULL	0
128	Blauer See Auto, Co.	Keitel	Roland	+49 69 66 90 2555	Lyonenstr. 34	NULL	Frankfurt	NULL	60528	Germany	1504	59700
129	Mini Wheels Co.	Murphy	Julie	6505555787	5557 North Pendale Street	NULL	San Fran...	CA	94217	USA	1165	64600

orderNumber	orderDate	requiredDate	shippedDate	status	comments	customerNumber
10104	2003-01-31	2003-02-09	2003-02-01	Shipped	NULL	141
10105	2003-02-11	2003-02-21	2003-02-12	Shipped	NULL	145
10106	2003-02-17	2003-02-24	2003-02-21	Shipped	NULL	129
10107	2003-02-24	2003-03-03	2003-02-26	Shipped	Difficult to negotiat...	131
10108	2003-03-03	2003-03-12	2003-03-08	Shipped	NULL	144
10109	2003-03-10	2003-03-19	2003-03-11	Shipped	Customer requeste...	157
10110	2003-03-18	2003-03-24	2003-03-20	Shipped	NULL	112
10111	2003-03-25	2003-03-31	2003-03-30	Shipped	NULL	129

productCode	productName	productLine	productScale	productVendor	productDescription	quantityInStock	buyPrice	MSRP
9	S12_1666 1958 Setra Bus	Trucks an...	1:12	Welly Diecast Product...	Model features 30 windows, skylights & glare r...	1579	77.9	136...
10	S12_2823 2002 Suzuki XREO	Motorcycles	1:12	Unimax Art Galleries	Official logos and insignias, saddle bags locate...	9997	66.27	150...
11	S12_3148 1969 Corvair Monza	Classic Cars	1:18	Welly Diecast Product...	1:18 scale die-cast about 10" long doors open...	6906	89.14	151...
12	S12_3380 1968 Dodge Charger	Classic Cars	1:12	Welly Diecast Product...	1:12 scale model of a 1968 Dodge Charger. H...	9123	75.16	117...
13	S12_3891 1969 Ford Falcon	Classic Cars	1:12	Second Gear Diecast	Turnable front wheels; steering function; detai...	1049	83.05	173...
14	S12_3990 1970 Plymouth Hemi Cuda	Classic Cars	1:12	Studio M Art Models	Very detailed 1970 Plymouth Cuda model in 1...	5663	31.92	79.8
15	S12_4473 1957 Chevy Pickup	Trucks an...	1:12	Exoto Designs	1:12 scale die-cast about 20" long Hood open...	6125	55.7	118.5
16	S12_4675 1969 Dodge Charger	Classic Cars	1:12	Welly Diecast Product...	Detailed model of the 1969 Dodge Charger. Th...	7323	58.73	115...
17	S18_1097 1940 Ford Pickup Truck	Trucks an...	1:18	Studio M Art Models	This model features soft rubber tires, working st...	2613	56.33	116...
18	S18_1129 1993 Mazda RX-7	Classic Cars	1:18	Highway 66 Mini Clas...	This model features, opening hood, opening d...	3975	83.51	141...
19	S18_1342 1937 Lincoln Berline	Vintage Ca...	1:18	Motor City Art Classics	Features opening engine cover, doors, trunk, a...	8693	60.62	102...
20	S18_1367 1936 Marauder, Buick Wildcat	Vintage Ca...	1:18	Studio M Art Models	This 1:18 scale sedan is constructed of brass...	8636	74.76	63.01

Query executed successfully.

(local)\SQLEXPRESS (16.0 RTM) DESKTOP-OFFQBQ4\ACER (53) MotorsCertification 00:00:00 60 rows

STEP 6

Find out the highest and the lowest amount in payments.

```
-- STEP 5: FIND OUT THE LOWEST AND HIGHEST AMOUNT IN PAYMENTS.  
SELECT * FROM payments;  
SELECT MAX(amount) AS MAX_AMOUNTS, MIN(amount) AS LEAST_AMOUNTS FROM payments;
```

115 %

Results Messages

	MAX_PAYMENTS	LEAST_PAYMENTS
1	101244.59	1491.38

STEP 7

Gave the unique count of customerName from customers.

⇒ This was done to check duplicates but there were none in the table.

```
-- STEP 6: FINDING OUT THE UNIQUE COUNT of CUSTOMER NAMES.  
SELECT * FROM customers;  
SELECT COUNT(DISTINCT(customerName)) AS UniqueCustomerCount FROM customers;
```

115 %

Results Messages

	UniqueCustomerCount
1	20

STEP 8

Create a view from **customers** and **payments** named **cust_payment** and select **customerName**, **amount**, **contactLastName**, **contactFirstName** who have paid.

Truncate and Drop the view after operation.

⇒ Used **view** as it is essentially a **virtual table** that allows us to see data from one or multiple tables without actually storing the data itself.

```
CREATE VIEW cust_payment AS
SELECT C.CustomerName, P.amount, C.contactLastName, C.contactFirstName
FROM customers as C
JOIN payments as P
ON C.customerNumber = P.customerNumber;

SELECT * FROM cust_payment;

DROP VIEW cust_payment;
```

Results

	CustomerName	amount	contactLastName	contactFirstName
1	Atelier graphique	6066.78	Schmitt	Carine
2	Signal Gift Stores	14571.44	King	Jean
3	Australian Collectors, Co.	1676.14	Ferguson	Peter
4	La Rochelle Gifts	14191.12	Labruno	Janine
5	Baane Mini Imports	32641.98	Bergulfsen	Jonas
6	Mini Gifts Distributors Ltd.	33347.88	Nelson	Susan
7	Havel & Zbyszek Co	45864.03	Piestrzeniewicz	Zbyszek
8	Blauer See Auto, Co.	82261.22	Kelkel	Roland
9	Mini Wheels Co.	7565.08	Murphy	Julie
10	Land of Toys Inc.	44894.74	Lee	Kwai
11	Euro+ Shopping Channel	19501.82	Freyre	Diego
12	Volvo Model Replicas, Co	47924.19	Berglund	Christina
13	Danish Wholesale Imports	49523.67	Petersen	Jytte
14	Saveley & Henriot, Co.	50218.95	Saveley	Mary
15	Dragon Souvenirs, Ltd.	1491.38	Natividad	Eric
16	Muscle Machine Inc	17876.32	Young	Jeff
17	Diecast Classics Inc.	34638.14	Leong	Kelvin
18	Technics Stores Inc.	101244.59	Hashimoto	Juri
19	Handji Gifts& Co	85410.87	Victorino	Wendy
20	Herikku Gifts	11044.3	Oeztan	Veyssel

STEP 9

Create a stored procedure on **products** which displays **productLine** for Classic Cars.

⇒ Stored Procedure are the reusable code in stored in database which can be executed multiple times and even after the sessions are ended.

```
-- CREATE A STORED PROCEDURE ON PRODUCTS WHICH DISPLAYS THE PRODUCTLINE FOR CLASSIC CARS.
CREATE PROCEDURE GetClassicCars
AS
BEGIN
    SELECT * FROM products WHERE productLine = 'Classic Cars';
END;

EXEC GetClassicCars;
```

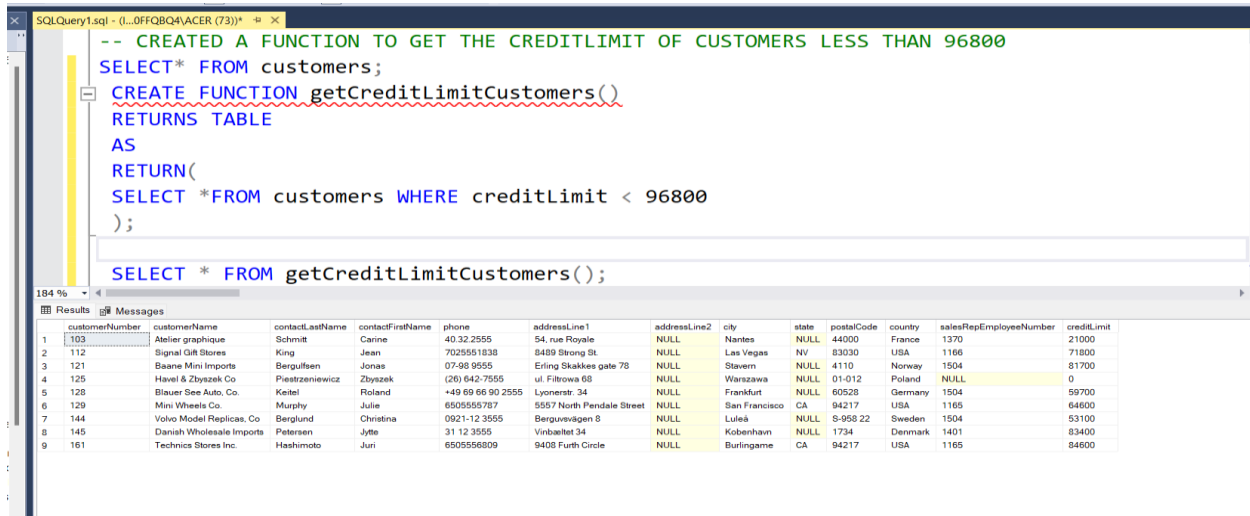
Results

	productCode	productName	productLine	productScale	productVendor	productDescription	quantityInStock	buyPrice	MSRP
1	S10_1949	1952 Alpine Renault 1300	Classic Cars	1:10	Classic Metal Creations	Turnable front wheels; steering function; detailed int...	7305	98.58	214.3
2	S10_4757	1972 Alfa Romeo GTA	Classic Cars	1:10	Motor City Art Classics	Features include: Turnable front wheels; steering fu...	3252	85.68	136
3	S10_4962	1962 Lancia Delta 16V	Classic Cars	1:10	Second Gear Diecast	Features include: Turnable front wheels; steering fu...	6791	103.42	147.74
4	S12_1099	1968 Ford Mustang	Classic Cars	1:12	Autoart Studio Design	Hood, doors and trunk all open to reveal highly detai...	68	95.34	194.57
5	S12_1108	2001 Ferrari Enzo	Classic Cars	1:12	Second Gear Diecast	Turnable front wheels; steering function; detailed int...	3619	95.59	207.8
6	S12_3148	1969 Convair Monza	Classic Cars	1:18	Welly Diecast Productions	1:18 scale die-cast about 10" long doors open, hoo...	6906	89.14	151.08
7	S12_3380	1968 Dodge Charger	Classic Cars	1:12	Welly Diecast Productions	1:12 scale model of a 1968 Dodge Charger. Hood, d...	9123	75.16	117.44
8	S12_3891	1969 Ford Falcon	Classic Cars	1:12	Second Gear Diecast	Turnable front wheels; steering function; detailed int...	1049	83.05	173.02
9	S12_3990	1970 Plymouth Hemi Cuda	Classic Cars	1:12	Studio M Art Models	Very detailed 1970 Plymouth Cuda model in 1:12 sc...	5663	31.92	79.6
10	S12_4675	1969 Dodge Charger	Classic Cars	1:12	Welly Diecast Productions	Detailed model of the 1969 Dodge Charger. This m...	7323	58.73	115.16
11	S18_1129	1993 Mazda RX-7	Classic Cars	1:18	Highway 66 Mini Classics	This model features, opening hood, opening doors, ...	3975	83.51	141.54

STEP 10

Create a function to get the creditLimit of **customers** less than 96800.

⇒ Return table returns a table with multiple rows and columns, just like views.



```
-- CREATED A FUNCTION TO GET THE CREDITLIMIT OF CUSTOMERS LESS THAN 96800
SELECT * FROM customers;
CREATE FUNCTION getCreditLimitCustomers()
RETURNS TABLE
AS
RETURN(
SELECT *FROM customers WHERE creditLimit < 96800
);

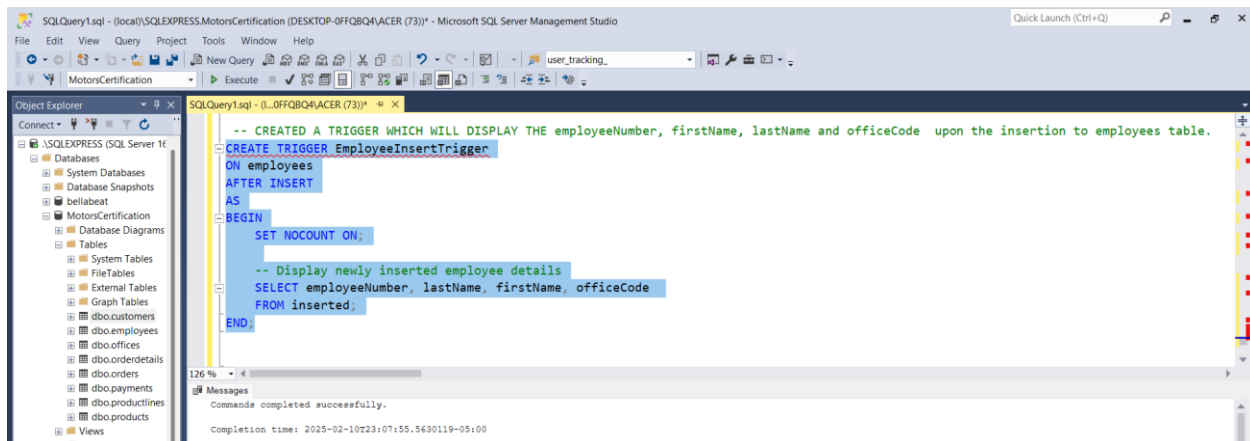
SELECT * FROM getCreditLimitCustomers();
```

customerNumber	customerName	contactLastName	contactFirstName	phone	addressLine1	addressLine2	city	state	postalCode	country	salesRepEmployeeNumber	creditLimit
1103	Atelier graphique	Schmitt	Carine	40 32 2555	54, rue Royale	NULL	Nantes	NULL	44000	France	1370	21000
112	Signal Gift Stores	King	Jean	7025551838	8489 Strong St	NULL	Las Vegas	NV	83030	USA	1166	71800
121	Baane Mini Imports	Bergussen	Jonas	07-98 9555	Erling Skakkes gate 78	NULL	Stavern	NULL	4110	Norway	1504	81700
125	Havel & Zbijezek Co	Piestrzeniewicz	Zbijezek	(26) 642-7555	ul. Filtrawa 68	NULL	Warszawa	NULL	01-012	Poland	NULL	0
128	Blauer See Auto. Co.	Ketsel	Roland	+49 69 66 90 2555	Lyonenstr. 34	NULL	Frankfurt	NULL	60528	Germany	1504	59700
129	Max Wheels Co.	Murphy	Julie	650555787	3557 North Pendale Street	NULL	San Francisco	CA	94217	USA	1165	64600
144	Volvo Model Replicas Co	Berglund	Christina	0921-12 3555	Berguvavägen 8	NULL	Luleå	NULL	S-958 22	Sweden	1504	53100
145	Danish Wholesale Imports	Petersen	Jytte	31 12 3555	Vinbaeltet 34	NULL	Kobenhavn	NULL	1734	Denmark	1401	83400
161	Technics Stores Inc.	Hashimoto	Juni	6505556809	9408 Furth Circle	NULL	Burlingame	CA	94217	USA	1165	84600

STEP 11

Create Trigger to store transaction record for **employee** table which displays employeeNumber, lastName, FirstName and office code upon insertion

⇒ A **trigger** is a special type of stored procedure that automatically runs when an event (INSERT, UPDATE, DELETE) happens on a table.



```
-- CREATED A TRIGGER WHICH WILL DISPLAY THE employeeNumber, firstName, lastName and officeCode upon the insertion to employees table.
CREATE TRIGGER EmployeeInsertTrigger
ON employees
AFTER INSERT
AS
BEGIN
SET NOCOUNT ON;

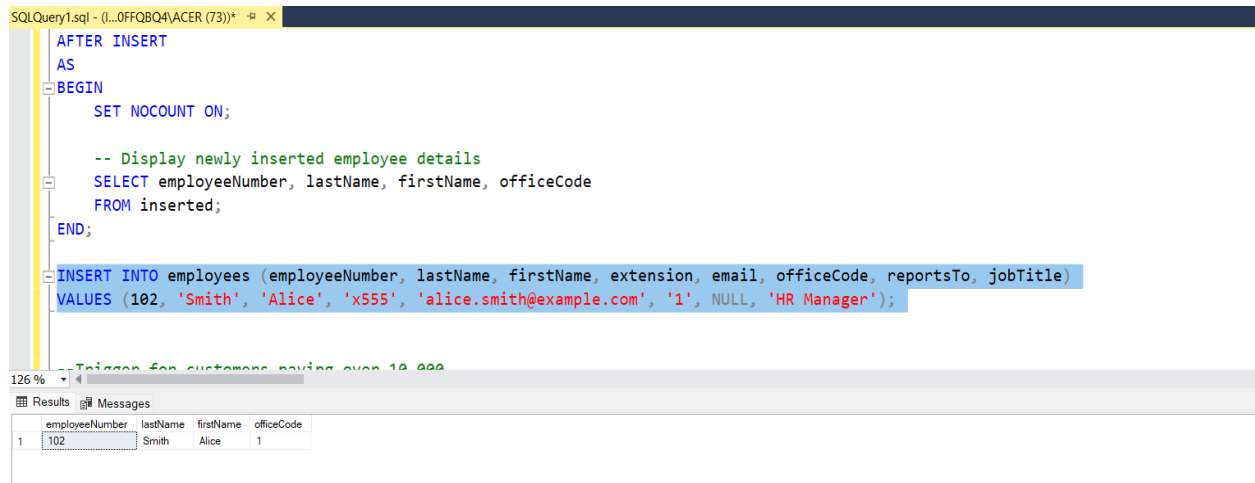
-- Display newly inserted employee details
SELECT employeeNumber, lastName, firstName, officeCode
FROM inserted;
END;
```

Messages

Commands completed successfully.

Completion time: 2025-02-10T23:07:55.5630119-05:00

Live Example



The screenshot shows a SQL Server Enterprise Manager window with a query editor and a results pane. The query editor contains the following SQL script:

```
SQLQuery1.sql - (\\...OFFQBQ4\\ACER (73))*
AFTER INSERT
AS
BEGIN
    SET NOCOUNT ON;

    -- Display newly inserted employee details
    SELECT employeeNumber, lastName, firstName, officeCode
    FROM inserted;
END;

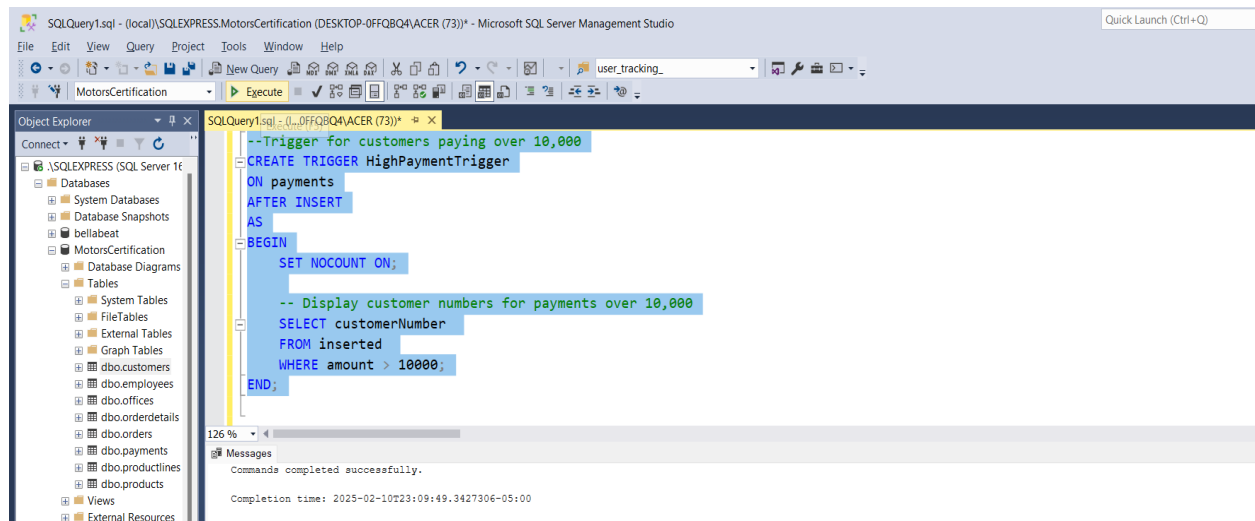
INSERT INTO employees (employeeNumber, lastName, firstName, extension, email, officeCode, reportsTo, jobTitle)
VALUES (102, 'Smith', 'Alice', 'x555', 'alice.smith@example.com', '1', NULL, 'HR Manager');
```

The results pane shows a single row of data:

employeeNumber	lastName	firstName	officeCode
102	Smith	Alice	1

STEP 10

Create a Trigger to display customer number if the amount is greater than 10,000



The screenshot shows a SQL Server Enterprise Manager window with a query editor and a messages pane. The query editor contains the following SQL script:

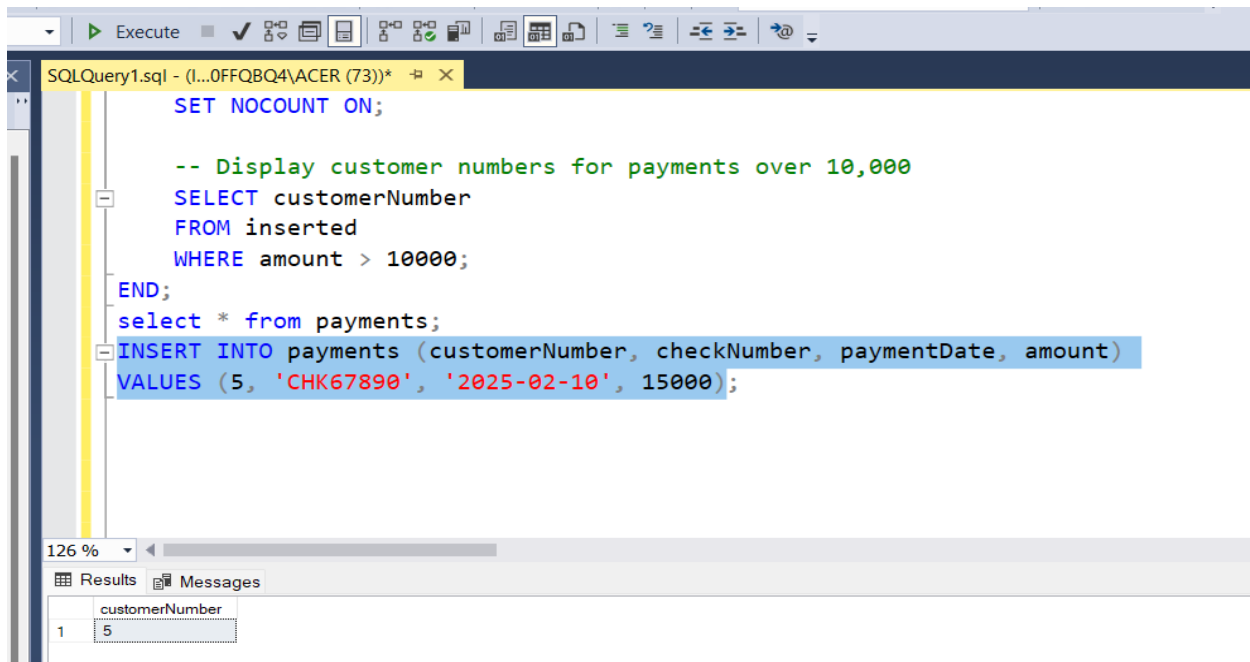
```
SQLQuery1.sql - (\\...OFFQBQ4\\ACER (73))*
--Trigger for customers paying over 10,000
CREATE TRIGGER HighPaymentTrigger
ON payments
AFTER INSERT
AS
BEGIN
    SET NOCOUNT ON;

    -- Display customer numbers for payments over 10,000
    SELECT customerNumber
    FROM inserted
    WHERE amount > 10000;
END;
```

The messages pane shows the following message:

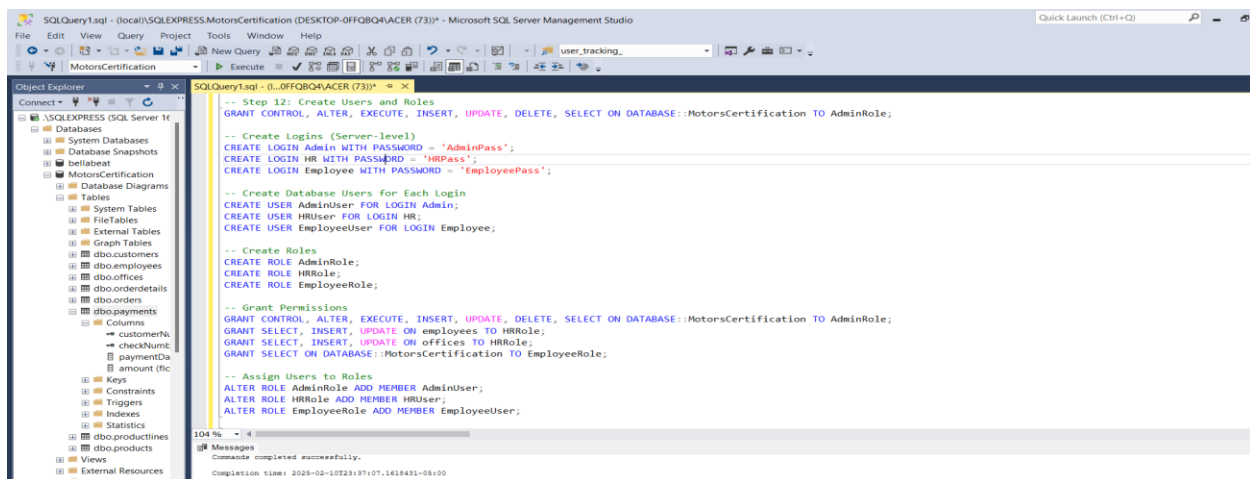
Commands completed successfully.
Completion time: 2025-02-10 23:09:49.3427306-05:00

Live Example



STEP 11

Create Users, Roles and Logins according to 3 Roles: Admin, HR, and Employee. Admin can view full database and has full access, HR can view and access only employee and offices table. Employee can view all tables only. Note: work from Admin role for any changes to be made for database.



CHECKED A LIST OF LOGINS CREATED AT SERVER LEVEL.

```
SELECT name, type_desc FROM sys.server_principals WHERE type IN ('S', 'U');
```

104 %

Results Messages

	name	type_desc
1	sa	SQL_LOGIN
2	##MS_PolicyEventProcessingLogin##	SQL_LOGIN
3	##MS_PolicyTsqlExecutionLogin##	SQL_LOGIN
4	DESKTOP-0FFQBQ4\ACER	WINDOWS_LOGIN
5	NT SERVICE\SQLWriter	WINDOWS_LOGIN
6	NT SERVICE\Winmgmt	WINDOWS_LOGIN
7	NT Service\MSSQL\$SQLEXPRESS	WINDOWS_LOGIN
8	NT AUTHORITY\SYSTEM	WINDOWS_LOGIN
9	NT SERVICE\SQLTELEMETRY\$SQL...	WINDOWS_LOGIN
10	Admin	SQL_LOGIN
11	HR	SQL_LOGIN
12	Employee	SQL_LOGIN

CHECKED DATABASE USERS

```
SELECT name, type_desc FROM sys.database_principals WHERE type IN ('S', 'U');
```

104 %

Results Messages

	name	type_desc
1	dbo	WINDOWS_USER
2	guest	SQL_USER
3	INFORMATION_SCHEMA	SQL_USER
4	sys	SQL_USER
5	AdminUser	SQL_USER
6	HRUser	SQL_USER
7	EmployeeUser	SQL_USER

CHECKED ROLES MEMBERSHIP

```
SELECT DP1.name AS DatabaseRoleName, DP2.name AS DatabaseUserName  
FROM sys.database_role_members AS DRM  
JOIN sys.database_principals AS DP1 ON DRM.role_principal_id = DP1.principal_id  
JOIN sys.database_principals AS DP2 ON DRM.member_principal_id = DP2.principal_id;
```

104 %

Results Messages

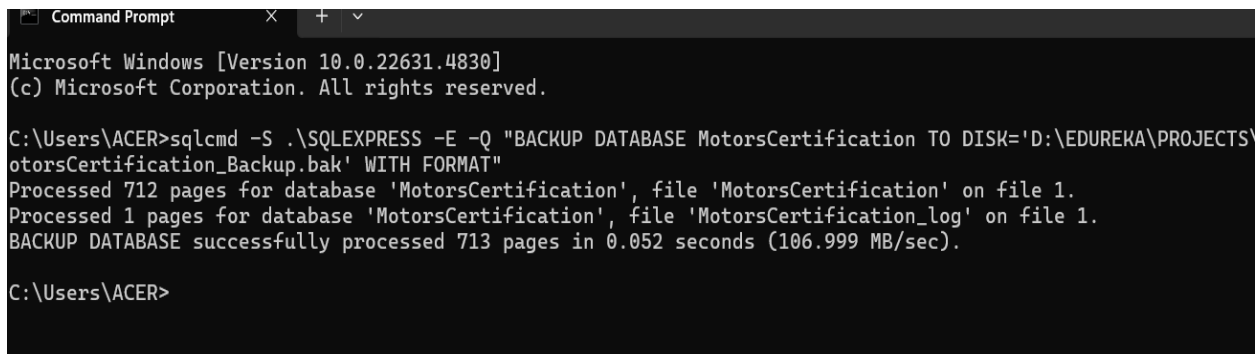
	DatabaseRoleName	DatabaseUserName
1	AdminRole	AdminUser
2	HRRole	HRUser
3	EmployeeRole	EmployeeUser
4	db_owner	dbo

STEP 12

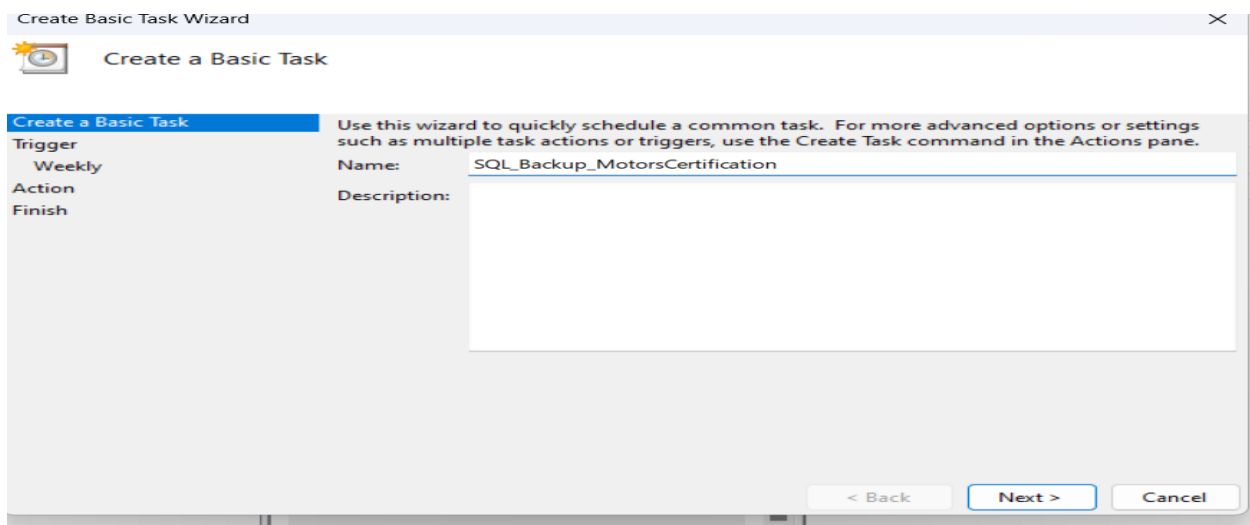
Scheduled a Job which backups and schedule it according to developer preference.

Since I'm using SQL Server Express, SQL Agent **is not available**. Instead, I used Task Scheduler with a batch script. So I couldn't do the azure part too.

```
sqlcmd -S .\SQLEXPRESS -E -Q "BACKUP DATABASE MotorsCertification TO  
DISK='D:\EDUREKA\PROJECTS\PROJECT 2\MotorsCertification_Backup.bak' WITH  
FORMAT"
```



```
Microsoft Windows [Version 10.0.22631.4830]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\Users\ACER>sqlcmd -S .\SQLEXPRESS -E -Q "BACKUP DATABASE MotorsCertification TO DISK='D:\EDUREKA\PROJECTS\  
MotorsCertification_Backup.bak' WITH FORMAT"  
Processed 712 pages for database 'MotorsCertification', file 'MotorsCertification' on file 1.  
Processed 1 pages for database 'MotorsCertification', file 'MotorsCertification_log' on file 1.  
BACKUP DATABASE successfully processed 713 pages in 0.052 seconds (106.999 MB/sec).  
  
C:\Users\ACER>
```



Create Basic Task Wizard

Create a Basic Task

Use this wizard to quickly schedule a common task. For more advanced options or settings such as multiple task actions or triggers, use the Create Task command in the Actions pane.

Create a Basic Task

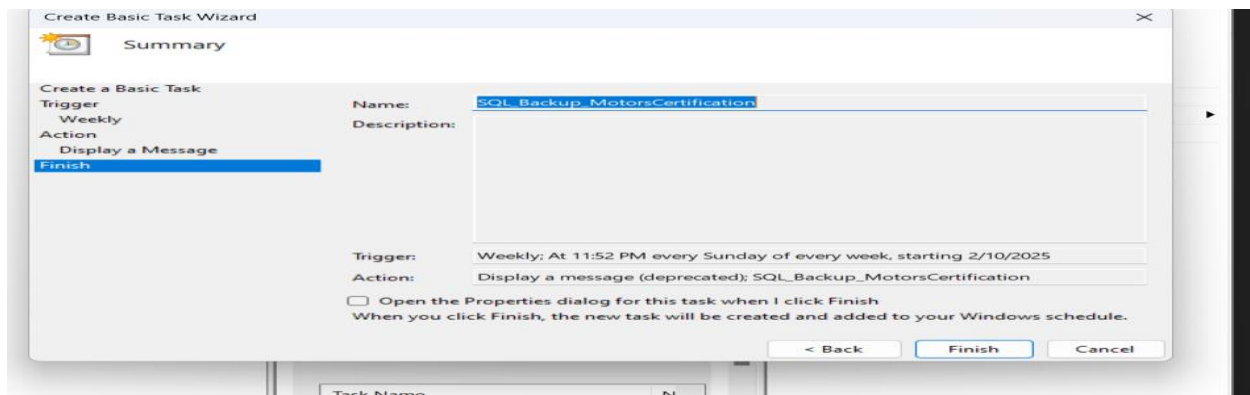
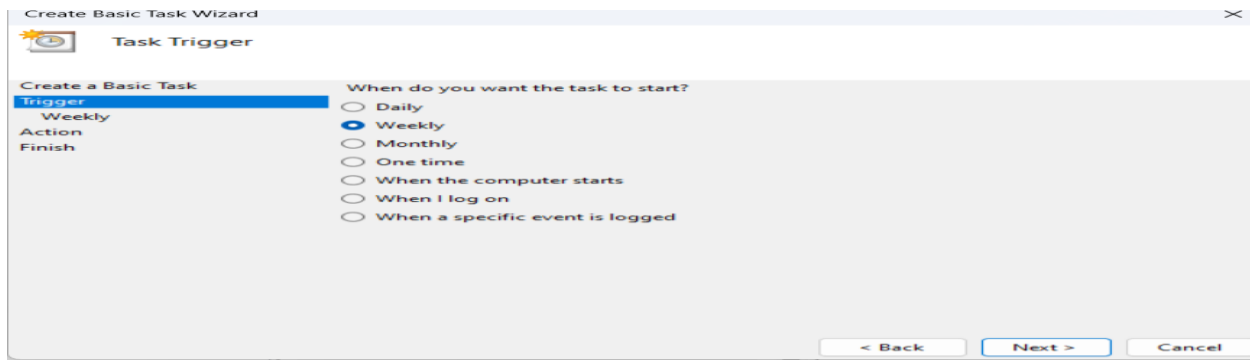
Trigger: Weekly

Action: Finish

Name: SQL_Backup_MotorsCertification

Description:

< Back Next > Cancel



STEP 13

Open Activity Monitor and list down some minor observations including Processes, Resource Waits, and Active Expensive Queries.

At the time of observation, the database server was idle with no active queries or resource usage.

