Module 18

Implementing Transactions

Module Overview

- Transactions and the Database Engine
- Controlling Transactions

Lesson 1: Transactions and the Database Engine

- Defining Transactions
- The Need for Transactions: Issues with Batches
- Transactions Extend Batches
- Demonstration: Transactions and the Database Engine

Defining Transactions

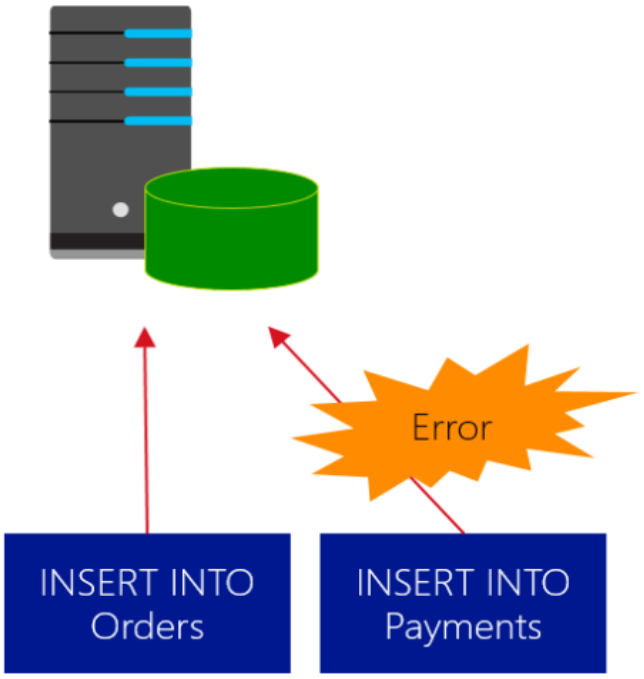
- A transaction is a group of tasks defining a unit of work
- The entire unit must succeed or fail together—no partial completion is permitted

```
--Two tasks that make up a unit of work
INSERT INTO Sales.Orders ...
INSERT INTO Sales.OrderDetails ...
```

- Individual data modification statements are automatically treated as stand-alone transactions
- User transactions can be managed with T-SQL commands:
  - BEGIN/ COMMIT/ROLLBACK TRANSACTION
- SQL Server uses locking mechanisms and the transaction log to support transactions

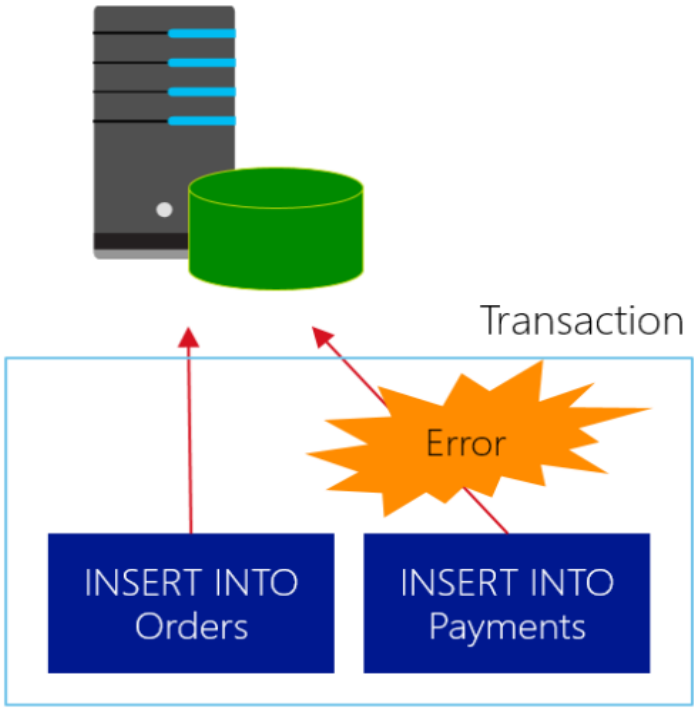
Understanding Transactions

Without Transactions:



Result: Order with no Payment

With Transactions:



Result: No Order and no Payment

The Need for Transactions: Issues with Batches

- To work around this situation, you will need to direct SQL Server to treat the batch as a transaction; you will learn more about creating transactions in the next topic

```
--Batch without transaction management
BEGIN TRY
        INSERT INTO Sales.Orders ... --Insert succeeds
        INSERT INTO Sales.OrderDetails ... --Insert fails
END TRY
BEGIN CATCH
        --Inserted rows still exist in Sales.Orders Table
        SELECT ERROR_NUMBER()
        ...
END CATCH;
```

Transactions Extend Batches

- Transaction commands identify blocks of code that must succeed or fail together and provide points where the database engine can roll back, or undo, operations:

```
BEGIN TRY
        BEGIN TRANSACTION
                INSERT INTO Sales.Orders ... --Insert succeeds
                INSERT INTO Sales.OrderDetails ... --Insert fails
        COMMIT TRANSACTION -- If no errors, transaction
        -- completes
END TRY
BEGIN CATCH
     --Inserted rows still exist in Sales.Orders Table
    SELECT ERROR_NUMBER()
    ROLLBACK TRANSACTION --Any transaction work undone
END CATCH;
```

Demonstration: Transactions and the Database Engine

In this demonstration, you will see how to:

- Use transactions

Lesson 2: Controlling Transactions

- BEGIN TRANSACTION
- COMMIT TRANSACTION
- ROLLBACK TRANSACTION
- Using XACT_ABORT
- Demonstration: Controlling Transactions

BEGIN TRANSACTION

- BEGIN TRANSACTION marks the starting point of an explicit, user-defined transaction
- Transactions last until a COMMIT statement is issued, a ROLLBACK is manually issued, or the connection is broken and the system issues a ROLLBACK
- Transactions are local to a connection and cannot span connections
- In your T-SQL code, mark the start of the transaction's work:

```
BEGIN TRY
        BEGIN TRANSACTION -- marks beginning of work
                INSERT INTO Sales.Orders ... --transacted work
                INSERT INTO Sales.OrderDetails ... --transacted work
...
```

COMMIT TRANSACTION

- COMMIT ensures all of the transaction's modifications are made a permanent part of the database
- COMMIT frees resources, such as locks, used by the transaction
- In your T-SQL code, if a transaction is successful, commit it

```
BEGIN TRY
        BEGIN TRAN -- marks beginning of work
                INSERT INTO Sales.Orders ...
                INSERT INTO Sales.OrderDetails ...
        COMMIT TRAN -- mark the work as complete
END TRY
```

ROLLBACK TRANSACTION

- A ROLLBACK statement undoes all modifications made in the transaction by reverting the data to the state it was in at the beginning of the transaction
- ROLLBACK frees resources, such as locks, held by the transaction
- Before rolling back, you can test the state of the transaction with the XACT_STATE function
- In your T-SQL code, if an error occurs, ROLLBACK to the point of the BEGIN TRANSACTION statement

```
BEGIN CATCH
        SELECT ERROR_NUMBER() --sample error handling
        ROLLBACK TRAN
END CATCH;
```

Using XACT_ABORT

- SQL Server does not automatically roll back transactions when errors occur
- To roll back, either use ROLLBACK statements in error-handling logic or enable XACT_ABORT
- XACT_ABORT specifies whether SQL Server automatically rolls back the current transaction when a runtime error occurs
  - When SET XACT_ABORT is ON, the entire transaction is terminated and rolled back on error, unless occurring in TRY block
  - SET XACT_ABORT OFF is the default setting
- Change XACT_ABORT value with the SET command:

```
SET XACT_ABORT ON;
```

Demonstration: Controlling Transactions

In this demonstration, you will see how to:

- Control transactions

Lab: Implementing Transactions

- Exercise 1: Controlling Transactions with BEGIN, COMMIT, and ROLLBACK
- Exercise 2: Adding Error Handling to a CATCH Block

Logon Information
Virtual machine: **20761C-MIA-SQL**
User name: **ADVENTUREWORKS\Student**
Password: **Pa55w.rd**

Estimated Time: 30 minutes