



<http://www.lycato.com>



# Spring Boot

## Database

*Nguyễn Nghiệm*





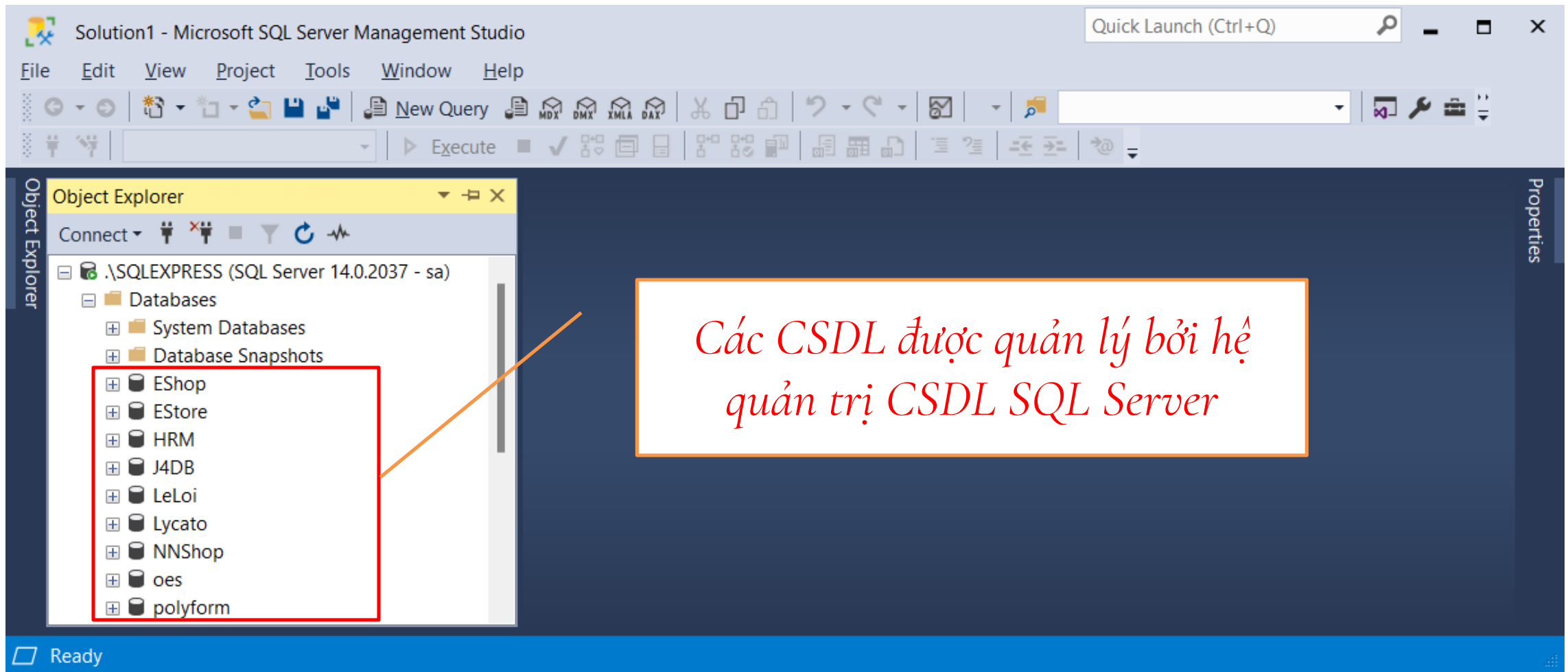
- ❑ DB & DBMS Concepts via WebShop
- ❑ Database Administration
  - ❖ Create
  - ❖ Backup
  - ❖ Restore
- ❑ WebShop Database Introduction
- ❑ SQL - Structured Query Language
  - ❖ Manipulating Data
  - ❖ Querying Data



# What is DB & DBMS?



- ❑ CSDL là nơi lưu trữ dữ liệu
- ❑ Hệ quản trị CSDL là phần mềm quản lý các CSDL





# DATABASE CONCEPTS

SONGLONG\SQLEXPRESS.WebShop1 - dbo.Customers - Microsoft SQL Server Management Studio

File Edit View Project Query Designer Tools Window Help

Quick Launch (Ctrl+Q)

*Primary Key*

*Table Structure (Column:DataType)*

Object Explorer

Connect

WebShop1

- Database Diagrams
- Tables
- System Tables
- FileTables
- External Tables
- Graph Tables
- dbo.Categories
- dbo.Customers**
- dbo.EmployeeRoles
- dbo.Employees
- dbo.OrderDetails
- dbo.Orders
- dbo.OrderStatuses
- dbo.Products
- dbo.Roles
- Views
- External Resources
- Synonyms

*Tables*

Username	Password	Fullname	Photo	Email	Enabled
ALFKI	alfki	Maria Anders,Maria Anders	new.png	nghiemn@fpt.edu.vn	True
ANATR	anatr	Ana Trujillo	cea0113		
ANTON	anton	Antonio Moreno	4cbb		
AROUT	arout	Thomas Hardy	20ba		
BERGS	bergs	Christina Berglund	user.png	bergs@gmail.com	True
<b>BLAUS</b>	<b>blaus</b>	<b>Hanna Moos</b>	<b>user.png</b>	<b>blaus@gmail.com</b>	<b>True</b>
BLONP	blonp	Frédérique Citeaux	user.png	blonp@gmail.com	True
BOLID	bolid	Martín Sommer	user.png	bolid@gmail.com	True
BONAP	bonap	Laurence Lebihan	user.png	bonap@gmail.com	True
BOTTM	bottm	Elizabeth Lincoln	user.png	bottm@gmail.com	True
BSBEV	bsbev	Victoria Ashworth	user.png	bsbev@gmail.com	True
CACTU	cactu	Patricio Simpson	user.png	cactu@gmail.com	True
CENTC	centc	Francisco Chang	user.png	centc@gmail.com	True
CHOPS	chops	Yang Wang	user.png	chops@gmail.com	True
COMMI	commi	Pedro Afonso	user.png	commi@gmail.com	True
CONSH	consh	Elizabeth Brown	user.png	consh@gmail.com	True

*A row is an entity*

Ready



# WORKING WITH DATA

SONGLONG\SQLEXPRESS.WebShop1 - dbo.Customers - Microsoft SQL Server Management Studio Quick Launch (Ctrl+Q)

File Edit View Project Query Designer Tools Window Help

New Query MDX DMX XMLA DAX

WebShop1 Execute

Object Explorer SONGLONG\SQLEXPRESS - dbo.Customers

Connect

- FileTables
- External Tables
- Graph Tables
- dbo.Categories
- dbo.Customers**
- dbo.Employee
- dbo.Employee
- dbo.OrderData
- dbo.Orders
- dbo.OrderStat
- dbo.Products
- dbo.Roles
- Views
- External Resource
- Supers

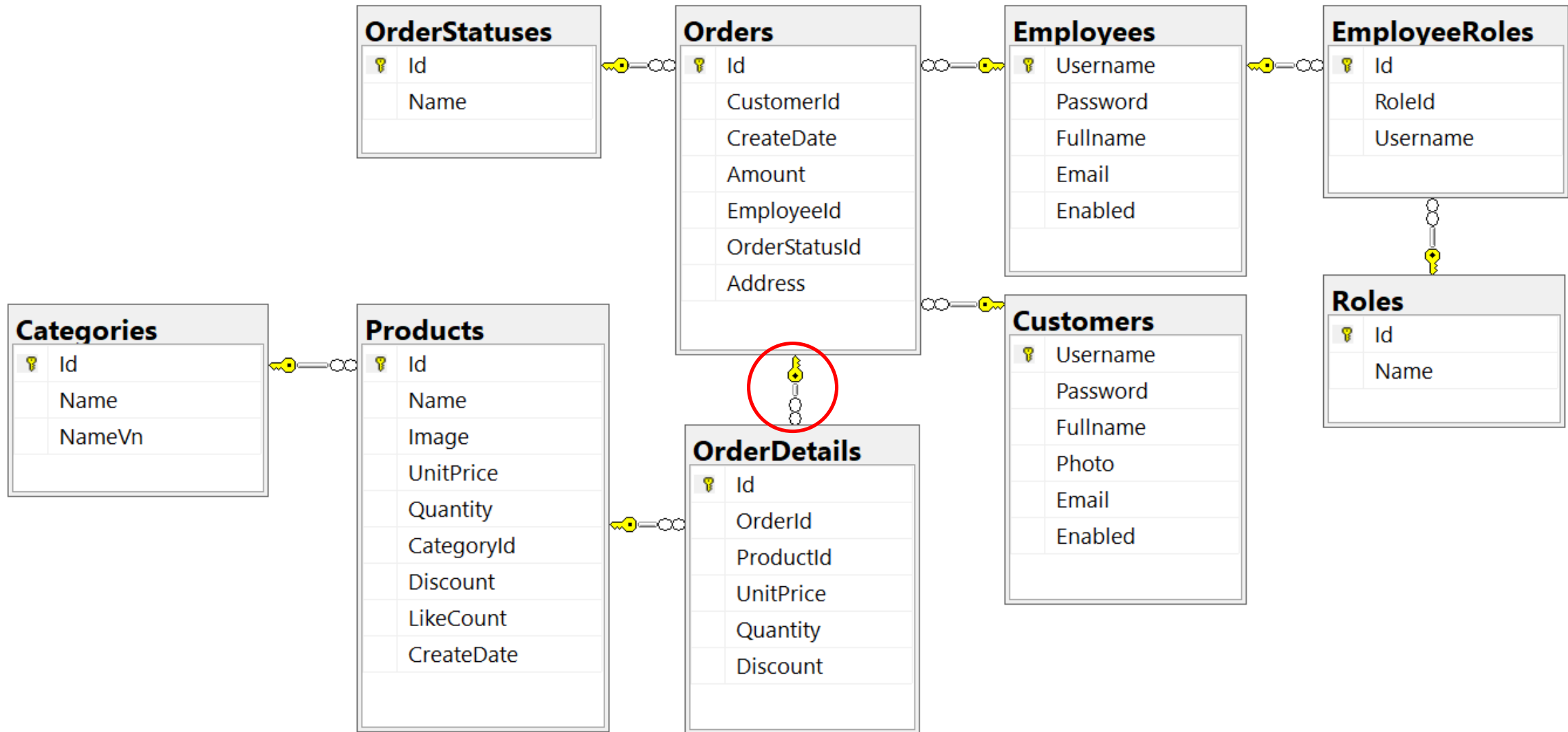
Table...  
Design  
Select Top 1000 Rows  
**Edit Top 200 Rows**  
Script Table as  
View Dependencies  
Memory Optimization Advisor  
Encrypt Columns...  
Full-Text index  
Storage  
Stretch  
Policies  
Facets  
Start PowerShell  
Reports

Password	Fullname	Photo	Email	Enabled
alfki	Maria Ande...	new.png	nghiemn@f...	True
anatr	Ana Trujillo	cea01b2c.jpg	anatr@gma...	True
anton	Antonio Mo...	4cbbc42c.jpg	anton@gm...	True
arout	Thomas Har...	20ba07e4.jpg	arout@gma...	False
bergs	Christina Be...	user.png	bergs@gma...	True
blaus	Hanna Moos	user.png	blaus@gma...	True
blonp	Frédérique ...	user.png	blonp@gm...	True
bolid	Martín Som...	user.png	bolid@gma...	True
bonap	Laurence Le...	user.png	bonap@gm...	True
bottm	Elizabeth Li...	user.png	bottm@gm...	True
bsbev	Victoria Ash...	user.png	bsbev@gm...	True
cartu	Patricio Sim	user.png	cartu@gma	True

Ready



# RELATIONSHIP DIAGRAM





# 1-N RELATIONSHIP

Orders							
	Id						
	CustomerId						
	CreateDate						
	Amount						
	EmployeeId						
	OrderStatusId						
	Address						



OrderDetails							
	Id						
	OrderId						
	ProductId						
	UnitPrice						
	Quantity						
	Discount						

SONGLONG\SQLXP...op1 - dbo.Orders							
	Id	CustomerId	CreateDate	Amount	EmployeeId	OrderStatusId	Address
	10249	TOMSP	2012-02-06	1696	super2	4	4/32 Lưu Ch...
	10250	HANAR	2020-07-06	2563	super2	3	4/32 Lưu Ch...
	10251	VICTE	2019-10-09	670.8	super2	4	4/32 Lưu Ch...
	10252	SUPRD	2017-07-20	3730	super2	4	4/32 Lưu Ch...

SONGLONG\SQLXP...op1 - dbo.Orders							SONGLONG\SQLXP...dbo.OrderDetails	
	Id	OrderId	ProductId	UnitPrice	Quantity	Discount		
	100005	10249	1051	42.4	2	0		
	100006	10250	1041	7.7	3	0.5		
	100007	10250	1051	42.4	2	0		
	100008	10250	1065	16.8	5	0.17		
	100009	10251	1022	16.8	3	0.08		





# DATA RELATION

SQLQuery2.sql - (local)\SQLEXPRESS.WebShop1 (sa (56))\* - Microsoft SQL Server Management S... Quick Launch (Ctrl+Q)

File Edit View Query Project Tools Window Help

WebShop1 Execute

Object Explorer

- FileTable
- External
- Graph Ta
- dbo.Cate
- dbo.Cust
- dbo.Emp
- dbo.Emp
- dbo.Orde
- dbo.Orde
- dbo.Orde
- dbo.Prod
- dbo.Role
- Views
- External

SQLQuery2.sql - (l...WebShop1 (sa (56))\* SONGLONG\SQLEXP...- dbo.Customers

```
SELECT * FROM Orders WHERE Id=10250
SELECT * FROM OrderDetails WHERE OrderId=10250
```

161 %

Results Messages

	Id	CustomerId	CreateDate	Amount	EmployeeId	OrderStatusId	Address
1	10250	HANAR	2020-07-06	2563	super2	3	4/32 Lưu Chí Hiếu, F.Tây Thạnh, Q.Tân Phú, Tp.HCM

	Id	OrderId	ProductId	UnitPrice	Quantity	Discount
1	100006	10250	1041	7.7	3	0.5
2	100007	10250	1051	42.4	2	0
3	100008	10250	1065	16.8	5	0.17
4	102316	10250	1009	150	5	0

Query executed successfully. (local)\SQLEXPRESS (14.0 RTM) sa (56) WebShop1 00:00:00 1 rows

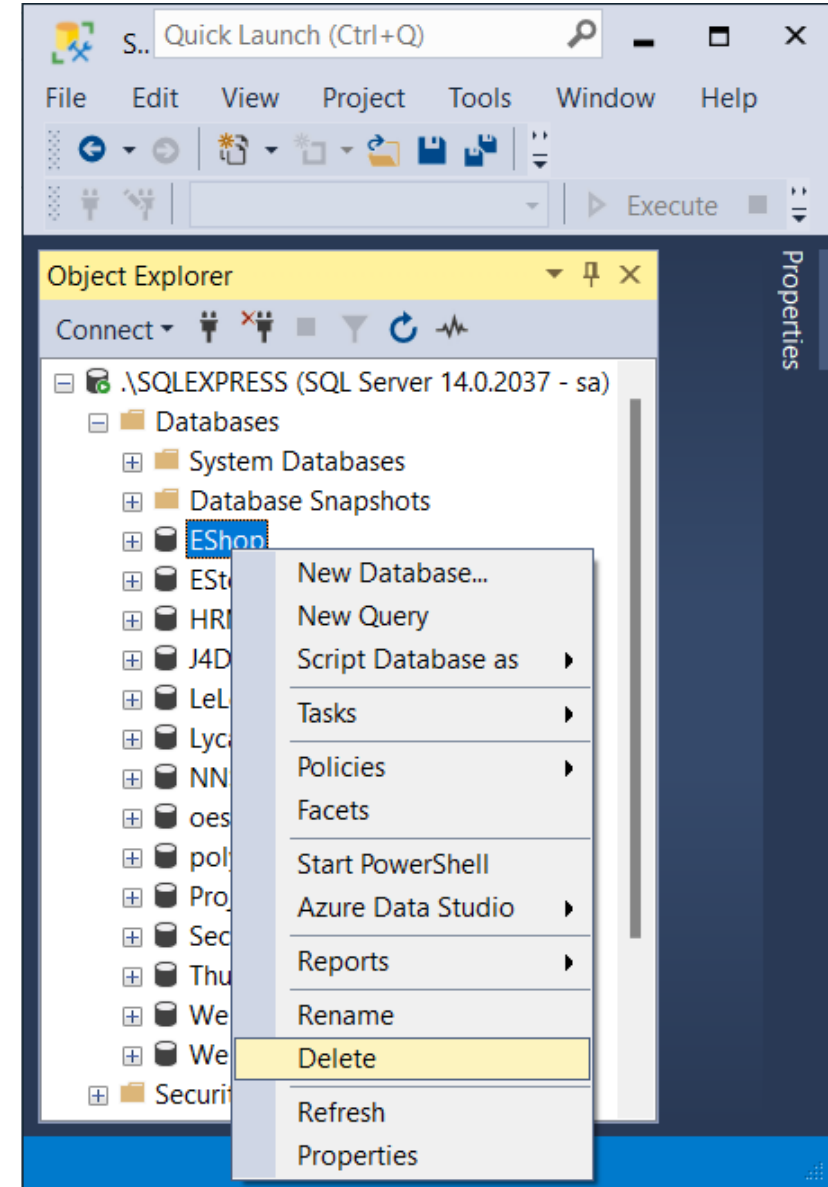
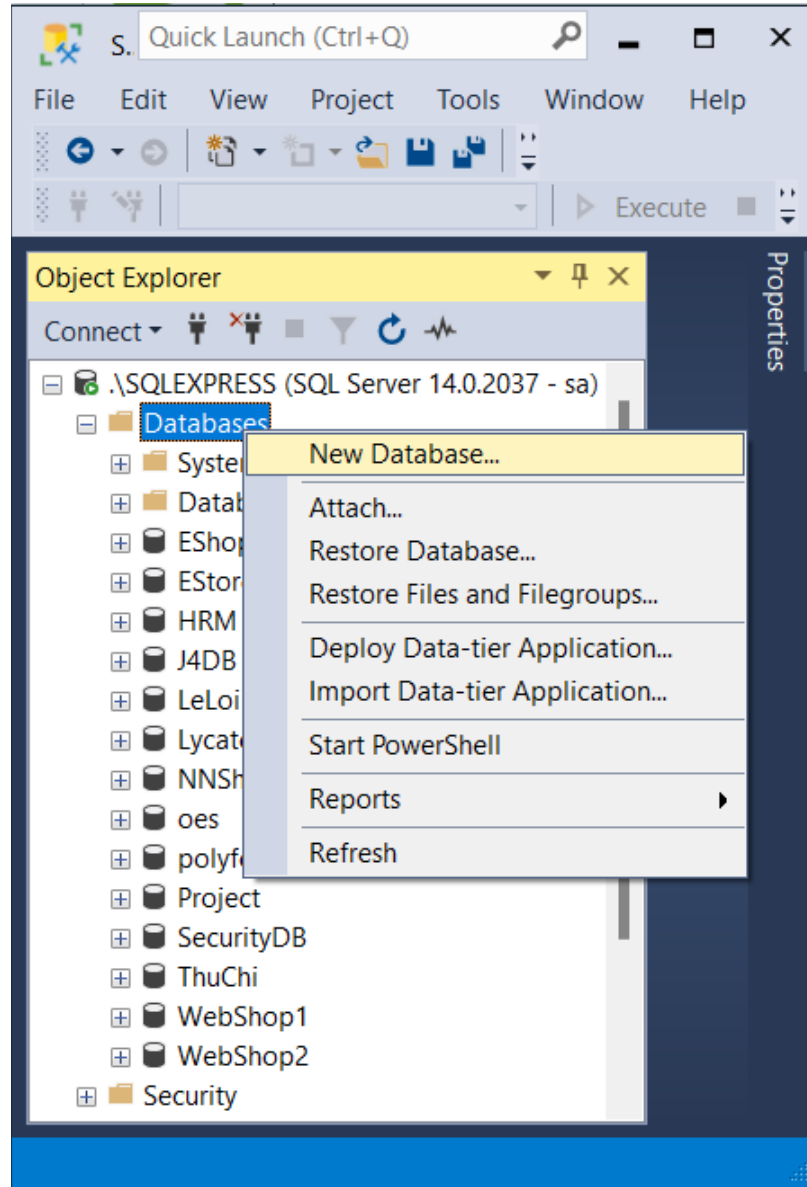
Ready Ln 1 Col 1 INS



# Database Administration



# CREATE & DELETE DATABASE





# BACKUP DATABASE

Set Scripting Options

Summary

Save Scripts

Specify how scripts should be saved.

☐ Save as notebook

Advanced

Advanced Scripting Options

Options

Script Defaults	SQL Server 2005
Script DROP and CREATE	SQL Server 2008
Script Extended Properties	SQL Server 2008 R2
Script for Server Version	SQL Server 2012
Script for the database engine edition	SQL Server 2014
Script for the database engine type	SQL Server 2016
Script Logins	SQL Server 2017
Script Object-Level Permissions	SQL Server 2019
Script Owner	SQL Server 2017
Script Statistics	Microsoft SQL Server Express Edition
Script USE DATABASE	Stand-alone instance
Types of data to script	Schema and data
Table/View Options	Data only
Script Change Tracking	Schema and data
Script Check Constraints	Schema only

Types of data to script

Generates script that contains schema only or schema and data.

OK Cancel



# RESTORE DATABASE

SQLQuery1.sql - (local)\SQLEXPRESS.WebShop1 (sa (52)) - Microsoft SQL Server Management St... Quick Launch (Ctrl+Q)

File Edit View Query Project Tools Window Help

WebShop1 Execute

Object Explorer

Connect

.\SQLEXPRESS (SQL Server 14.0.2037 - sa)

- Databases
  - System Databases
  - Database Snapshots
  - EShop
  - EStore
  - HRM
  - J4DB
  - LeLoi
  - Lycato
  - NNShop
  - oes
  - polyform
  - Project
  - SecurityDB

SQLQuery1.sql - (l....WebShop1 (sa (52)))

```
USE [WebShop1]
GO
/***** Object: Table [dbo].[Categories]
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
CREATE TABLE [dbo].[Categories](
    [Id] [int] IDENTITY(1000,1) NOT NULL
```

161 %

Connected. (1/1) | (local)\SQLEXPRESS (14.0 RTM) | sa (52) | WebShop1 | 00:00:00 | 0 rows

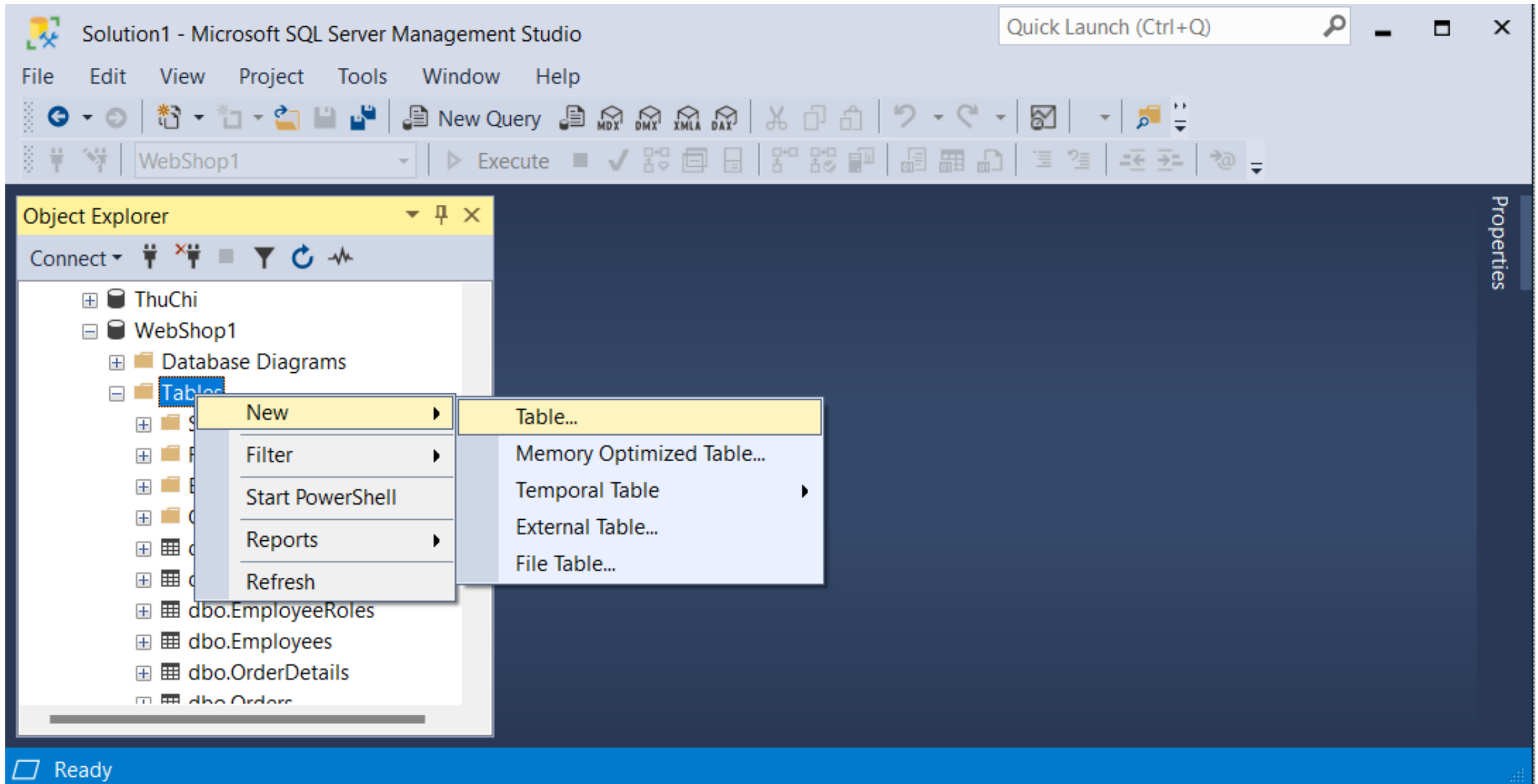
Ready Ln 3 Col 81 Ch 81 INS



# Designing Table



# CREATING TABLE







# DESIGNING TABLE

SONGLONG\SQLEXPRESS.WebShop1 - dbo.Customers\* - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

Connect

WebShop1

- Databases
  - dbo.
  - dbo.
- Tables
  - System Tables
  - FileTables
  - External Tables
  - Graph Tables
  - dbo.Categories
  - dbo.Customers
  - dbo.EmployeeRoles
  - dbo.Employees
  - dbo.OrderDetails
  - dbo.Orders
  - dbo.OrderStatuses
  - dbo.Products
  - dbo.Roles
- Views

Primary Key Column

Column Information

Column Name	Data Type	Allow Nulls
Username	nvarchar(50)	<input type="checkbox"/>
Password	nvarchar(200)	<input type="checkbox"/>
Fullname	nvarchar(50)	<input type="checkbox"/>
Photo	nvarchar(50)	<input type="checkbox"/>
Email	nvarchar(50)	<input type="checkbox"/>
Enabled	bit	<input type="checkbox"/>

More Column Information

Column Properties

Collation	<database default>
Computed Column Spec	
Condensed Data Type	nvarchar(50)
Description	Tên đăng nhập

Condensed Data Type

Properties

[Tbl] dbo.Customers

(Identity)

(Name)	Customers
Database Name	WebShop1
Description	Thông tin khách hàng
Schema	dbo
Server Name	songlong\sqlexpress

Table Designer

Identity Colour	
Indexable	Yes
Lock Escalation	Table
Regular Data	PRIMARY
Replicated	No
Row GUID Col	
Text/Image File	PRIMARY

Regular Data Space Specification

Ready





# COLUMN DATATYPE

Object Explorer: WebShop1

- Database Diagrams
  - dbo.WebSecurity
  - dbo.WebShop
- Tables
  - System Tables
  - FileTables
  - External Tables
  - Graph Tables
  - dbo.Categories
  - dbo.Customers
  - dbo.EmployeeRoles
  - dbo.Employees
  - dbo.OrderDetails
  - dbo.Orders
  - dbo.OrderStatuses
  - dbo.Products
  - dbo.Roles
- Views

Column Name	Data Type	Allow Nulls
Username	nvarchar(50)	<input type="checkbox"/>
Password	nvarchar(50)	<input type="checkbox"/>
Fullname	nvarchar(MAX)	<input type="checkbox"/>
Photo	real	<input type="checkbox"/>
Email	smalldatetime	<input type="checkbox"/>
Enabled	smallint	<input type="checkbox"/>

Column Properties

Property	Value
Collation	<database default>
Computed Column Specification	
Condensed Data Type	nvarchar(50)
Description	Tên đăng nhập

Condensed Data Type

## String:

[N]CHAR(N), [N]VARCHAR(N), [N]TEXT

## Integer:

INT, BIGINT, SMALLINT

## Double:

FLOAT, DECIMAL, MONEY

## Boolean:

BIT

## Date:

DATE, TIME, DATETIME

## Binary:

BINARY(N), VARBINARY(N), IMAGE



# COLUMN CONSTRAINTS

SONGLONG\SQLEXPRESS.WebShop1 - dbo.Customers\* - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

New Query MDX DMX XMLA DAX

Execute

Object Explorer

Connect

dbo.WebShop

Tables

System Tables

FileTables

External Tables

Graph Tables

dbo.Categories

dbo.Customers

Columns

Username (PK, nvarchar(50), not null)

Password (nvarchar(200), not null)

Fullname (nvarchar(50), not null)

Photo (nvarchar(50), not null)

Email (nvarchar(50), not null)

Enabled (bit, not null)

Keys

Constraints

Triggers

SONGLONG\SQLEXPRESS... - dbo.Customers\*

Column Name	Data Type	Allow Nulls
Fullname	nvarchar(50)	<input type="checkbox"/>
Photo	nvarchar(50)	<input type="checkbox"/>
Email	nvarchar(50)	<input type="checkbox"/>
Enabled	bit	<input type="checkbox"/>

Column Properties

(General)

(Name)	Email
Allow Nulls	No
Data Type	nvarchar
Default Value or Binding	N'nghiemn@fpt.edu.vn'
Length	50

(General)

**PRIMARY KEY:**

Khóa chính

**FOREIGN KEY:**

Khóa ngoại

**[NOT]NULL:**

Cho phép [not] null?

**UNIQUE:**

Duy nhất

**CHECK(ĐK):**

Theo điều kiện

**DEFAULT:**

Giá trị mặc định

**IDENTITY(N, STEP):**

Tự tăng



# COLUMN CONSTRAINTS

SONGLONG\SQLEXPRESS.WebShop1 - dbo.Customers\* - Microsoft SQL Server Management Studio

Quick Launch (Ctrl+Q)

File Edit View Project Table Designer Tools Window Help

New Query MDX DMX XMLA DAX

Execute

Object Explorer

Connect

dbo.WebShop

Tables

System Tables

FileTables

External Tables

Graph Tables

dbo.Categories

dbo.Customers

Columns

Username (PK, nvarchar(50), not null)

Password (nvarchar(200), not null)

FullName (nvarchar(50), not null)

Photo (nvarchar(50), not null)

Email (nvarchar(50), not null)

Enabled (bit, not null)

Keys

Constraints

Triggers

SONGLONG\SQLEXPRESS... - dbo.Customers\*

Column Name	Data Type	Allow Nulls
FullName	nvarchar(50)	<input type="checkbox"/>
Photo	nvarchar(50)	<input type="checkbox"/>

Set Primary Key

Insert Column

Delete Column

Relationships...

Indexes/Keys...

Fulltext Index...

XML Indexes...

Check Constraints...

Spatial Indexes...

Generate Change Script...

Properties Alt+Enter

Properties

[Tbl] dbo.Customers

(Name) Customers

Database Name WebShop1

Description Thông tin khách hàng

Schema dbo

Server Name songlong\sqlexpress

Table Designer

Identity Colour

Indexable Yes

Lock Escalation Table

Regular Data PRIMARY

Replicated No

Row GUID Col

Text/Image File PRIMARY

Regular Data Space Specification

Ready



## COLUMN CONSTRAINTS

Indexes/Keys

Selected Primary/Unique Key or Index:

IX\_Customers\*  
PK\_Customers

Editing properties for new unique key or index.

✓ (General)	
Columns	Email (ASC)
Is Unique	Yes
Type	Index
✓ Identity	
(Name)	IX_Customers
Description	
✓ Table Designer	
Create As Clustered	No
> Data Space Specification	PRIMARY
> Fill Specification	
Ignore Duplicate Keys	No

Add Delete Close

### **PRIMARY KEY:**

Khóa chính

### **FOREIGN KEY:**

Khóa ngoại

### **[NOT]NULL:**

Cho phép [not] null?

### **UNIQUE:**

Duy nhất

### **CHECK(ĐK):**

Theo điều kiện

### **DEFAULT:**

Giá trị mặc định



# Designing Relationship



Solution1 - Microsoft SQL Server Management Studio

File Edit View Project Tools Window Help

WebShop1 Execute

Object Explorer

- ThuChi
- WebShop1
  - Database Diagrams
  - Tables
    - System Tables
    - FileTables
    - External Tables
    - Graph Tables
    - dbo.Categories
    - dbo.Customers
    - dbo.EmployeeRoles
    - dbo.Employees
    - dbo.OrderDetails
    - dbo.Orders

New Database Diagram

- Filter
- Reports
- Refresh

Add Table

Tables

- Categories
- Customers
- EmployeeRoles
- Employees
- OrderDetails
- Orders
- OrderStatuses
- Products
- Roles

Refresh Add Close

Ready



# 1-N RELATIONSHIP CONSTRAINTS

SONGLONG\SQLEXPRESS.WebShop1 - Diagram\_0\* - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

SONGLONG\SQLEXP...hop1 - Diagram\_0\* SONGLONG\SQLEXP...op1 - dbo.Orders

**Orders**

Id
CustomerId
CreateDate
Amount
EmployeeId
OrderStatusId
Address

**OrderDetails**

Id
OrderId
ProductId
UnitPrice
Quantity
Discount

**Properties**

[Rel] FK\_OrderDetails\_Orders

(General)

Check Existing Data On Creation Or Re-Enabling Yes

Tables And Columns Specification

Property	Value
Foreign Key Base Table	OrderDetails
Foreign Key Columns	OrderId
Primary/Unique Key Base Table	Orders
Primary/Unique Key Columns	Id

Database Designer

Property	Value
Enforce For Replication	Yes
Enforce Foreign Key Constraint	Yes

INSERT And UPDATE Specification

Property	Value
Delete Rule	Cascade
Update Rule	Cascade

No Action  
Cascade  
Set Null  
Set Default

**OneToMany**  
**Primary Key <= Foreign Key**  
*Orders.Id <= OrderDetails.OrderId*



- ❑ Dữ liệu giữa các table tồn tại phụ thuộc lẫn nhau. Relationship được sử dụng để quản lý sự phụ thuộc đó.
- ❑ Phân loại quan hệ dữ liệu giữa các bảng:
  - ❖ **1-1** (OneToOne)
    - Một thực thể của Bảng chứa khóa chính kết hợp với một thực thể của Bảng chứa khóa ngoại
  - ❖ **1-N** (OneToMany), **N-1** (ManyToOne)
    - Một thực thể của Bảng chứa khóa chính kết hợp với nhiều thực thể của Bảng chứa khóa ngoại
  - ❖ **N-N** (ManyToMany)
    - Một thực thể của Bảng chứa khóa chính kết hợp với nhiều thực thể của Bảng chứa khóa ngoại và ngược lại





# Data Manipulation Language



## ❑ Chèn thêm dữ liệu vào bảng

❖ Cú pháp: **INSERT INTO** T(C1, C2...) **VALUES**(V1, V2...)

❖ Ví dụ: **INSERT INTO** Employees(Username, Password, Fullname, Email, Enabled)  
**VALUES**('a', '123', N'Nguyễn Văn A', 'a@gmail.com', 1)

## ❑ Cập nhật dữ liệu

❖ Cú pháp: **UPDATE** T **SET** C1=V1, C2=V2... **WHERE** CONDITION

❖ Ví dụ: **UPDATE** Employees  
**SET** Password='456', Email='b@gmail.com' **WHERE** Username='a'

## ❑ Xóa dữ liệu khỏi bảng

❖ Cú pháp: **DELETE** [**FROM**] T **WHERE** CONDITION

❖ Ví dụ: **DELETE FROM** Employees **WHERE** Enabled = 0



## Query Data



## SELECT CLAUSES

- ❑ SELECT <\* | columns>
- ❑ FROM <table>
  - ❖ [<JOIN Expressions>]
- ❑ WHERE <Condition>
- ❑ GROUP BY <Expressions>
  - ❖ HAVING <Condition>
- ❑ ORDER BY <Expression> [ASC | DESC]



```
SELECT * FROM Categories
```

```
SELECT * FROM Products WHERE CategoryId=1005
```

```
SELECT * FROM Products  
WHERE UnitPrice BETWEEN 0 AND 5  
ORDER BY CreateDate DESC
```

```
SELECT c.NameVn, p.Name, p.UnitPrice  
FROM Products p  
    JOIN Categories c ON c.Id=p.CategoryId  
WHERE CategoryId=1005  
ORDER BY UnitPrice
```



```
SELECT
    c.NameVn,
    SUM(p.Quantity) AS Total
FROM Products p
    JOIN Categories c ON c.Id=p.CategoryId
WHERE YEAR(p.CreateDate) > 1999
GROUP BY c.NameVn
    HAVING SUM(p.Quantity) > 500
ORDER BY SUM(p.Quantity) DESC
```



- ☐ Doanh số bán hàng từng mặt hàng của năm 2021
- ☐ Doanh số bán hàng từng loại hàng của năm 2021
- ☐ Doanh số bán hàng từng tháng của năm 2021
- ☐ Danh sách các khách hàng có tổng số tiền đã mua từ 100000 trở lên