



Introduction to ERwin

Database Design & Modelling

Hans-Petter Halvorsen, M.Sc.

Software

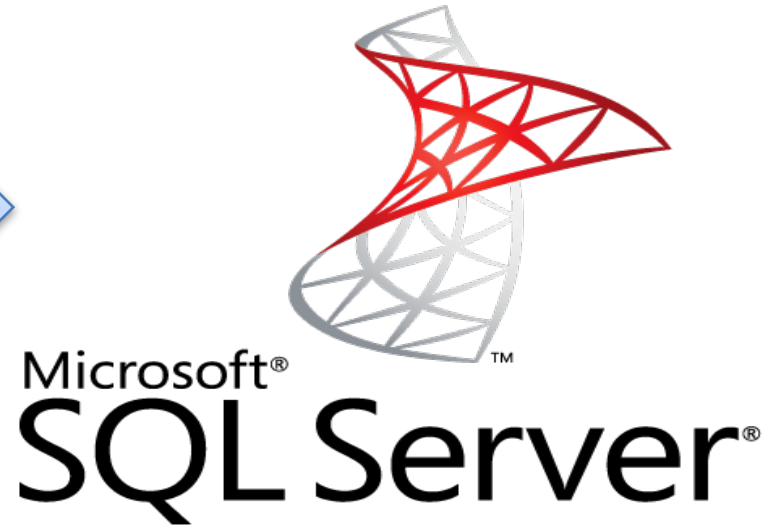
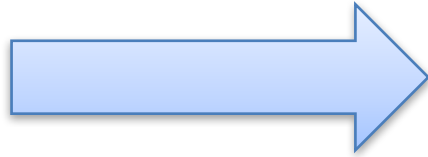


The following Editions can be downloaded for Free on Internet:

CA ERwin Data Modeler Community Edition

SQL Server Express Edition

Overview



1. Design and Create Tables

2. Make a SQL Script

3. Execute the Script within SQL Server

4. Start using your Database,
Insert Data, etc.



Database Design & Modelling

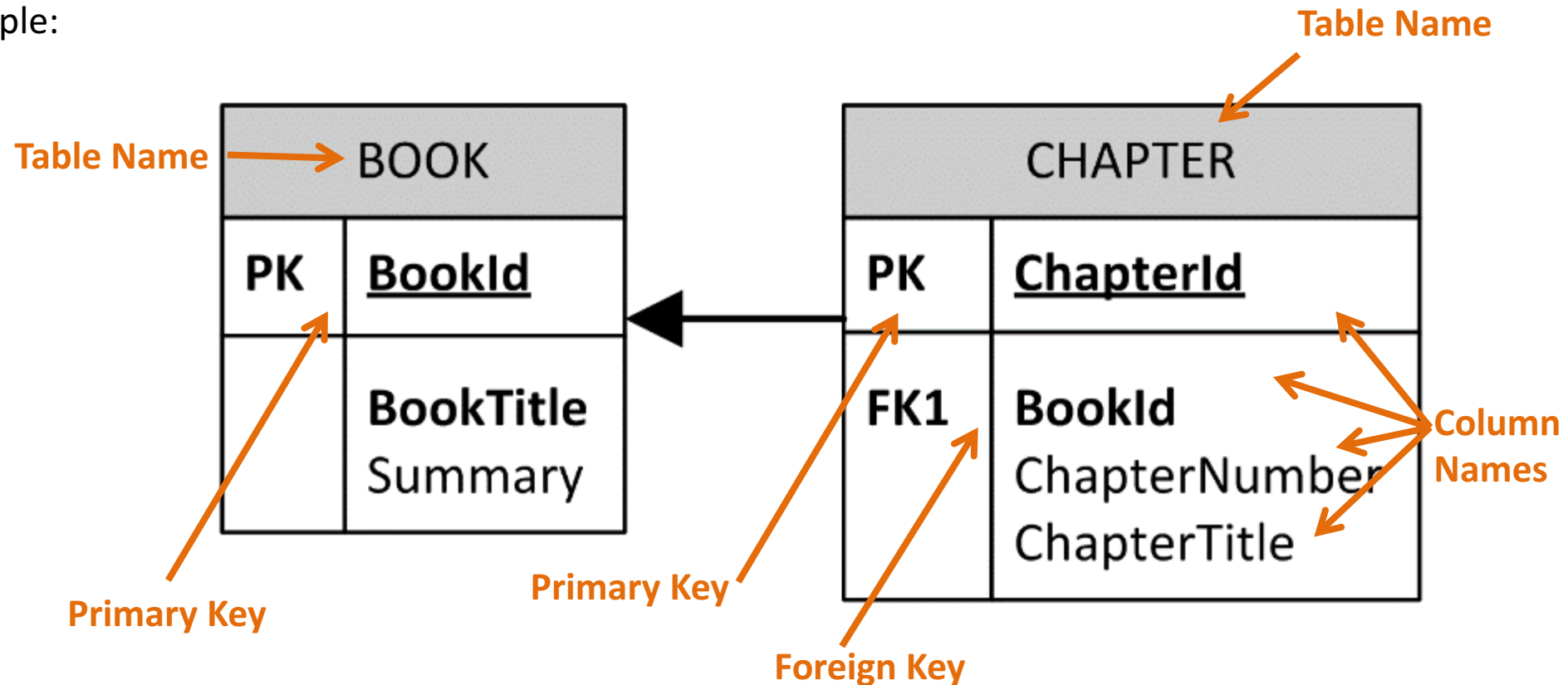
Hans-Petter Halvorsen, M.Sc.

Database Design – ER Diagram

ER Diagram (Entity-Relationship Diagram)

- Used for Design and Modeling of Databases.
- Specify Tables and relationship between them (**Primary Keys** and **Foreign Keys**)

Example:



Relational Database. In a relational database all the tables have one or more relation with each other using Primary Keys (PK) and Foreign Keys (FK). Note! You can only have one PK in a table, but you may have several FK's.

Database - “Best Practice”

- **Tables:** Use upper case and singular form in table names – not plural, e.g., “STUDENT” (not “students”)
- **Columns:** Use Pascal notation, e.g., “StudentId”
- **Primary Key:**
 - If the table name is “COURSE”, name the Primary Key column “CourseId”, etc.
 - “Always” use Integer and Identity(1,1) for Primary Keys. Use UNIQUE constraint for other columns that needs to be unique, e.g. “RoomNumber”
- Specify **Required** Columns (NOT NULL) – i.e., which columns that need to have data or not
- Standardize on few/these **Data Types:** *int, float, varchar(x), datetime, bit*
- Use English for table and column names
- Avoid abbreviations! (Use “RoomNumber” – not “RoomNo”, “RoomNr”, ...)

Database Design & Implementation

Recommended Steps:

1. Database Modelling/Design using ERwin
2. Generate SQL Table Script using ERwin (you might need to adjust/improve it in order to make it more robust)
3. Generate Tables in SQL Server using the SQL Script generated by ERwin
4. Create Stored Procedures, View, Triggers, etc. inside SQL Server if needed.



ERwin

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CA ERwin Data Modeler Community Edition

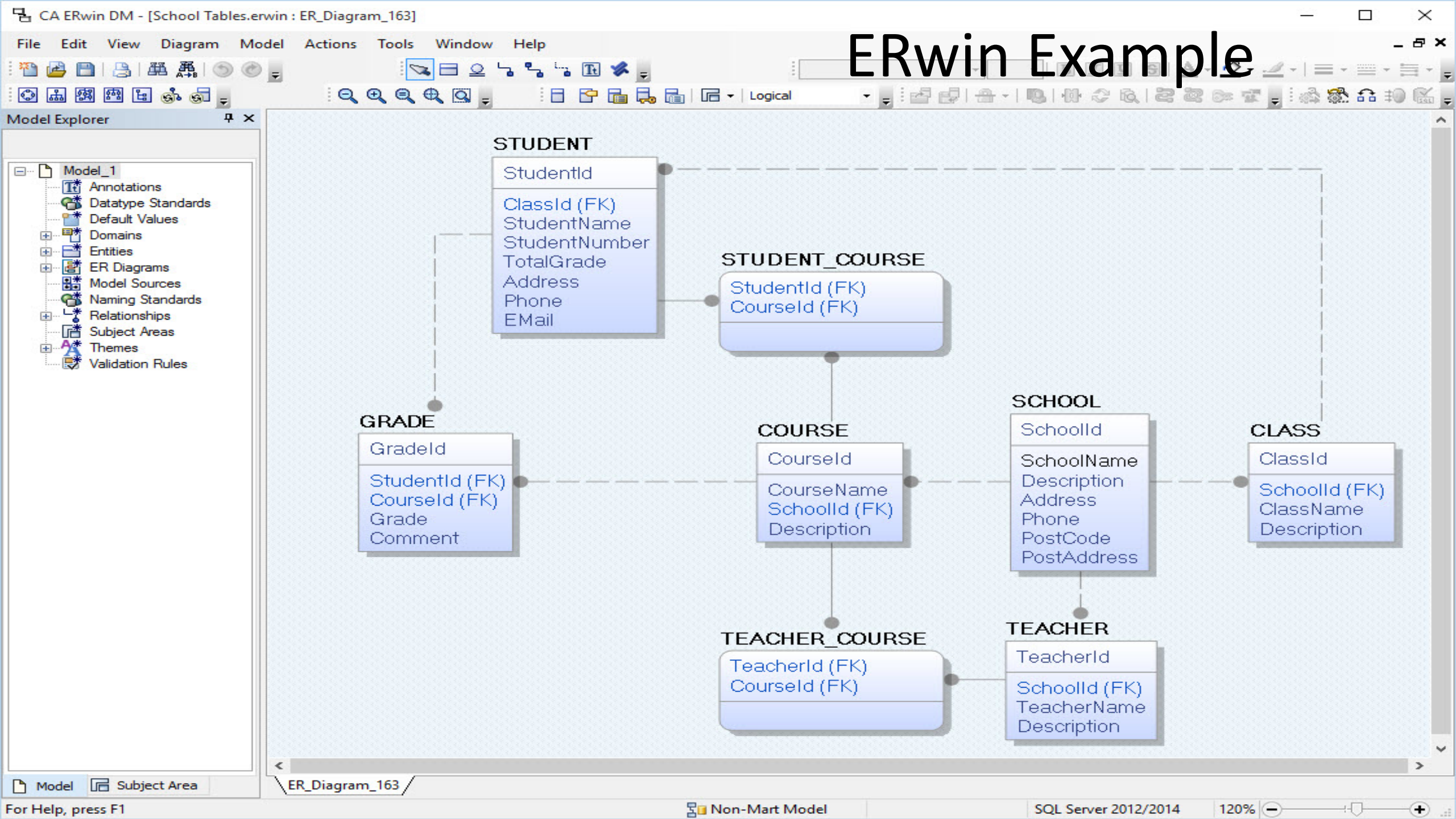


- Tool for Database Modelling (ER Diagrams)
- Free!
- Forward and Reverse Engineering with a 25 object limit

Download here:

<http://erwin.com/products/data-modeler/community-edition>

ERwin Example

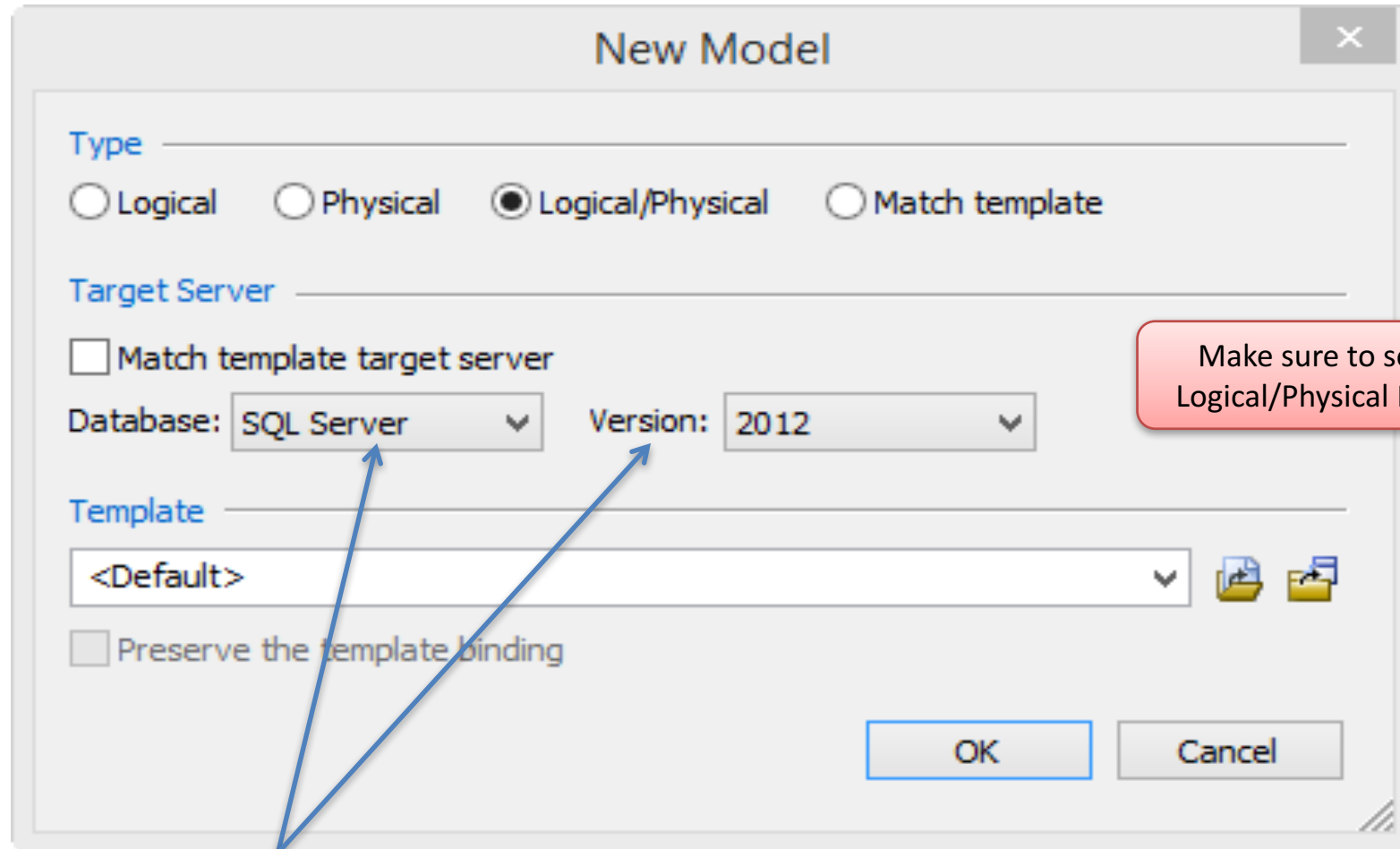


New Database Model



Open ERwin and select File->New...

The following window appears (New Model):



Select the Database Type and Version you shall use

Page Setup

CA ERwin DM - [Model2 : ER_Diagram_163 *]

File Edit View Diagram Model Actions Tools Window Help

Model Explorer

- Model_2
 - Annotations
 - Datatype Standards
 - Default Values
 - Domains
 - Entities
 - ER Diagrams
 - Model Sources
 - Naming Standards
 - Relationships
 - Subject Areas
 - Themes
 - Validation Rules

Page Setup 'Default Page Setup' Editor

General Margins

Page Setup

Page Size: A4

Width(inches): 11.69 Height(inches): 8.27

Orientation: Landscape

Zoom Level: 100

Miscellaneous

Print Border:

Print In Color:

Keep synchronized with Current Diagram

Load from Diagram Save to Diagram Close Cancel

Details...

Action Log

- Page Setup save to Current Diagram
- Set Page Style Sheet property Print Orientation

Advisories

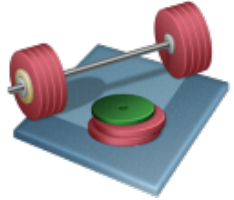
- Page Setup save to Current Diagram

Overview

For Help, press F1

Non-Mart Model SQL Server 2012 110%

Exercise

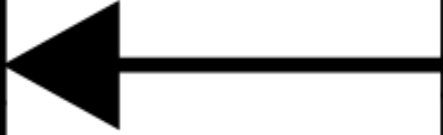


Lets try to create the following Tables, Columns, Primary Keys and Foreign Keys using ERwin:



BOOK	
PK	<u>BookId</u>
	BookTitle Summary

CHAPTER	
PK	<u>ChapterId</u>
FK1	BookId ChapterNumber ChapterTitle



Create Tables and Columns

CA ERwin DM - [Model2 : ER_Diagram_163 *]

File Edit View Diagram Model Actions Tools Window Help

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BOOK

BookId
BookTitle Summary

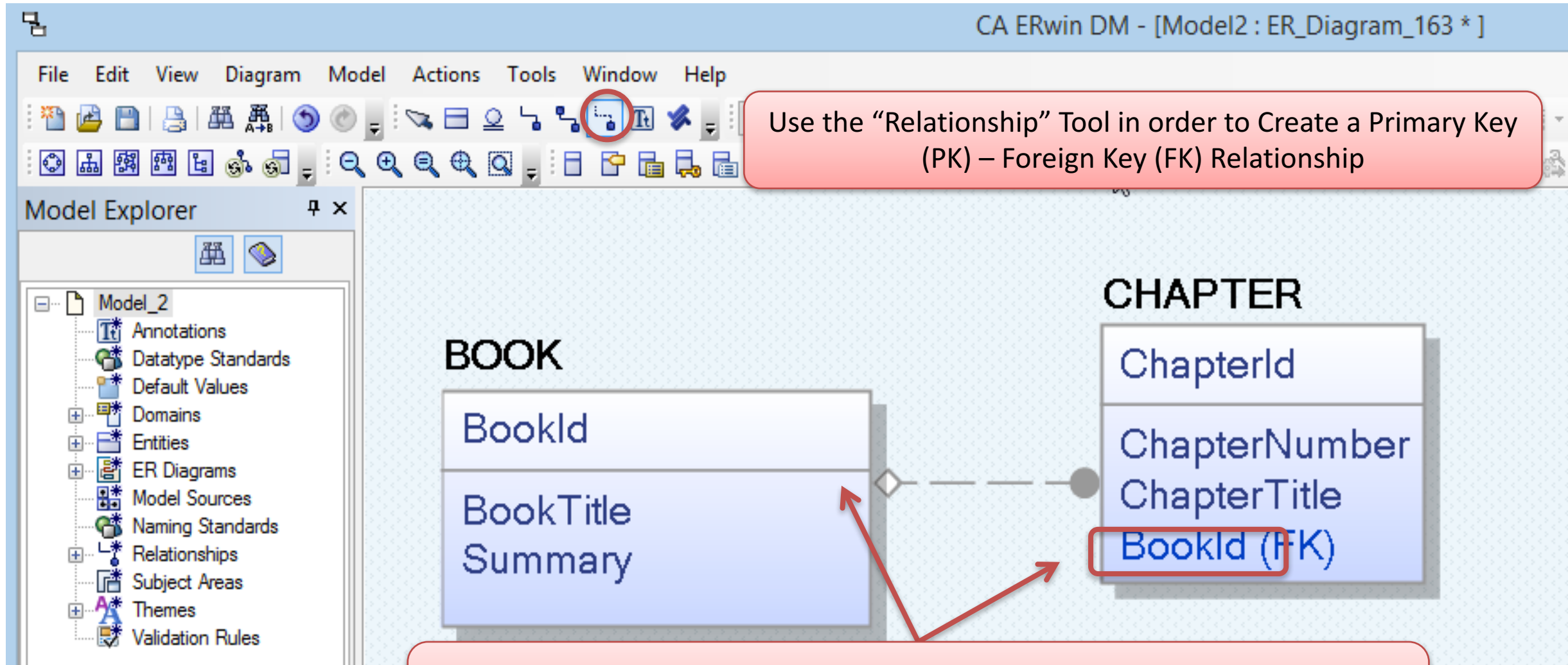
CHAPTER

ChapterId
ChapterNumber ChapterTitle

Use the "Entity" Tool in order to Create New Tables

Use <Tab> and <Enter> in order to give the Tables a Name and to create Columns. Use the <Arrows> to switch between the Columns inside a Table

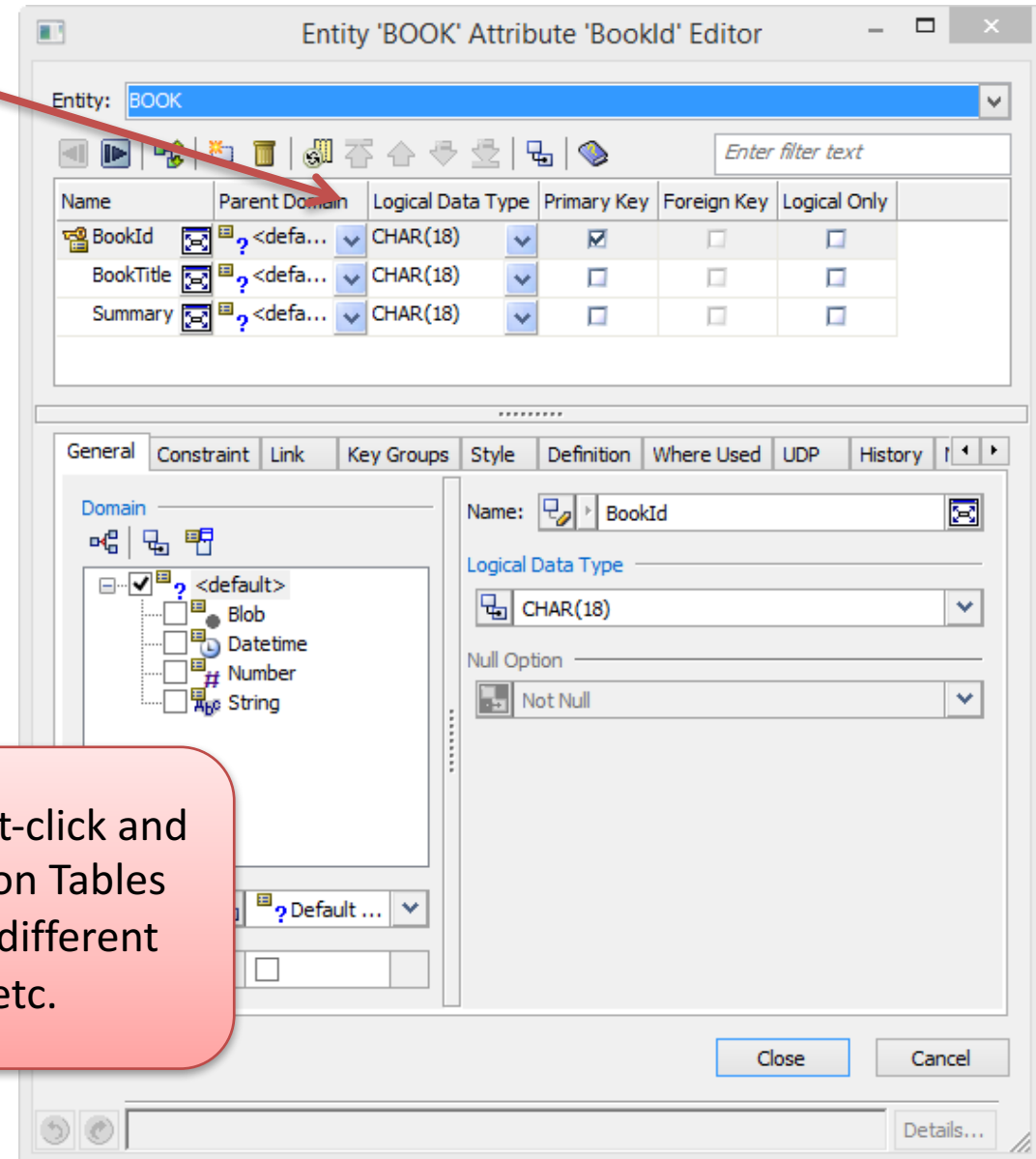
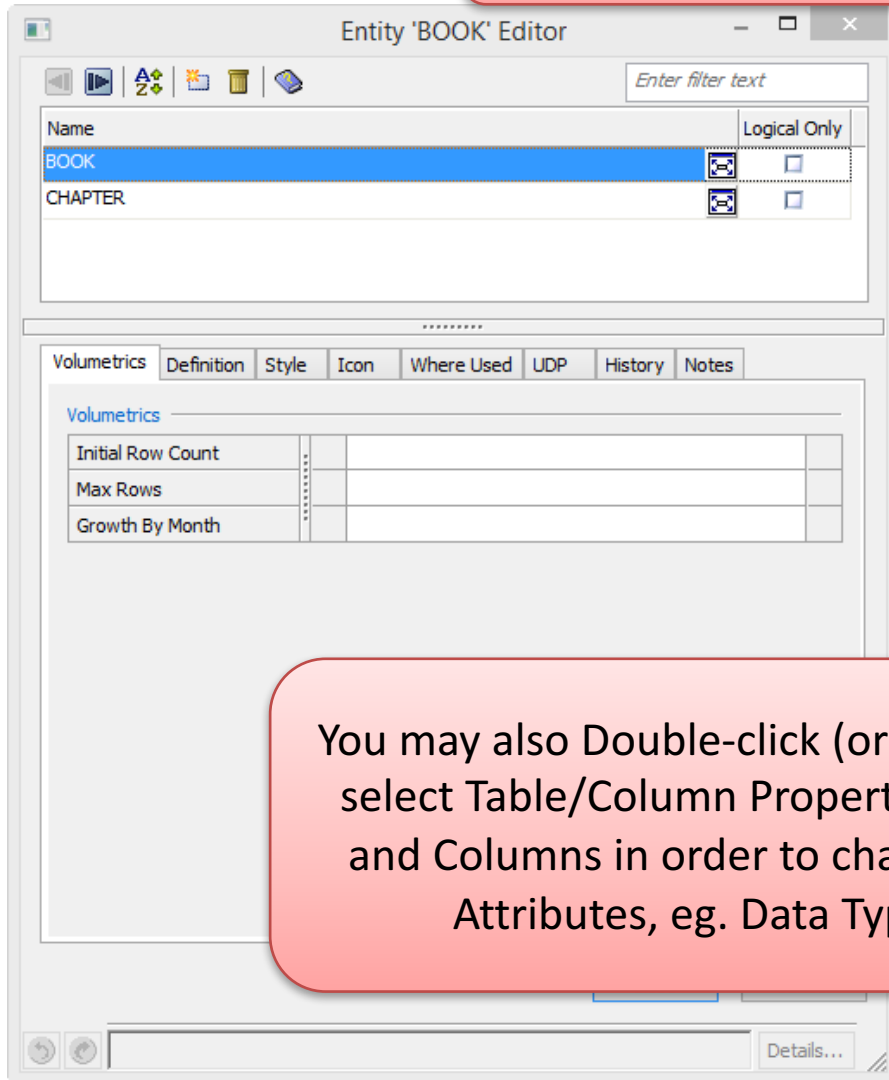
Create Primary Key (PK) – Foreign Key (FK) Relationships



Click first on the PK table and then on the FK table using the "Relationship" Tool. The Relationship Connection is then Created Automatically

Set Data Types

Make sure to set proper Data Types



You may also Double-click (or Right-click and select Table/Column Properties) on Tables and Columns in order to change different Attributes, eg. Data Types, etc.

Attributes

Entity 'BOOK' Attribute 'BookId' Editor

Entity: BOOK

Enter filter text

Name	Parent Domain	Logical Data Type	Primary Key	Foreign Key	L
BookId	<defa...>	INTEGER	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
BookTitle	<defa...>	VARCHAR(50)	<input type="checkbox"/>	<input type="checkbox"/>	
Summary	<defa...>	CHAR(1000)	<input type="checkbox"/>	<input type="checkbox"/>	

General Constraint Link Key Groups Style Definition Where Used UDP History Notes

Domain

- <default>
- Blob
- Datetime
- Number
- String

Name: BookId

Logical Data Type: INTEGER

Null Option: Not Null

Image: Default ...

Logical Only:

Close Cancel

Details...

Entity 'CHAPTER' Attribute 'ChapterId' Editor

Entity: CHAPTER

Enter filter text

Name	Parent Domain	Logical Data Type	Primary Key	Foreign Key	L
ChapterId	<defa...>	INTEGER	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
BookId	<defa...>	INTEGER	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
ChapterNumber	<defa...>	INTEGER	<input type="checkbox"/>	<input type="checkbox"/>	
ChapterTitle	<defa...>	VARCHAR(100)	<input type="checkbox"/>	<input type="checkbox"/>	

General Constraint Link Key Groups Style Definition Where Used UDP History Notes

Domain

- <default>
- Blob
- Datetime
- Number
- String

Name: ChapterId

Logical Data Type: INTEGER

Null Option: Not Null

Image: Default ...

Logical Only:

Close Cancel

Details...

DEMO

More Tables...

We can extend our Database Design/Modell with, e.g.:

- AUTHOR
- PUBLISHER
- CATEGORY (e.g., Programming, Control Systems, ..)

...

(You can try this on your own)



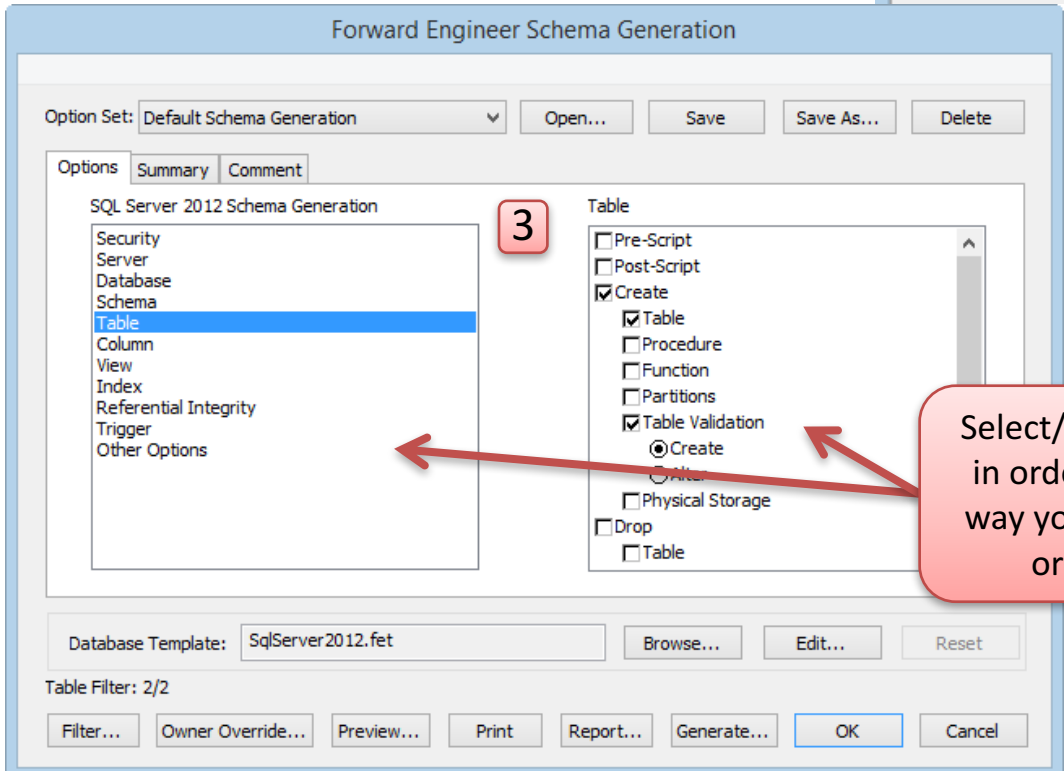
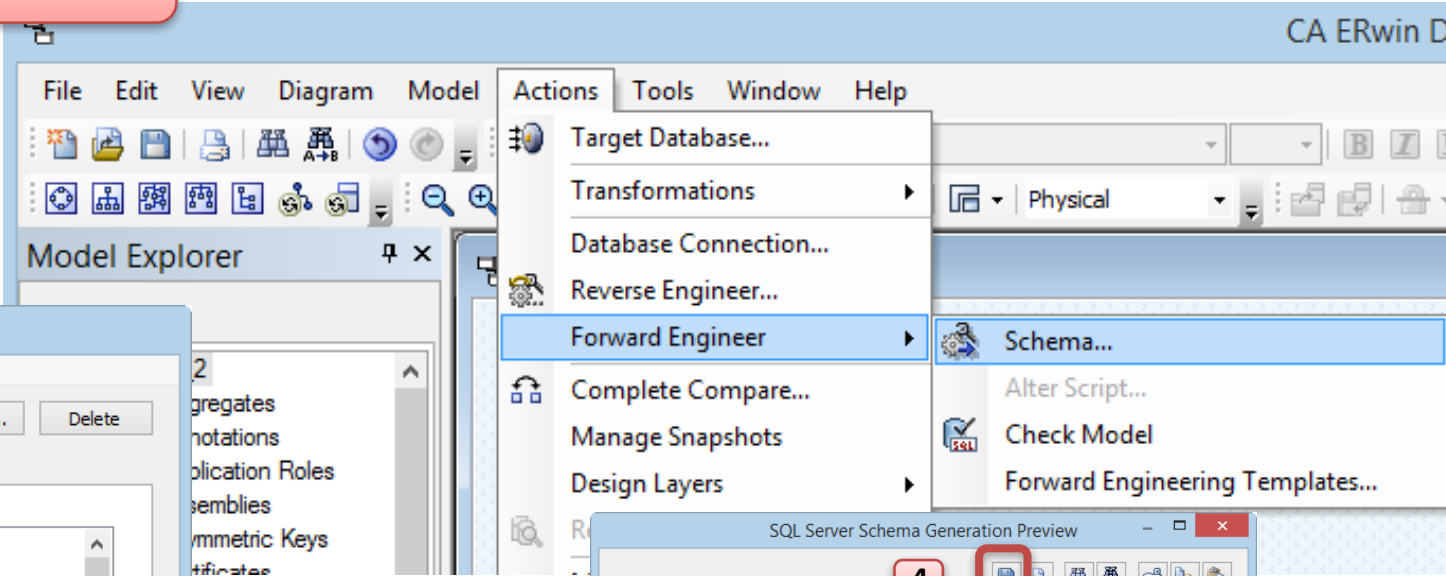
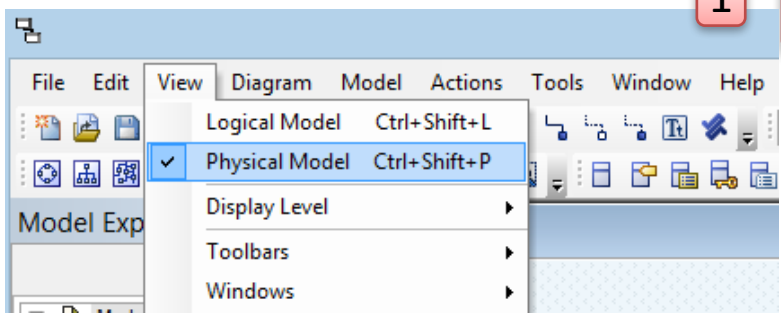
Create SQL Scripts with ERwin

Hans-Petter Halvorsen, M.Sc.

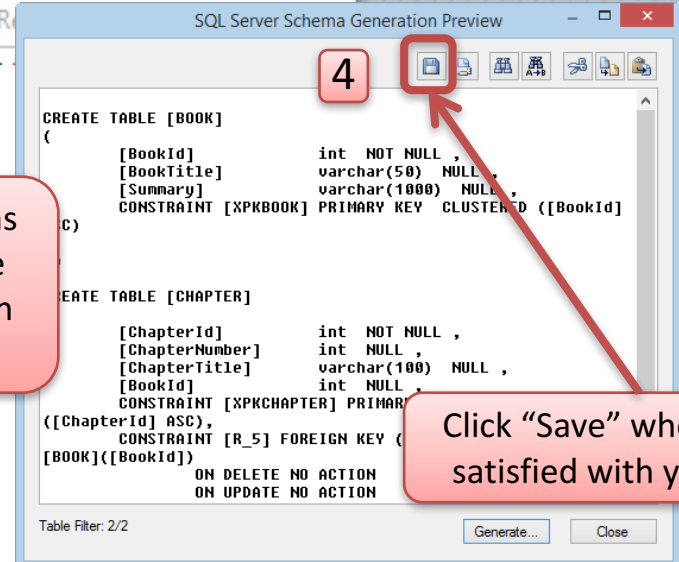
Create SQL Script

1 Make sure you are using the Physical Model

2 Select "Forward Engineering" and "Schema..."



Select/Deselect different Options in order to make your script the way you want. Click "Preview" in order to see the results.



Click "Save" when you are satisfied with your Script

DEMO

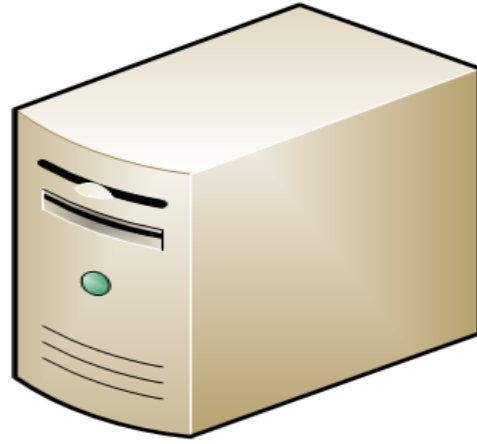


SQL Server

Execute the SQL Script within SQL Server

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Microsoft SQL Server

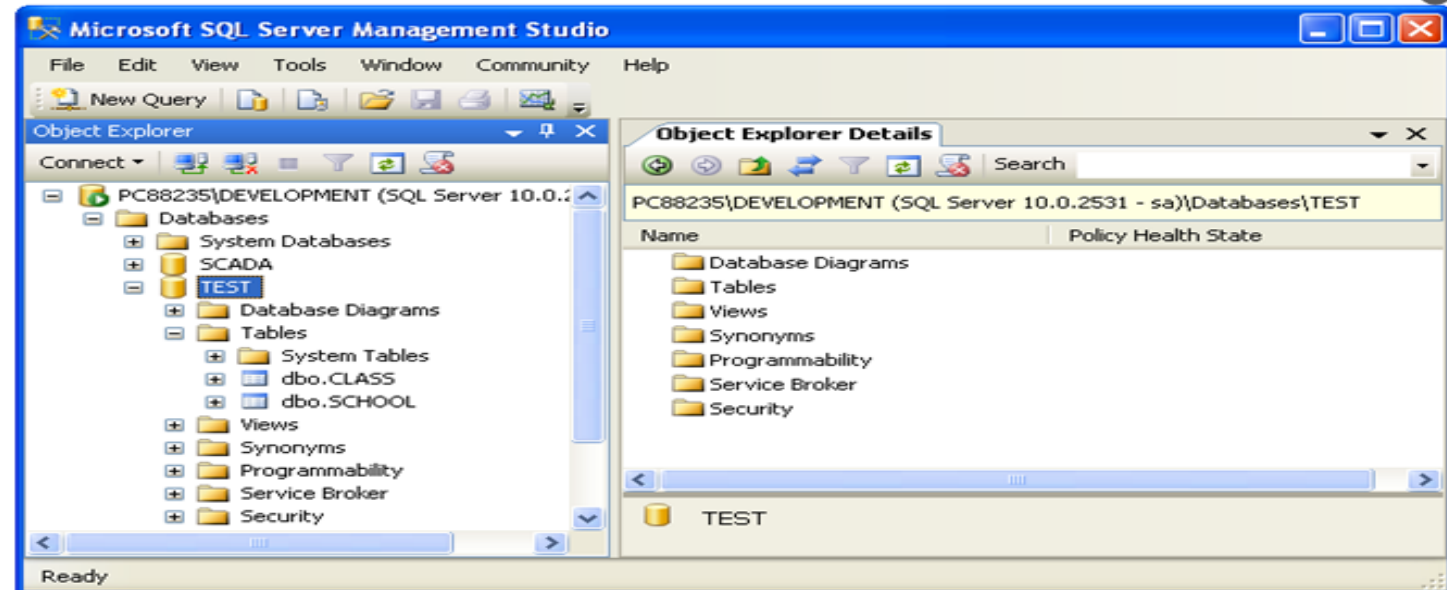


Database Engine



A Service running on the computer in the background

Management Studio



A Graphical User Interface to the database used for configuration and management of the database

Microsoft SQL Server Management Studio

The screenshot shows the Microsoft SQL Server Management Studio interface. On the left, the Object Explorer tree is expanded to show the 'SCHOOL' database and its tables. A red circle highlights the 'SCHOOL' database folder, labeled '1 Your Database'. Another red circle highlights the 'dbo.SCHOOL' table, labeled '2 Your Tables'. The top menu bar has 'New Query' highlighted with a red circle and labeled '3 Your SQL Server'. The central query editor contains the text 'select * from SCHOOL', with a red arrow pointing to it from the label '4 Write your Query here'. Below the query editor, the 'Results' tab shows a table with 4 rows and 8 columns. A red arrow points from the label '5 The Results from your Query' to the results table. The status bar at the bottom indicates 'Query executed successfully.' and '4 rows'.

1 Your Database

2 Your Tables

3 Your SQL Server

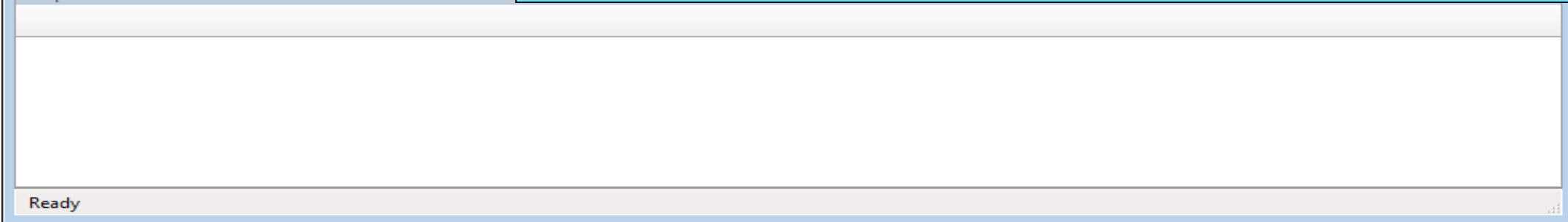
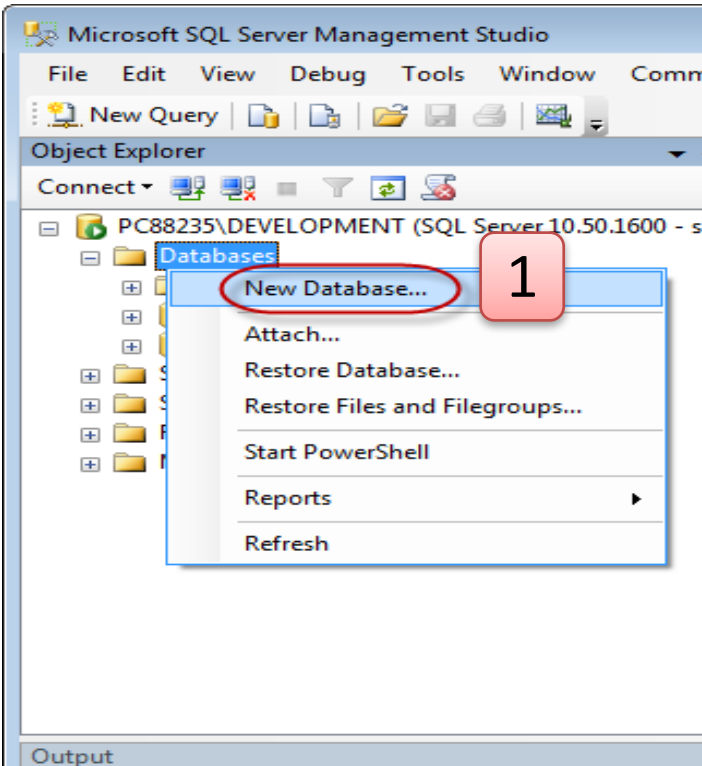
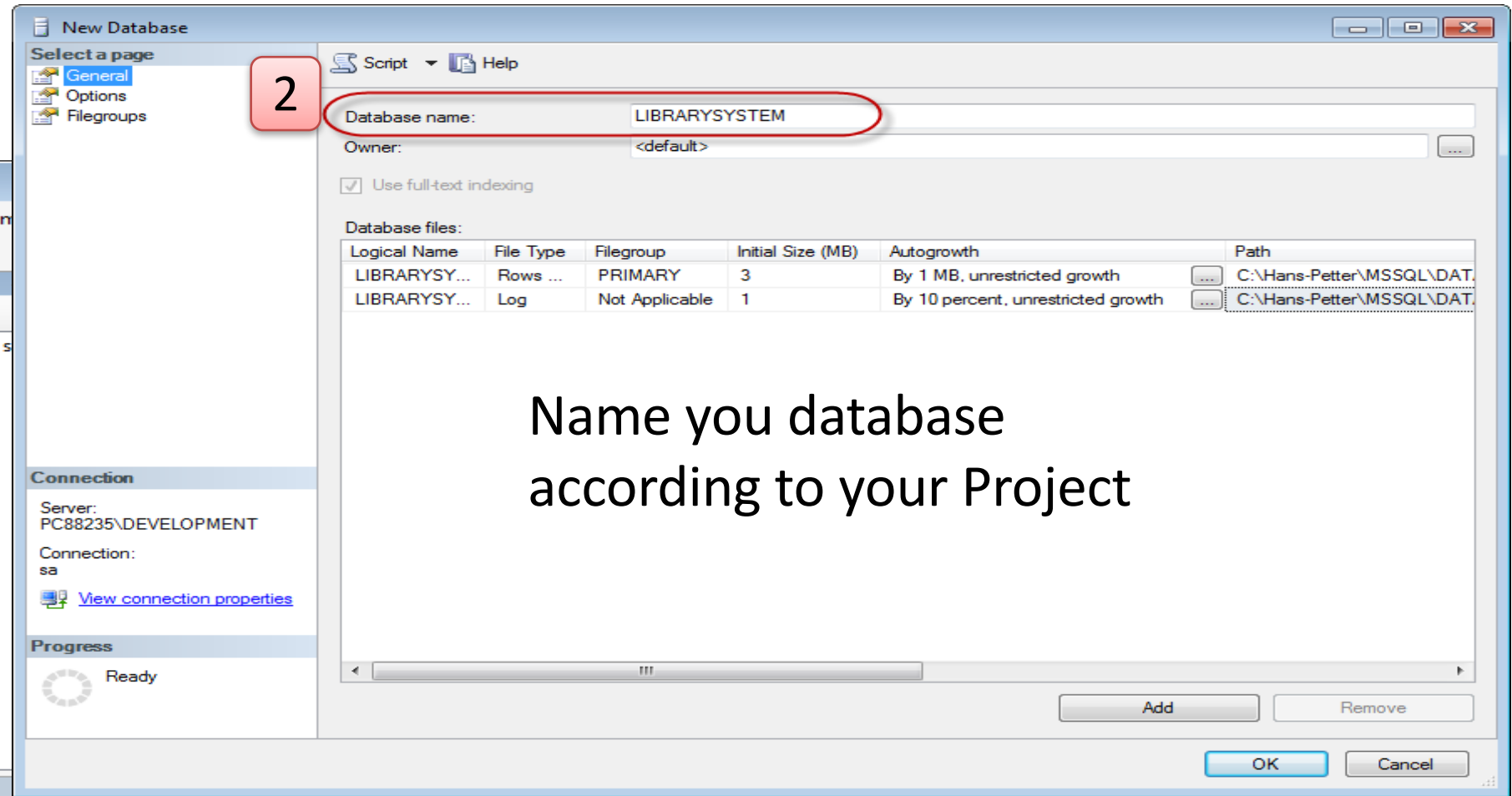
4 Write your Query here

5 The Results from your Query

	SchoolId	SchoolName	Description	Address	Phone	PostCode	PostAddress
1	1	TUC	The best school	Telemark	NULL	NULL	NULL
2	2	MIT	OK School	USA	NULL	NULL	NULL
3	3	NTNU	The second best school	Trondheim	NULL	NULL	NULL
4	4	University of Oslo	The third best school	Oslo	NULL	NULL	NULL

Query executed successfully. | PC88235\DEVELOPMENT (10.50 ... | sa (52) | SCHOOL | 00:00:00 | 4 rows

Microsoft SQL Server – Create a New Database



Object Explorer

1

Open SQL Server and create a "New Database..."

SQL Server

3 You are Finished. Start inserting some test data, etc.

2 Open the SQL Script in order to insert the Tables in SQL Server

BOOK_STORE

- Database Diagrams
- Tables
 - System Tables
 - FileTables
 - dbo.BOOK
 - Columns
 - BookId (PK, int, not null)
 - BookTitle (varchar(50), null)
 - Summary (varchar(1000), null)
 - Keys
 - Constraints
 - Triggers
 - Indexes
 - Statistics
 - dbo.CHAPTER
 - Columns
 - ChapterId (PK, int, not null)
 - ChapterNumber (int, null)
 - ChapterTitle (varchar(100), null)
 - BookId (FK, int, null)
 - Keys
 - Constraints
 - Triggers
 - Indexes
 - Statistics

Object Explorer

- MACWIN8\SQLEXPRESS (SQL Server 12)
 - Databases
 - System Databases
 - BOOK_STORE
 - Database Diagrams
 - Tables
 - System Tables
 - FileTables
 - Views
 - Synonyms
 - Programmability
 - Service Broker
 - Storage
 - Security
 - Security
 - Logins
 - Server Roles
 - Credentials
 - Server Objects

MyDatabaseScript.sql - MACWIN8\SQLEXPRESS.BOOK_STORE (sa (54)) - Microsoft

BOOK_STORE Execute Debug

MyDatabaseScript.s...OK_STORE (sa (54))

```
CREATE TABLE [BOOK]
(
    [BookId]          int NOT NULL ,
    [BookTitle]       varchar(50) NULL ,
    [Summary]         varchar(1000) NULL ,
    CONSTRAINT [XPKBOOK] PRIMARY KEY CLUSTERED ([BookId] ASC)
)
GO

CREATE TABLE [CHAPTER]
(
    [ChapterId]       int NOT NULL ,
    [ChapterNumber]   int NULL ,
    [ChapterTitle]    varchar(100) NULL ,
    [BookId]          int NULL ,
    CONSTRAINT [XPKCHAPTER] PRIMARY KEY CLUSTERED ([ChapterId] ASC),
    CONSTRAINT [R_5] FOREIGN KEY ([BookId]) REFERENCES [BOOK]([BookId])
        ON DELETE NO ACTION
        ON UPDATE NO ACTION
)
GO
```

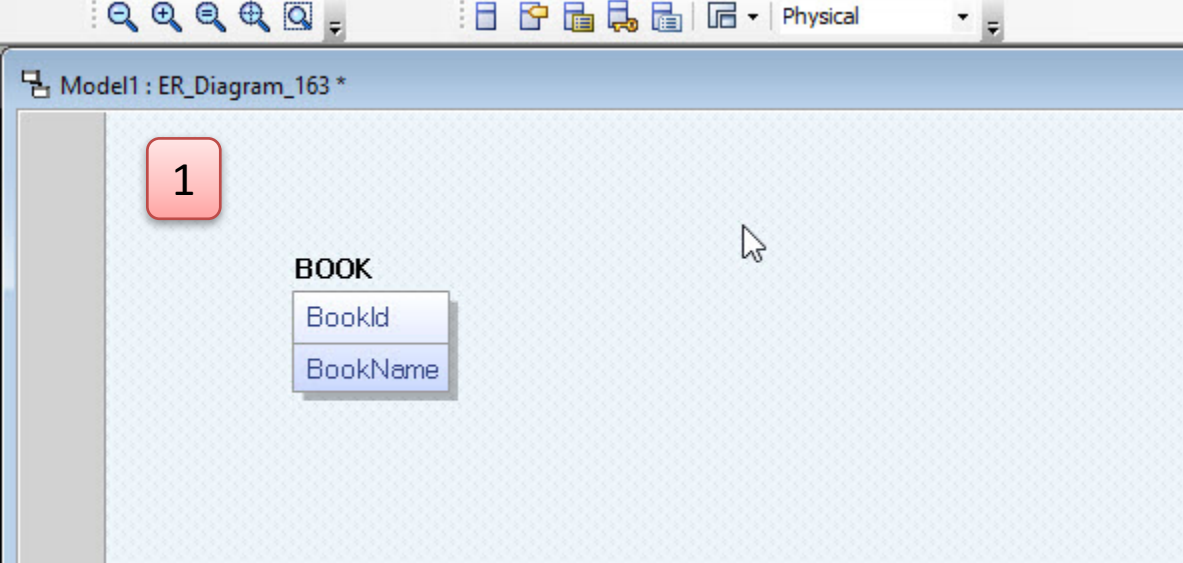
DEMO



Identity (1,1)

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Setting the Identity(1,1) Property in ERwin



SQL Server Table 'BOOK' Column 'BookId' Editor

Table: BOOK

Physical Name	Domain Parent	Physical Data Type	Primary Key	Physical Only	Foreign Key
BookId	?.default_	integer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BookName	?.default_	varchar(50)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

General | SQL Server | Constraint | Link | Indexes | Style | Comment | Where Used | UDP | History | Notes | Extended Notes

Datatype

Physical Datatype	integer
Null Option	Not Null

Volumetrics

Average Width	
Percent Null	

Options

Row GUID	
Sparse	<input type="checkbox"/>
Is Sparse Column Set	<input type="checkbox"/>

Identity

Generated Identity	<input checked="" type="checkbox"/>
Starting Value	1
Increment By	1
Is Not For Replication	<input type="checkbox"/>

Collation

XML

XML Schema Collection	
XML Document Type	

Populate All Rows With Default Value

Expression

Enter SQL text here...

Persisted

Close Cancel

SQL Server Schema Generation Preview

```
CREATE TABLE BOOK
(
    BookId          integer NOT NULL IDENTITY ( 1,1 ) ,
    BookName        varchar(50) NULL ,
    CONSTRAINT XPKBOOK PRIMARY KEY CLUSTERED (BookId ASC)
)
go
```

Table Filter: 1/1

Generate... Close

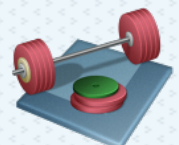
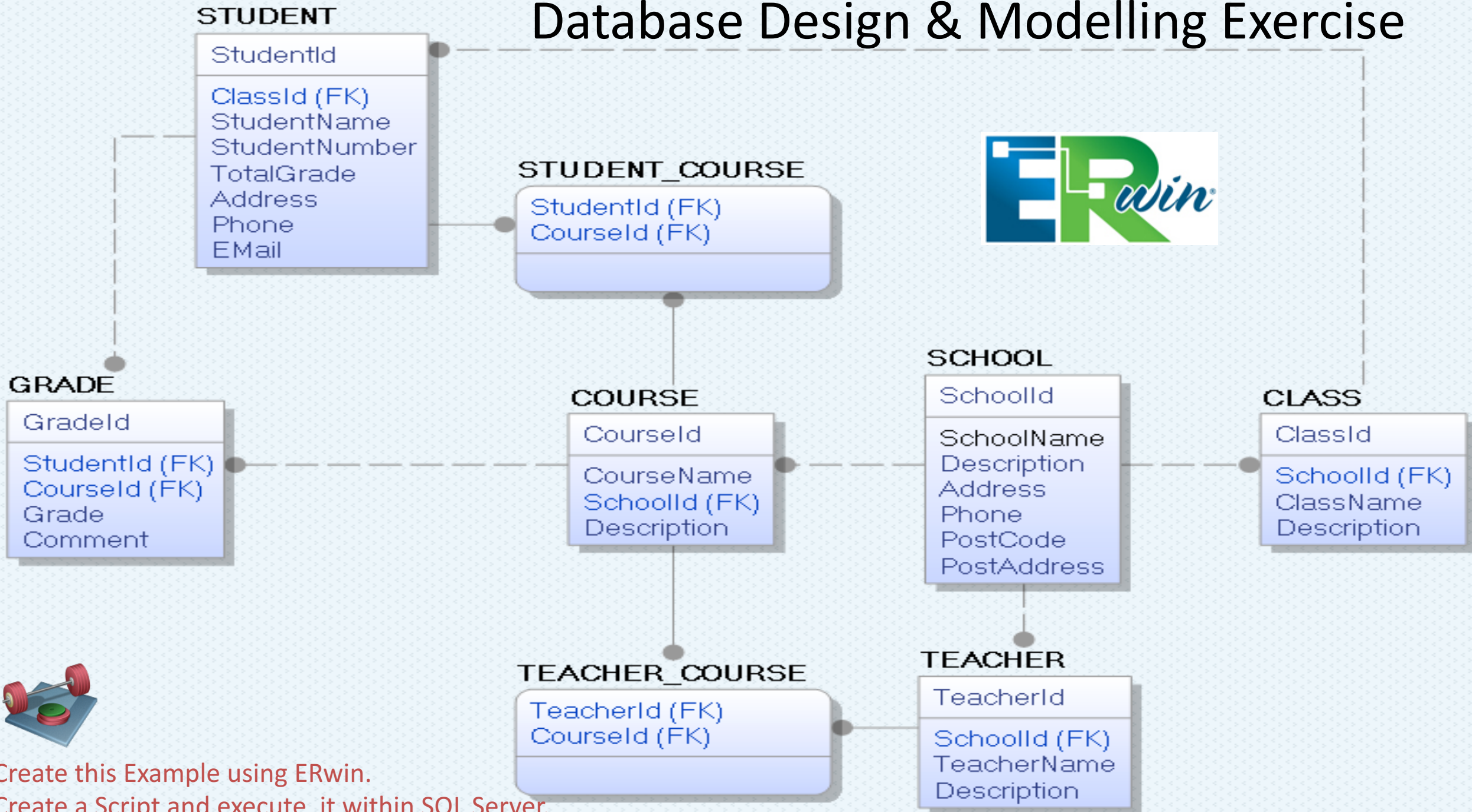
DEMO



Exercise

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Database Design & Modelling Exercise



Create this Example using ERwin.
Create a Script and execute it within SQL Server.

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