

# Design Your Databases Straight to the Cloud

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Nordic ACE Tour 2017

# Introduction, Heli

- \* Graduated from University of Helsinki (Master of Science, computer science), currently a doctoral student, researcher and lecturer (databases, Big Data, Multi-model Databases, methods and tools for utilizing semi-structured data for decision making) at University of Helsinki
- \* Worked with Oracle products since 1993, worked for IT since 1990
- \* Data and Database!
- \* CEO for Miracle Finland Oy
- \* Oracle ACE Director
- \* Ambassador/EOUC (EMEA Oracle Users Group Community)
- \* Public speaker and an author
- \* Winner of Devvy for Database Design Category, 2015
- \* Author of the book Oracle SQL Developer Data Modeler for Database Design Mastery (Oracle Press, 2015), co-author for Real World SQL and PL/SQL: Advice from the Experts (Oracle Press, 2016)



ORACLE

# Oracle SQL Developer Data Modeler for Database Design Mastery

Design, Deploy, and Maintain World-Class Databases  
on Any Platform

**Heli Helskyaho**

Oracle ACE Director

Forewords by C.J. Date and Tom Kyte



Oracle  
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# Real World SQL & PL/SQL

Advice from the Experts

Arup Nanda

Brendan Tierney

Heli Helskyaho

Martin Widlake

Alex Nuijten



Oracle  
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# Introduction, Heli

- \* Been an Oracle Designer user since 1996 and Data Modeler user since 2010
- \* Been solving performance problems since 1993
  - \* Absolutely convinced that good database *design* and *documentation* will *reduce* this work.
  - \* Absolutely convinced that it is *easier* to solve problems on database that has been *documented*

# 500+ Technical Experts Helping Peers Globally



## 3 Membership Tiers

- Oracle ACE Director
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- Oracle ACE Associate

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# Why to design?

- \* "Data is the most valuable property in our company"
- \* "Why do we need to design the database? We already design the application!"

# Why is designing the application not enough?

- \* Point of view (saving and retrieving data vs. UI)
- \* First increment vs. 20 years from now
- \* "the whole picture" vs. increments
- \* Different goals/targets:
  - \* Code tables vs. Code files (how about the data integrity?)
  - \* How about analysis, reports, ... everything else but the UI that the data is used for
- \* Same terminology, different meaning -> misunderstandings
- \* ...

# Why to model the data?

- \* To facilitate communication about the requirements
- \* To find the questions that should be asked
- \* To understand the requirements

# How is Cloud different?

- \* It has a bigger chance to have latency (usually a hybrid solution)
  - \* Good reason to add as much business logic to the database as possible!
  - \* But you would do that anyway 😊
- \* Everything you have learned about database designing still applies....

# What is database designing?

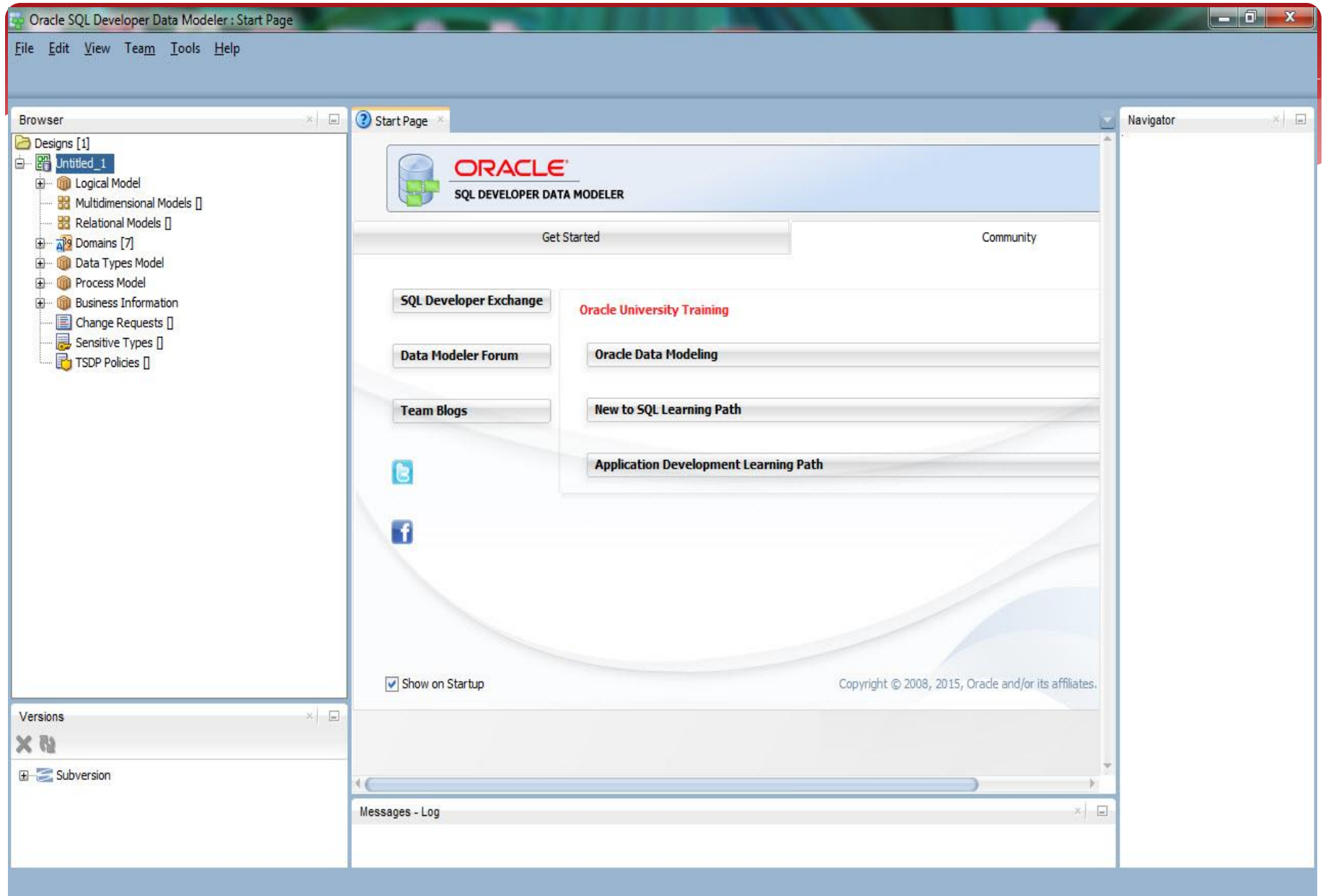
- \* 4 (5) phases, over and over again
  - \* Requirement analysis (DM: logical)
  - \* Conceptual design (DM: logical)
  - \* Logical design (DM: relational)
  - \* Physical design (DM: physical)
  - \* (Transaction design) (DM: process)

# It would be crazy...

- \* ...to design databases without a tool!

# Oracle SQL Developer Data Modeler

- \* To be efficient in designing you need a tool: my recommendation is Data Modeler
  - \* Free of charge
  - \* Support for many different databases (Oracle, MS SQL Server, DB2,...)
  - \* Support for both documenting the existing databases and designing a new one (and maintaining that)
  - \* Support for reporting, naming standards, glossaries, design rules, ...
  - \* Support for version control and multiuser environment
  - \* Support for everything you need for database design plus more



# Designing the database

1. **Requirement analysis:** finding and analysing the requirements the future end users have

**Result:** specification of user requirements

- **data** requirements
- **functional** requirements

Also requirements for security, performance, ...

# Designing the database

2. **Conceptual design.** "Interpretation" of all the requirements to a formal presentation (conceptual model).

**Result:** conceptual schema, also textual documentation is possible/recommended (to make sure all the knowledge is documented)

This is a tool for communication with end users.

# Requirement analysis and Conceptual design

- \* Collecting requirements and analyzing them
- \* Fact-finding: interviews, questionnaires, existing documentation,... (recordings)
- \* Requirements specifications
  - \* data requirements
  - \* functional requirements (performance, security, backup/recovery,..)
- \* Completely neutral to any technology

# Requirement analysis and Conceptual design

- \* Why entity-relationship model (ER)
  - \* Defining the tables directly based on requirements can be too difficult and lead to a wrong db schema.
  - \* Based on a good ER it is easy to generate the relational model (which is at least on 3NF)
- \* Data Flow Diagrams (DFD)

# Conceptual design

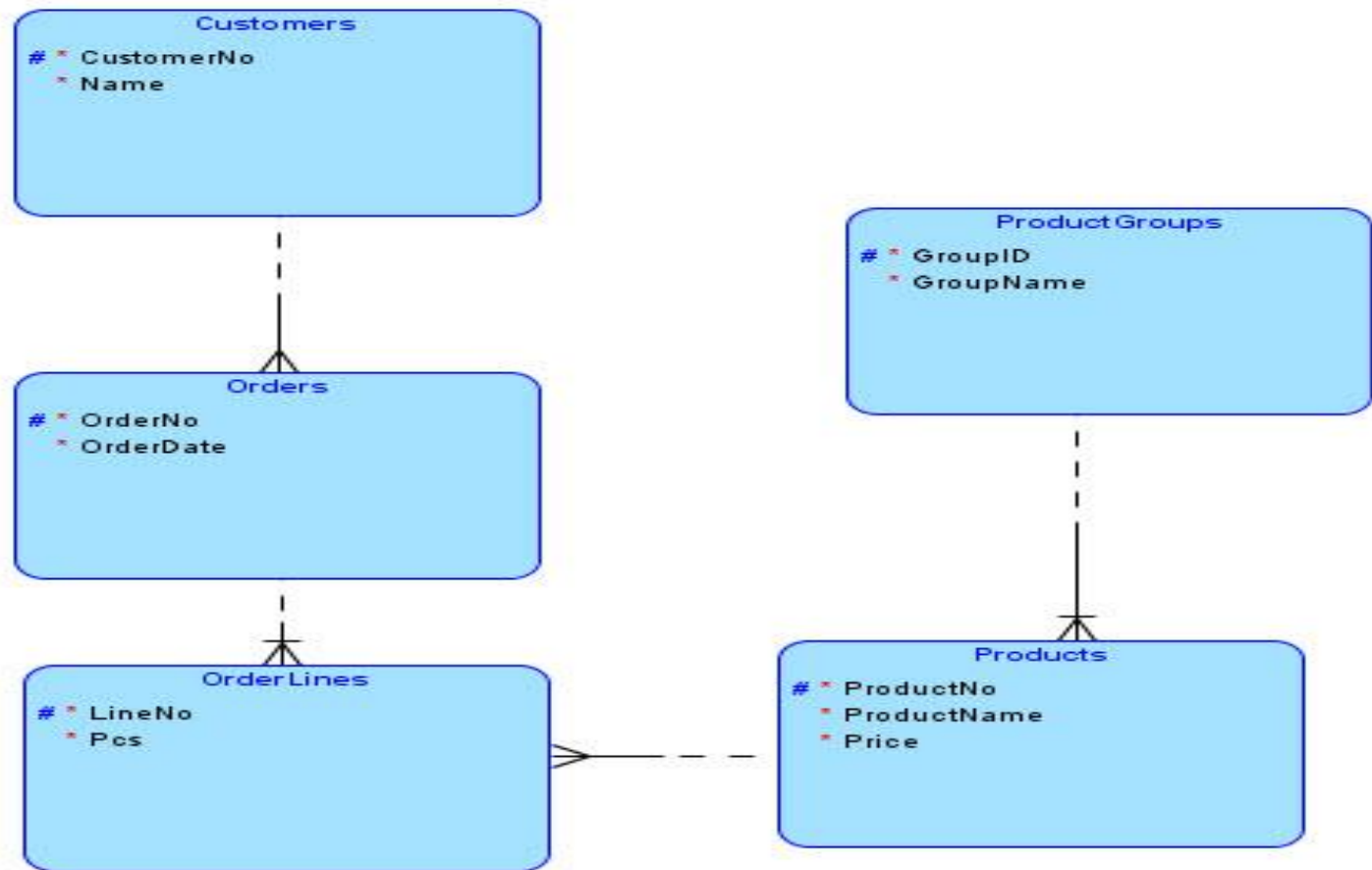
- \* Use right **terminology** and clear names, much easier to communicate with the end users (one of the reasons to model!)
- \* Try to find and understand the **main** concepts and their relationships (these are the most difficult to change during the iterations)

# Conceptual design

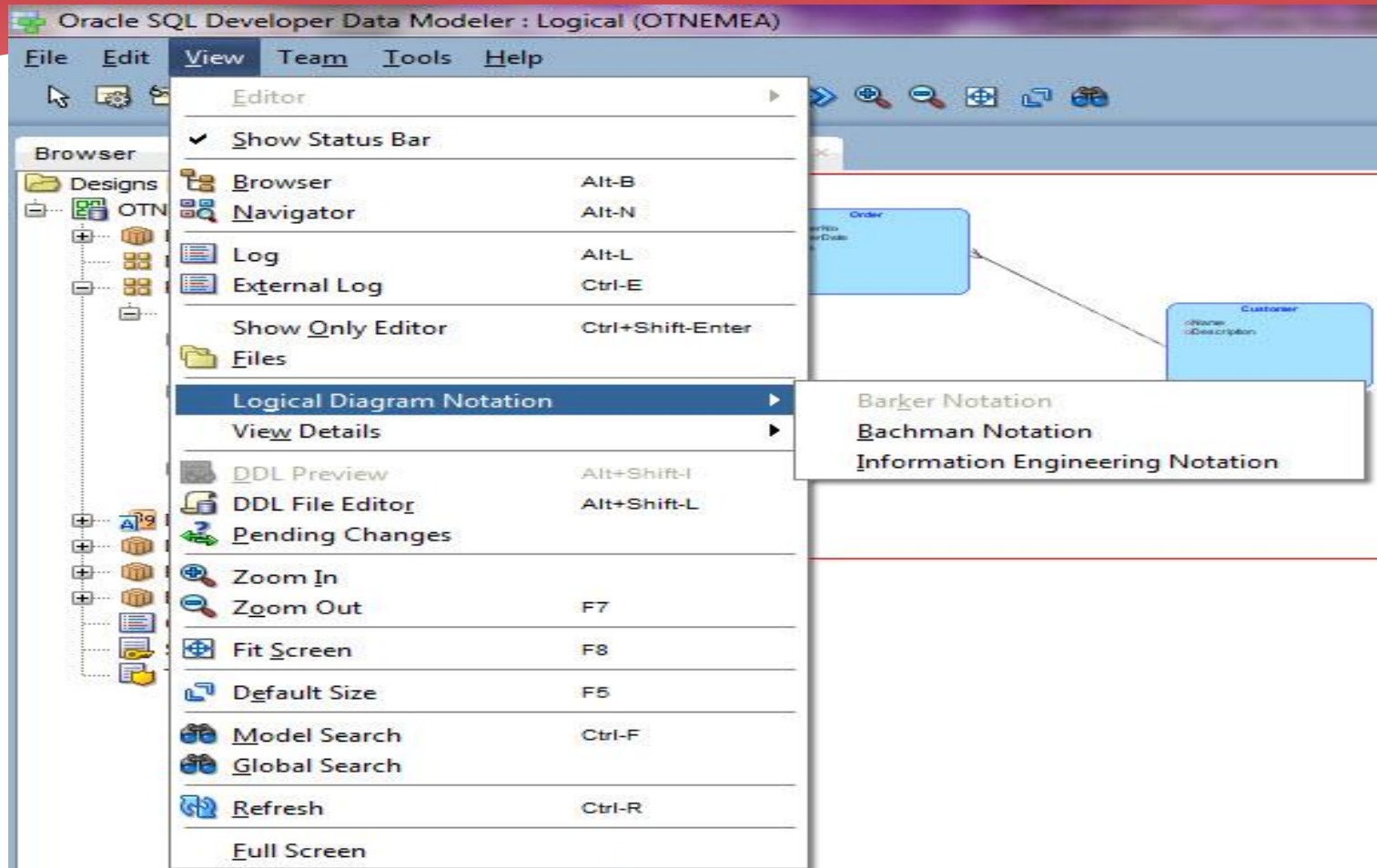
- \* Modeling is **difficult** because
  - \* Spoken/written language is not exact
  - \* Usually all the "important" things are those that "everybody knows" so they are not told.
  - \* At this stage we do not know one important thing: how the data will be **retrieved**? That will be on iteration 9...
- \* Modeling is **mandatory** because when modeling the database designer realizes **what must be asked!**

# Logical model

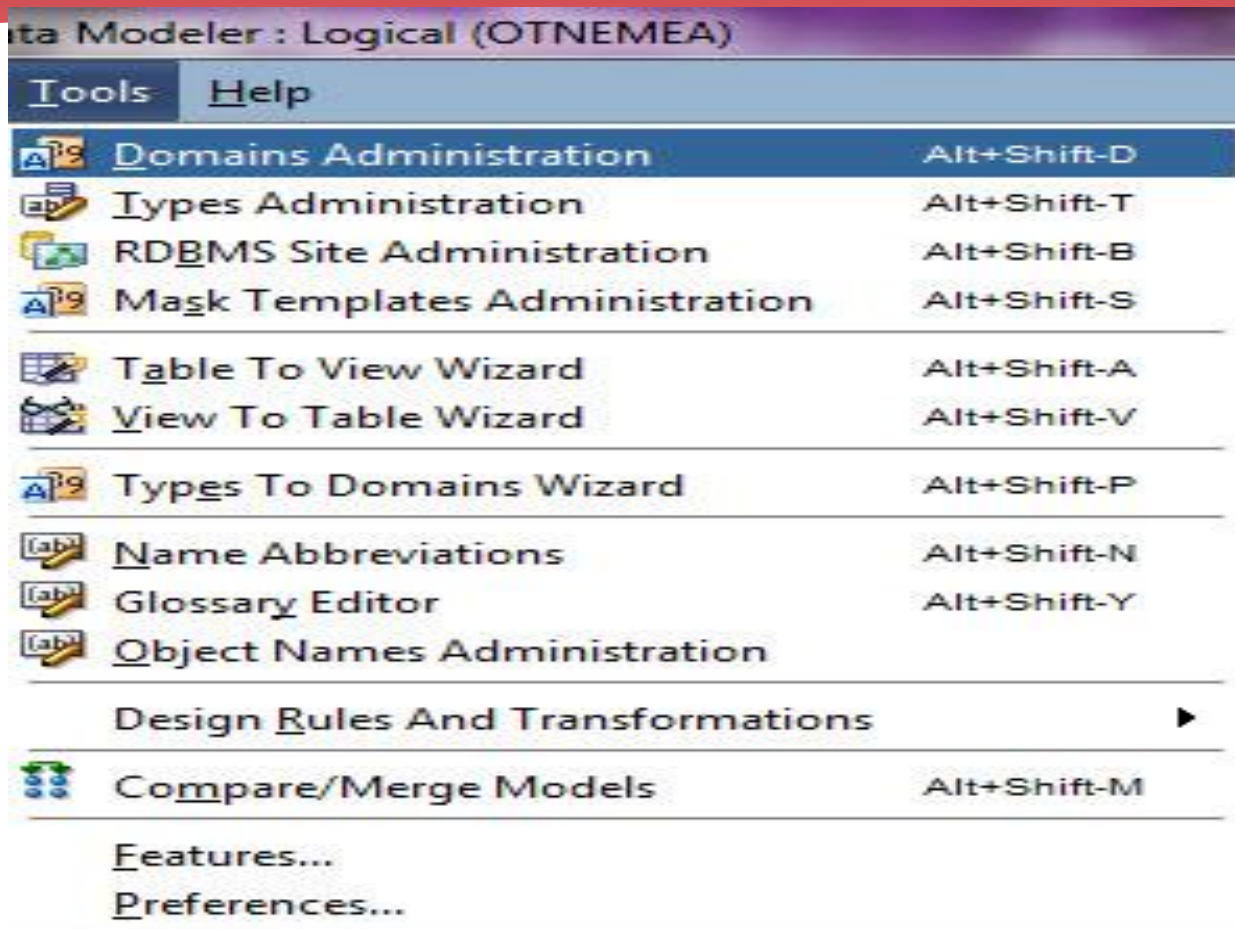
# Demo (Logical)



# Notation



# Domains administration




**Domains Administration**

Choose domain

Domains File

**Select**

Available Domains

 Unknown

**Domain Properties**

Name	<input type="text"/>	Synonym	<input type="text"/>
Logical type	<input type="text" value="unknown"/>	Comments	<input type="text"/>
Size	<input type="text"/>	Unit of Measure	<input type="text"/>
Units	<input type="text"/>	Default Value	<input type="text"/>
Precision	<input type="text"/>	<b>Check Constraint</b>	
Scale	<input type="text"/>	<b>Ranges</b>	
Domains File	<input type="text"/>	<b>Value List</b>	

**Add** **Remove** **Modify**

**Save** **Close** **Help**

Domains Administration

Choose domain

Domains File

Select

Available Domains

Money

Unknown

Add

Remove

Modify

Domain Properties

Name

Money

Synonym

Logical type

NUMERIC

Comments

Size

15

Unit of Measure

Units

CHAR

Default Value

Precision

15

Check Constraint

Scale

2

Ranges

Domains File

defaultdomains

Value List

Save

Close

Help

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Entity Properties - OrderLine

General

Attributes

Unique Identifiers

Relationships

Volume Properties

Engineer To

Comments

Comments in RDBMS

Overlapping Attributes

Notes

Impact Analysis

Measurements

Change Requests

Responsible Parties

Documents

Dynamic Properties

Summary

Attributes

Details

Overview

Attributes:

✎

+

✖

↑

↓

📄

📋

Name	Data type
1 OrderlineNo	NUMERIC (10)
2 Pcs	NUMERIC
3 Price	Money
4 OrderNo	NUMERIC
5 ProductNo	NUMERIC (10)

Attribute Properties

Name:

Price

Datatype:

Domain

Logical

Distinct

Structured

Collection

Type:

Money

Preferred

Primary UID

Relation UID

Mandatory

Comments

Comments in RDBMS

Notes

OK

Apply

Naming Rules

Cancel

Help

**Column Properties - Price** [X]

**General**

- Default and Constraint
- Auto Increment
- Security
- UI Defaults
- Permitted Subtypes
- Comments
- Comments in RDBMS
- Notes
- Impact Analysis
- Measurements
- Change Requests
- Responsible Parties
- Documents
- Dynamic Properties
- Summary

**General**

Name:

Table:

Abbreviation:

Engineer: ☒

Allow Nulls: ☒

Datatype:  ...

Type:

Computed: ☐

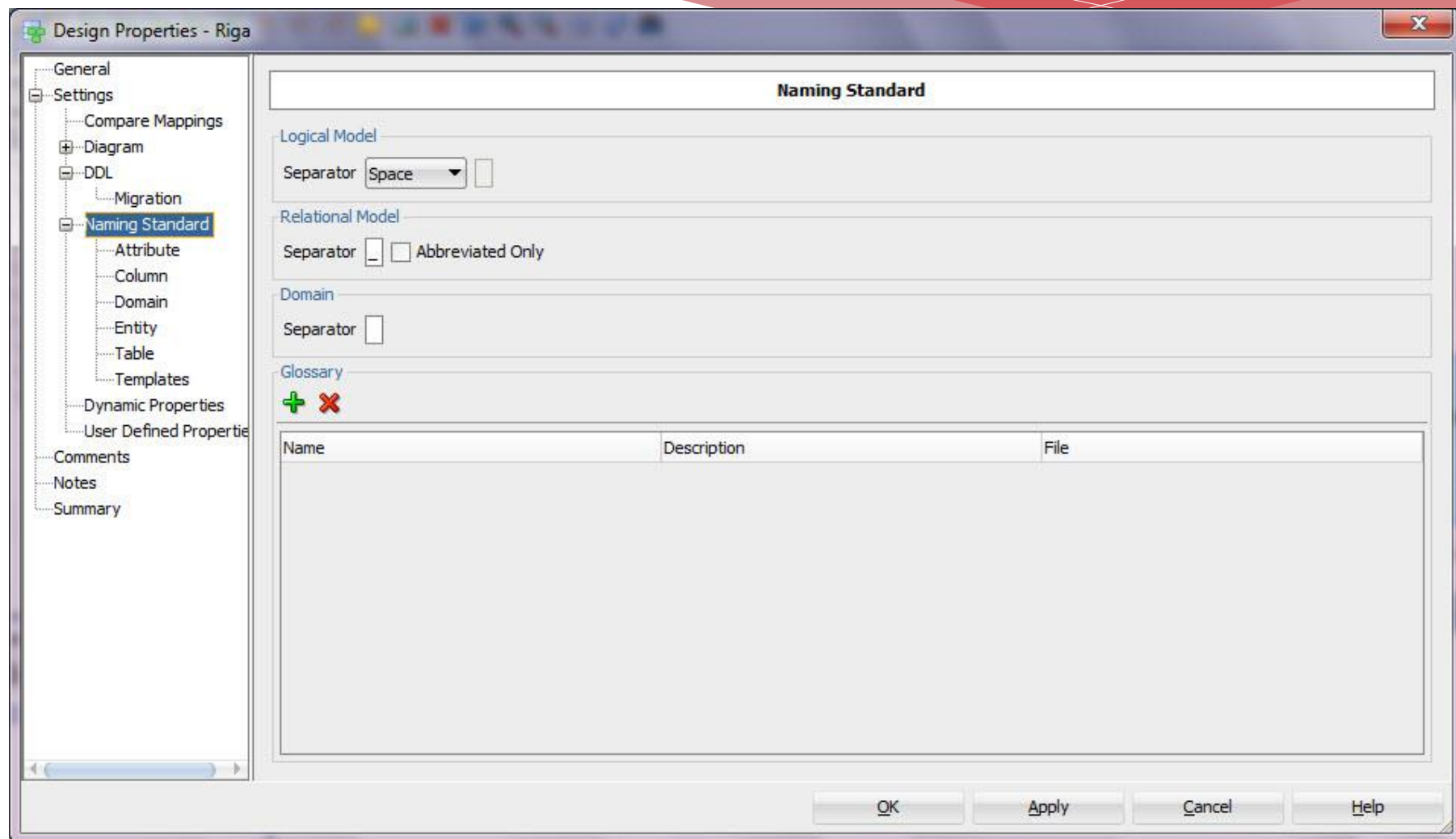
Column Expression:

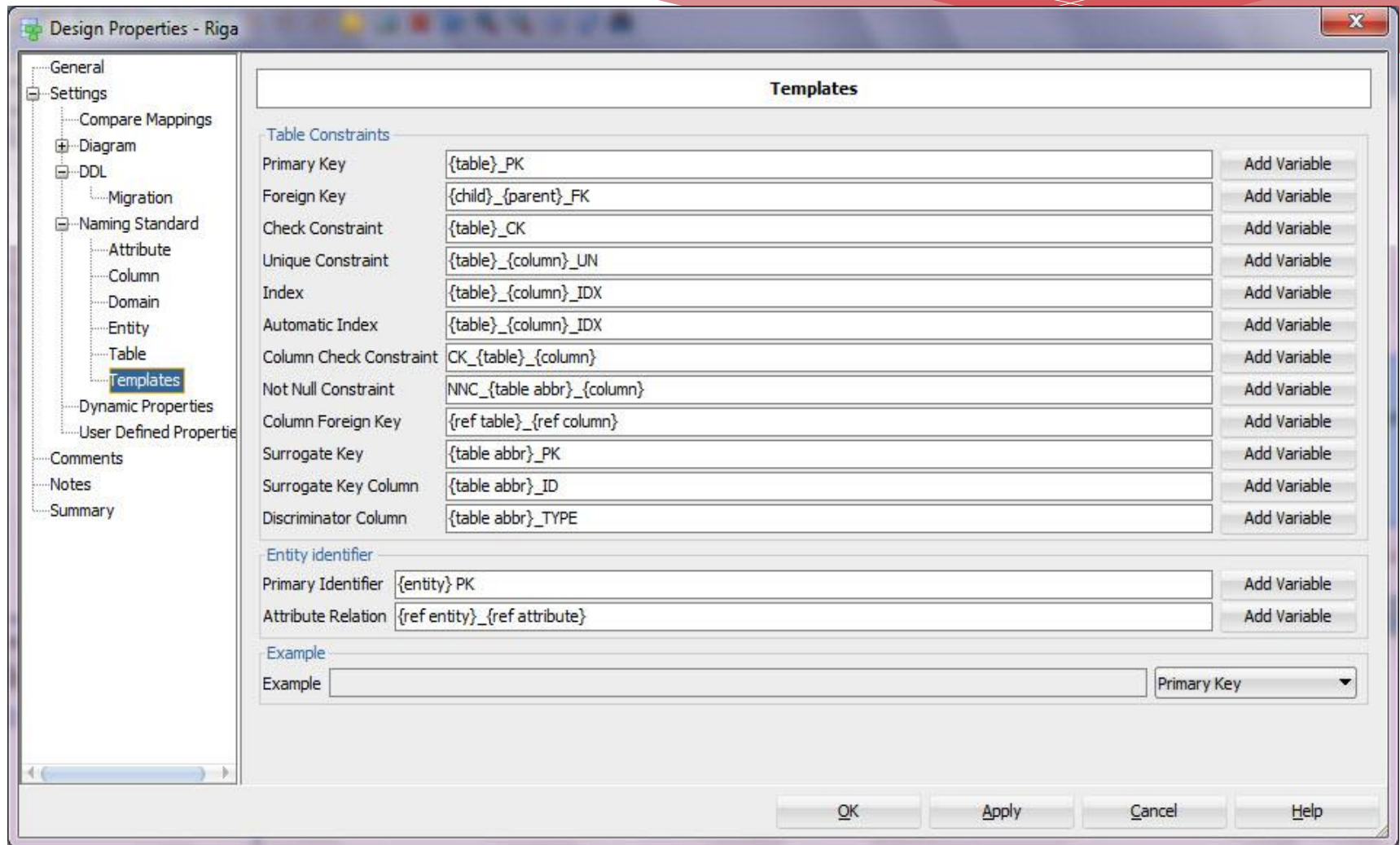
Auto Increment ☐ Identity Column ☐

Scope:

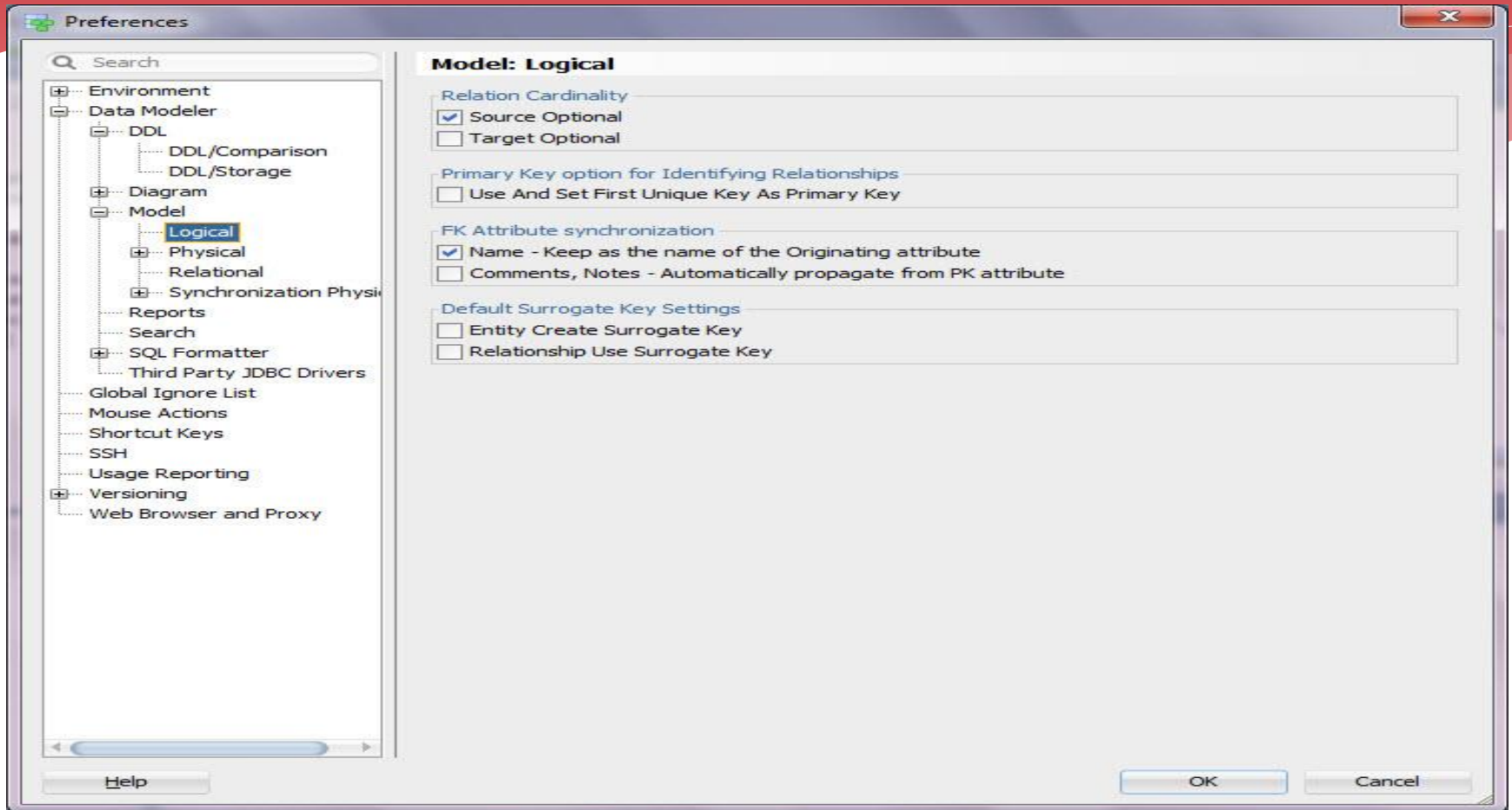
Type Substitution:

# Design Properties





# Preferences

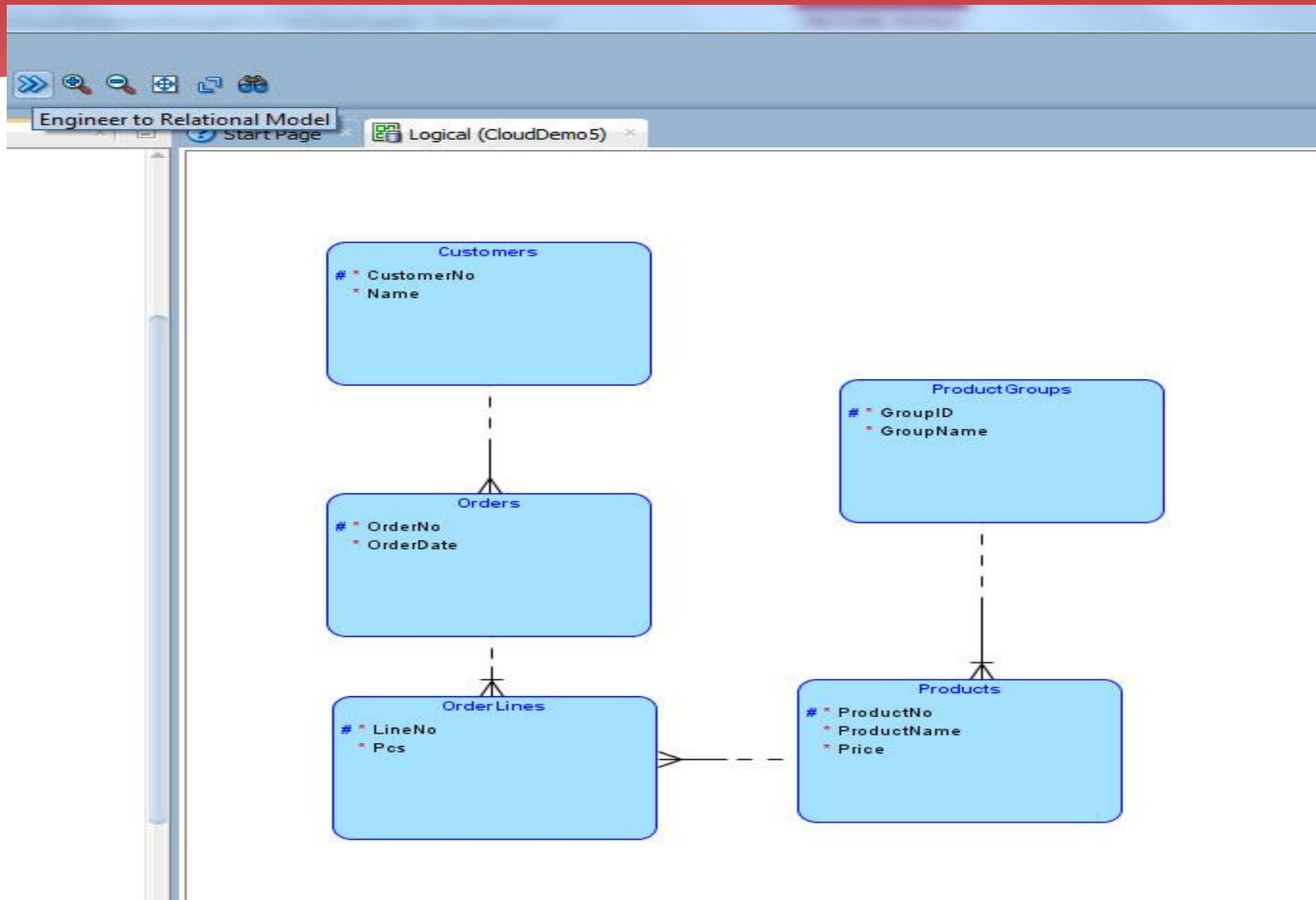


# Designing the database

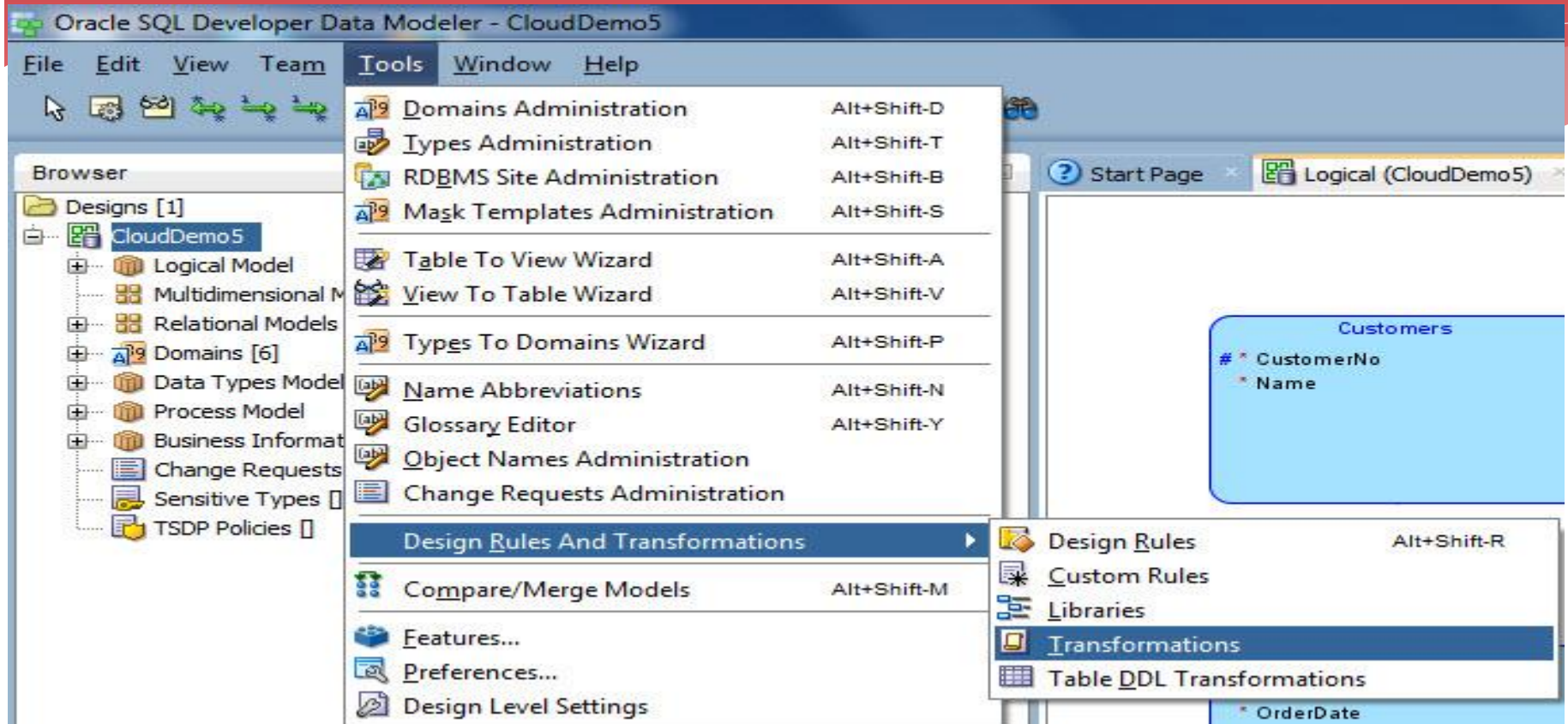
3. **Logical design:** transforming the conceptual model into a logical data model and a logical schema that the RDMS understands

**Result:** relational-database schema  
(relational schemas and constraints)

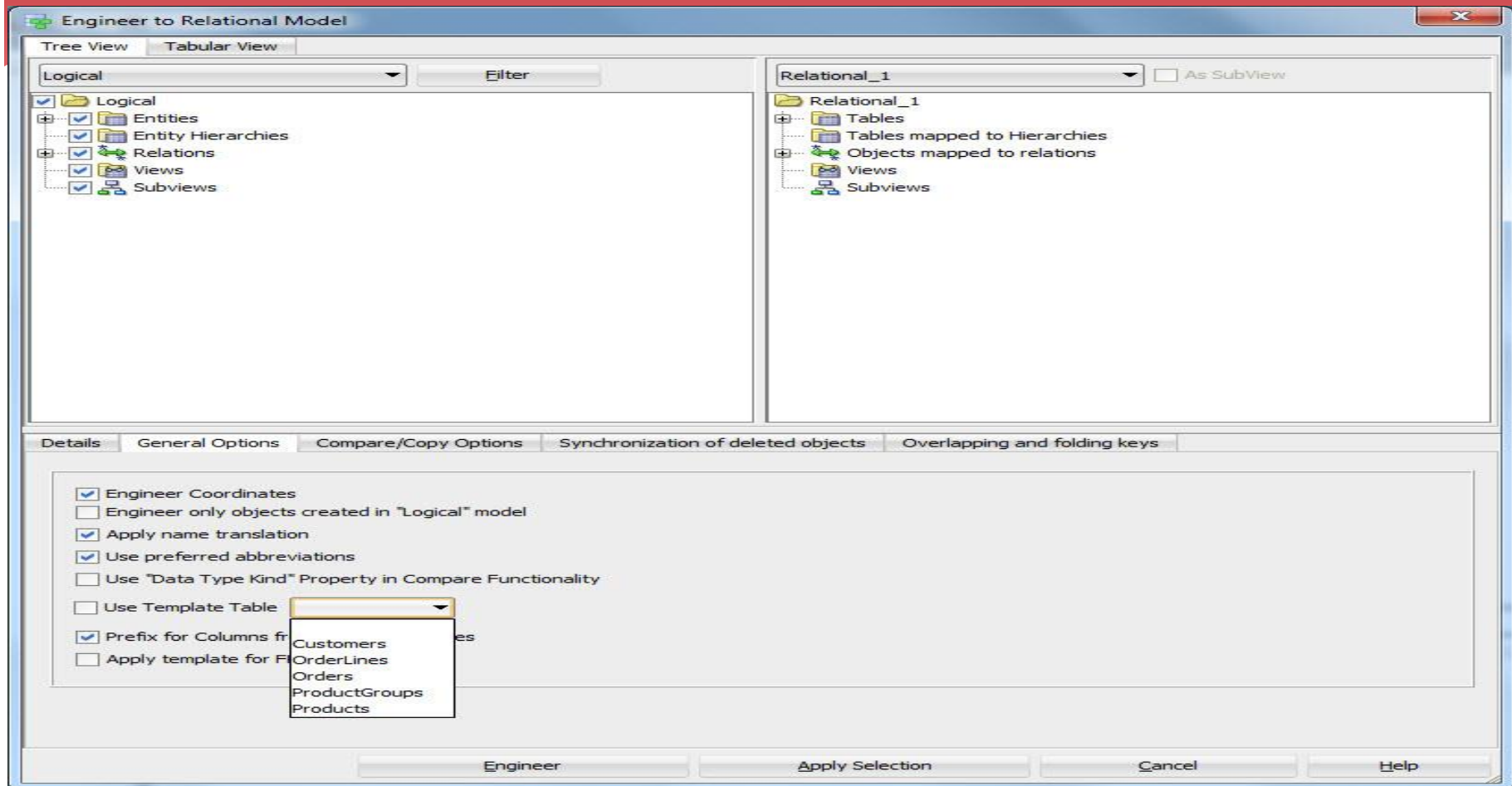
# From logical to relational



# Transformations



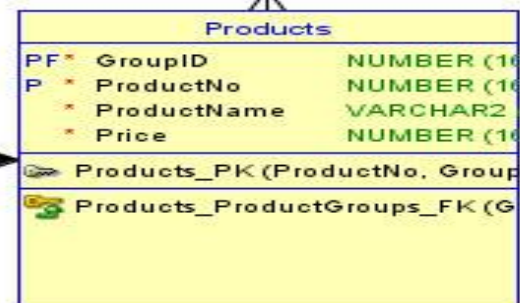
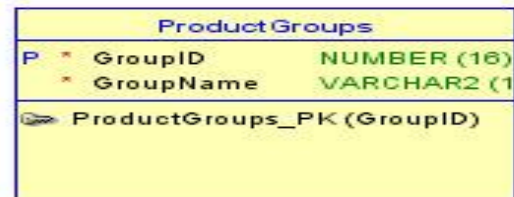
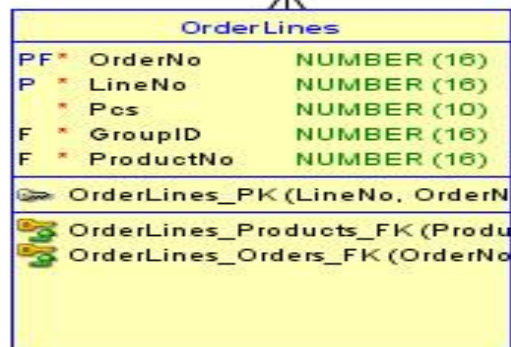
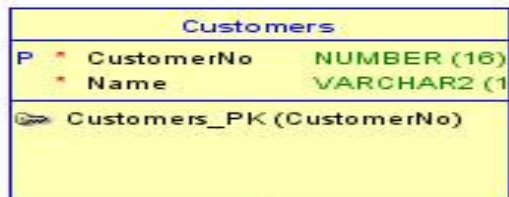
# Adding technical columns



# Demo (Relational)

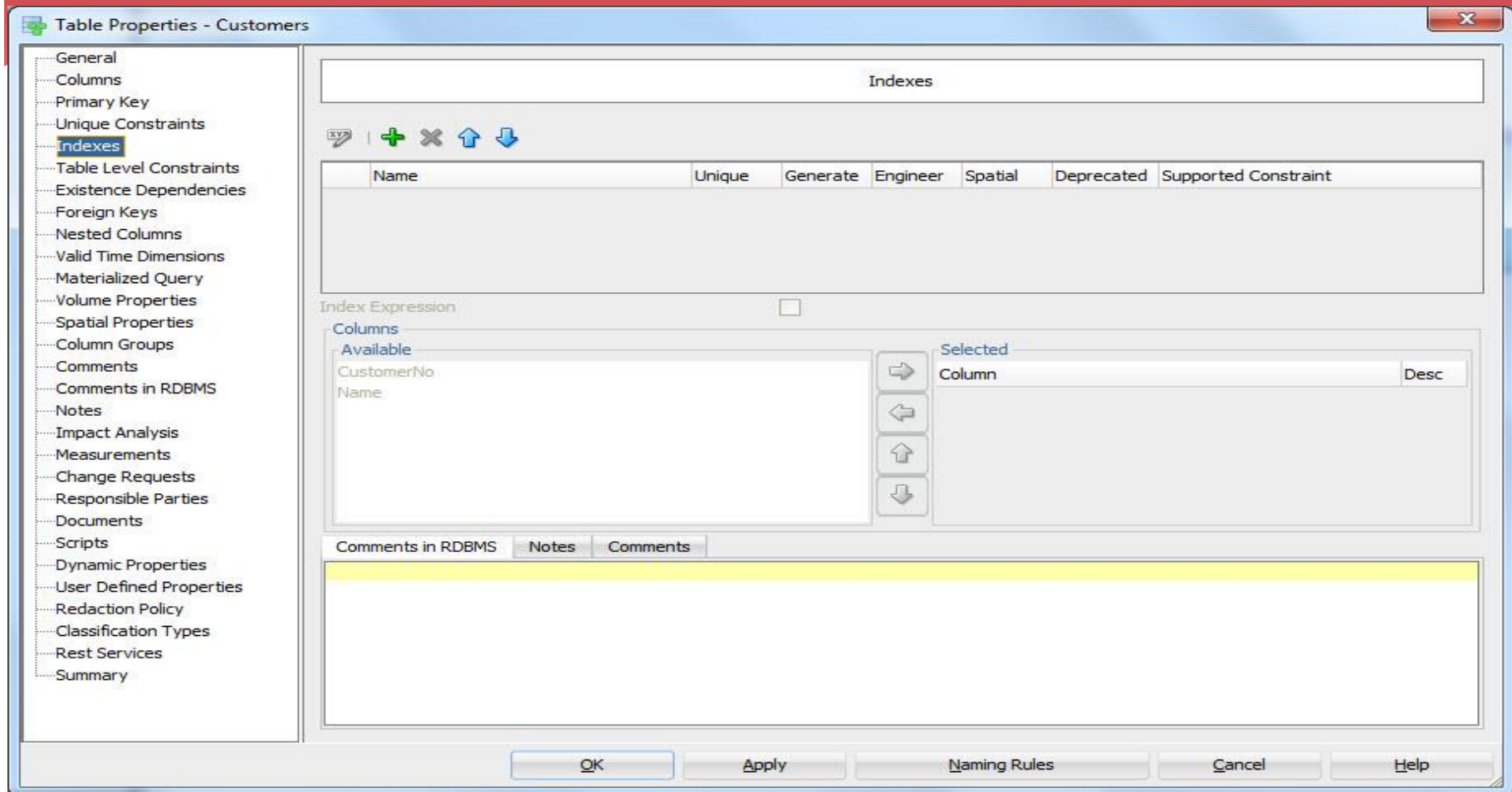
# Step 1

\* Check that you got what you wanted...

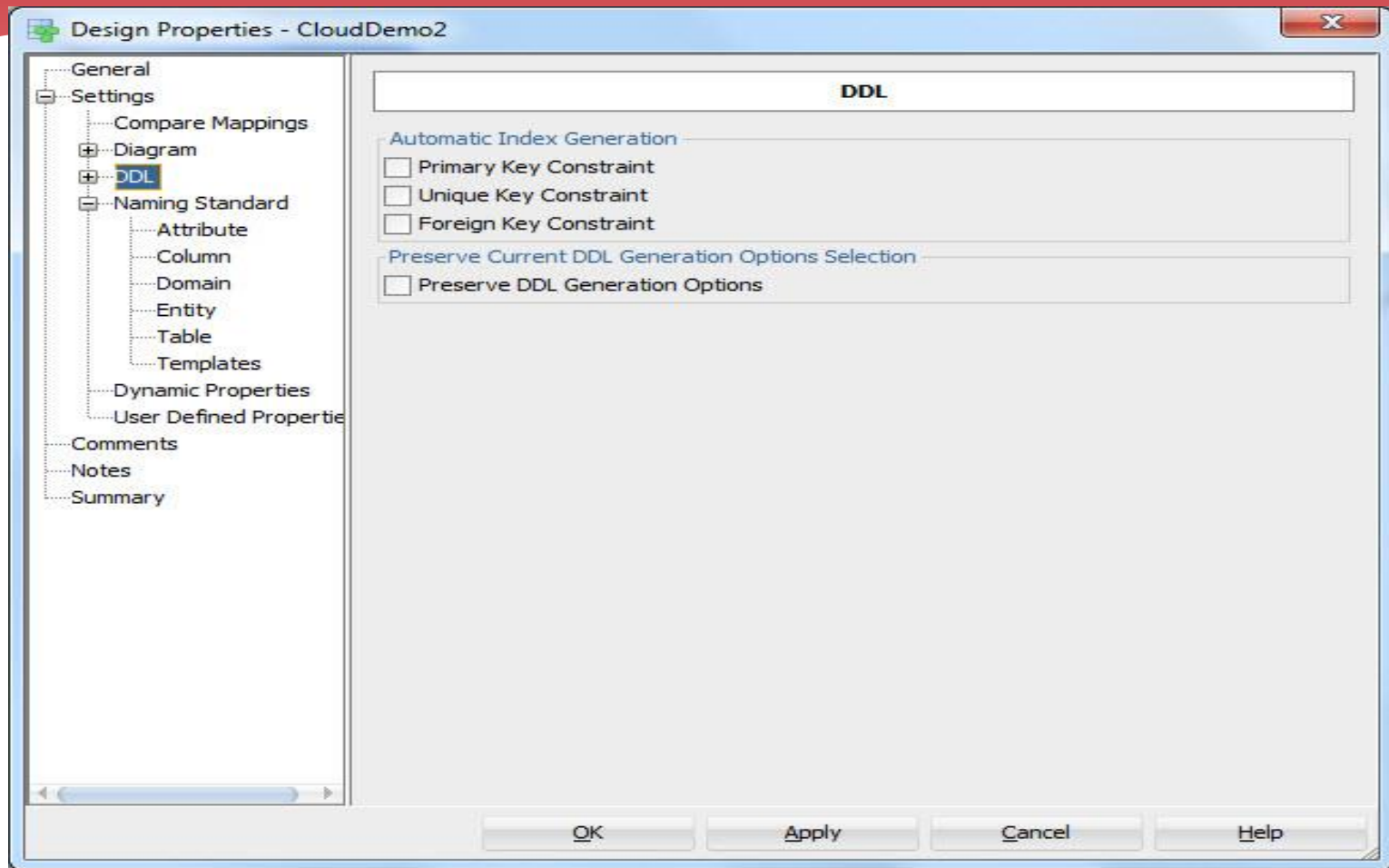


# Indexes

# Manually



# Automatically



# Designing the database

## 4. **Physical design:** instances, tablespaces, indexes, disks ...

And all of these phases over and over again...

(this is different, we have always done that but not so many times and in such a short cycles)

# From relational to physical

# Demo (Physical)

Oracle SQL Developer Data Modeler

File Edit View Versingning Tools Help

Browser x

Designs [1]

Orderdb

Logical Model

Entities [4]

Customer

Order

OrderLine

Product

Relations [3]

Relation\_2 (Customer - 0..\*:1..1 - Order)

Relation\_4 (Order - 0..\*:1..1 - OrderLine)

Relation\_6 (Product - 0..\*:1..1 - OrderLine)

Inheritances []

Views []

SubViews []

Displays []

Multidimensional Models []

Relational Models [1]

Relational\_1

Tables [4]

Views []

Foreign Keys [3]

Schemas []

SubViews []

Physical Model

Displays []

Domains [1]

Data Types Model

Process Model

Business Information

Change Requests []

New

Save All

Close All

Versioning Navigator x

Subversion

SVN Console - Log x

Pending Changes x

propset svn:ignore "\*" .localiz " C:/ohjelmat/DataModeler mallit/DesignsDirectory/Orderdb/Orderdb/rel/34FF578A-EE8FBF2012-09-17 10:28:15 - Design Orderdb saved.

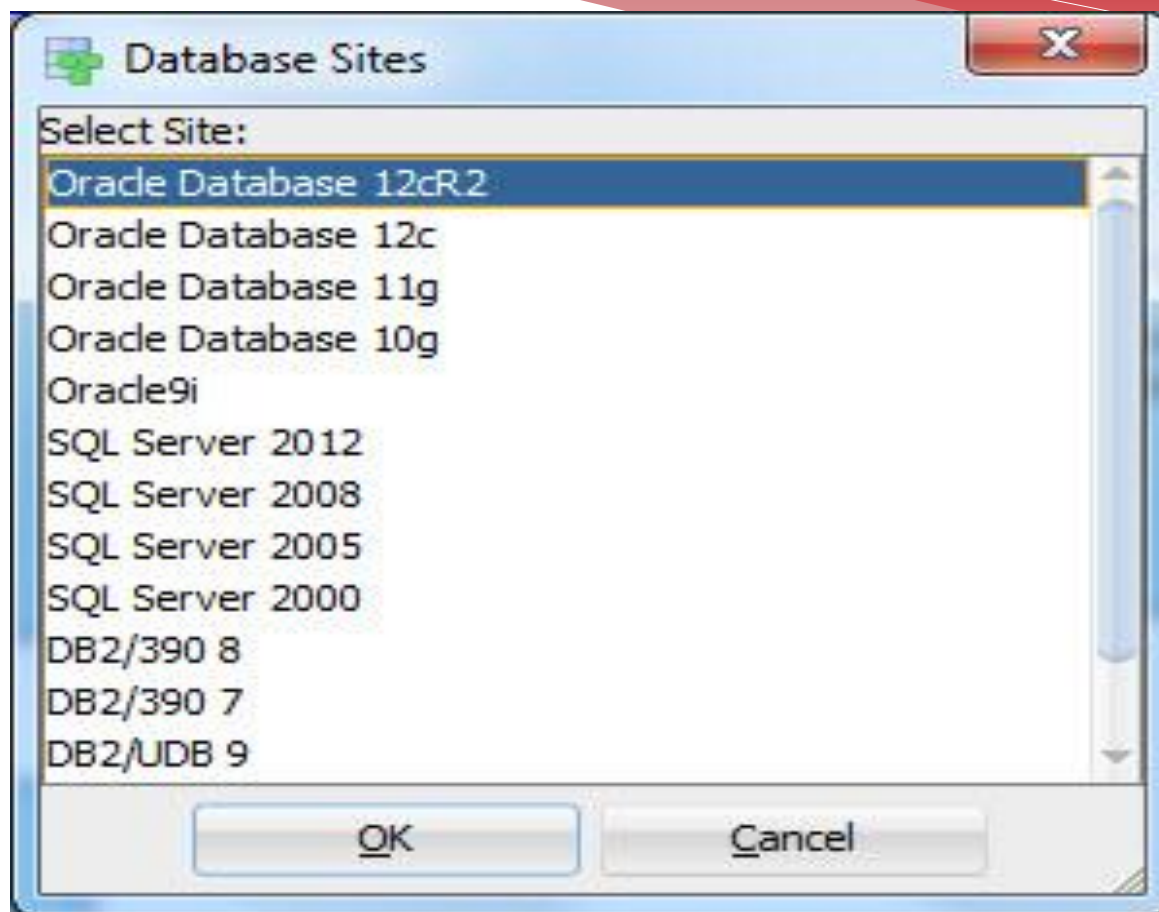
Messages SVN Console x

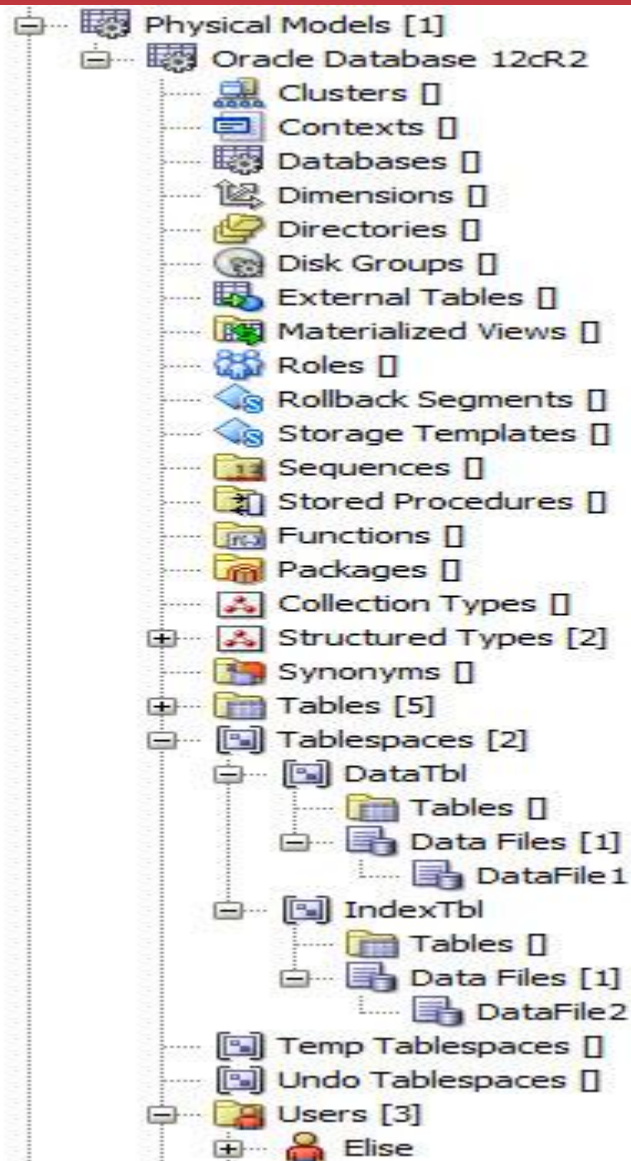
Editing

```

erDiagram
    Order ||--o{ Customer : "has"
    Order ||--o{ OrderLine : "has"
    Product ||--o{ OrderLine : "has"

    Order {
        NUMBER OrderNo PK
        DATE OrderDate
        NUMBER CustomerNo FK
    }
    Customer {
        NUMBER CustomerNo PK
        VARCHAR Name
        VARCHAR DeliveryAddress
        VARCHAR MailAddress
    }
    OrderLine {
        NUMBER OrderlineNo PK
        NUMBER Pos
        NUMBER Price
        NUMBER OrderNo FK
        NUMBER ProductNo FK
    }
    Product {
        NUMBER ProductNo PK
        VARCHAR2 ProductName
    }
  
```





# Physical Design

- \* Creating physical elements (tablespaces, users, ...)
- \* Privileges...

# Setting up the Properties

**TableSpace Properties - TableSpace1** [X]

Indexes | **Storage** | Materialized Views | Comments

General | **Default Storage** | Clusters | Tables

Name: TableSpace1

Datafiles: NO

File Type: [v]

Min. Ext Len: 0

Block size: 0

Logging: LOGGING [v]

Force Logging: NO [v]

Status: ONLINE [v]

Contents: PERMANENT [v]

Default Compression: [v]


Ext. Management: LOCAL [v]

EM Local SubType: AUTOALLOCATE [v]

EM Uniform Size: 0

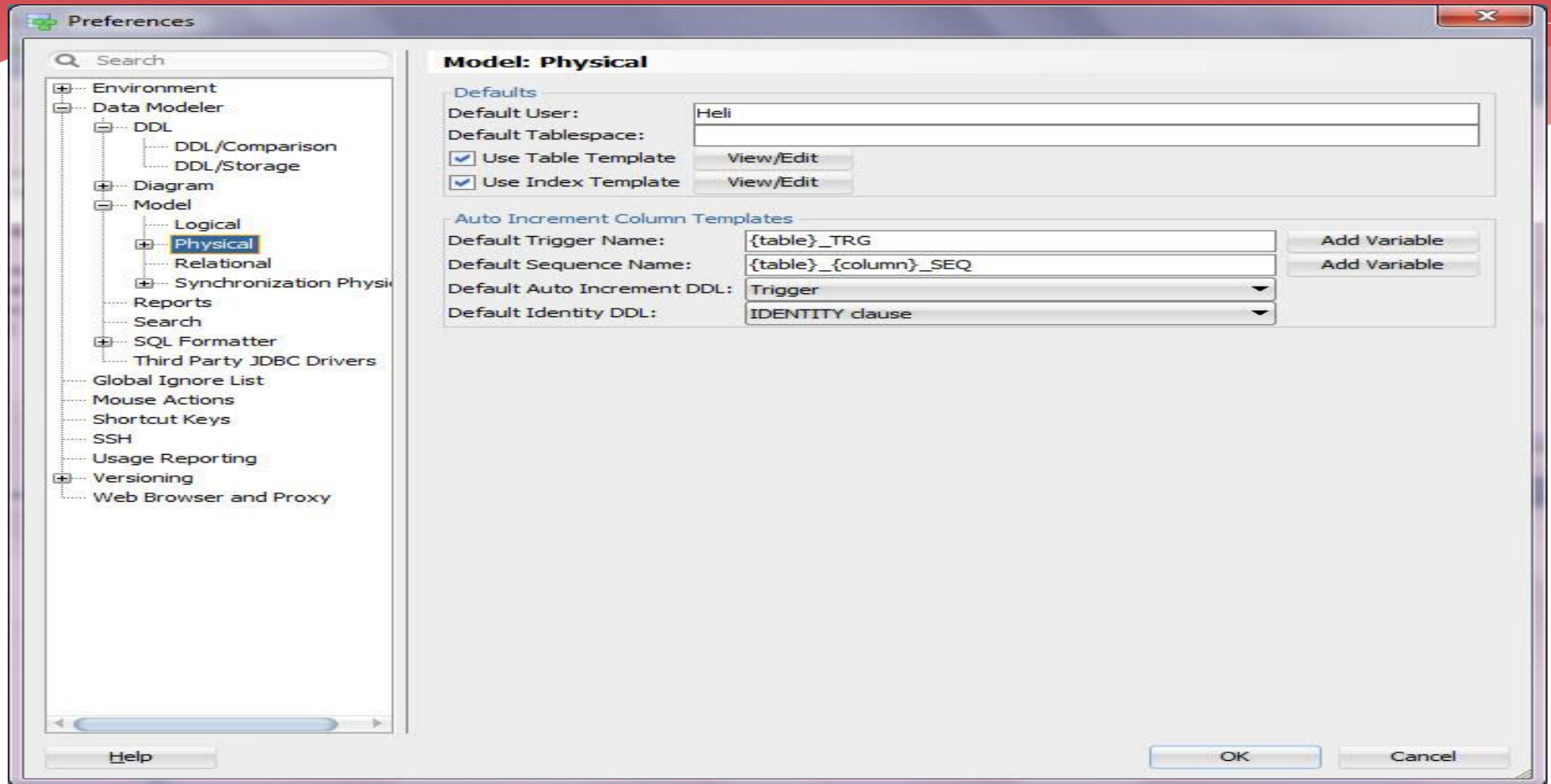
Seg. Management: [v]

Flashback Mode: ON [v]

 Propagate Properties

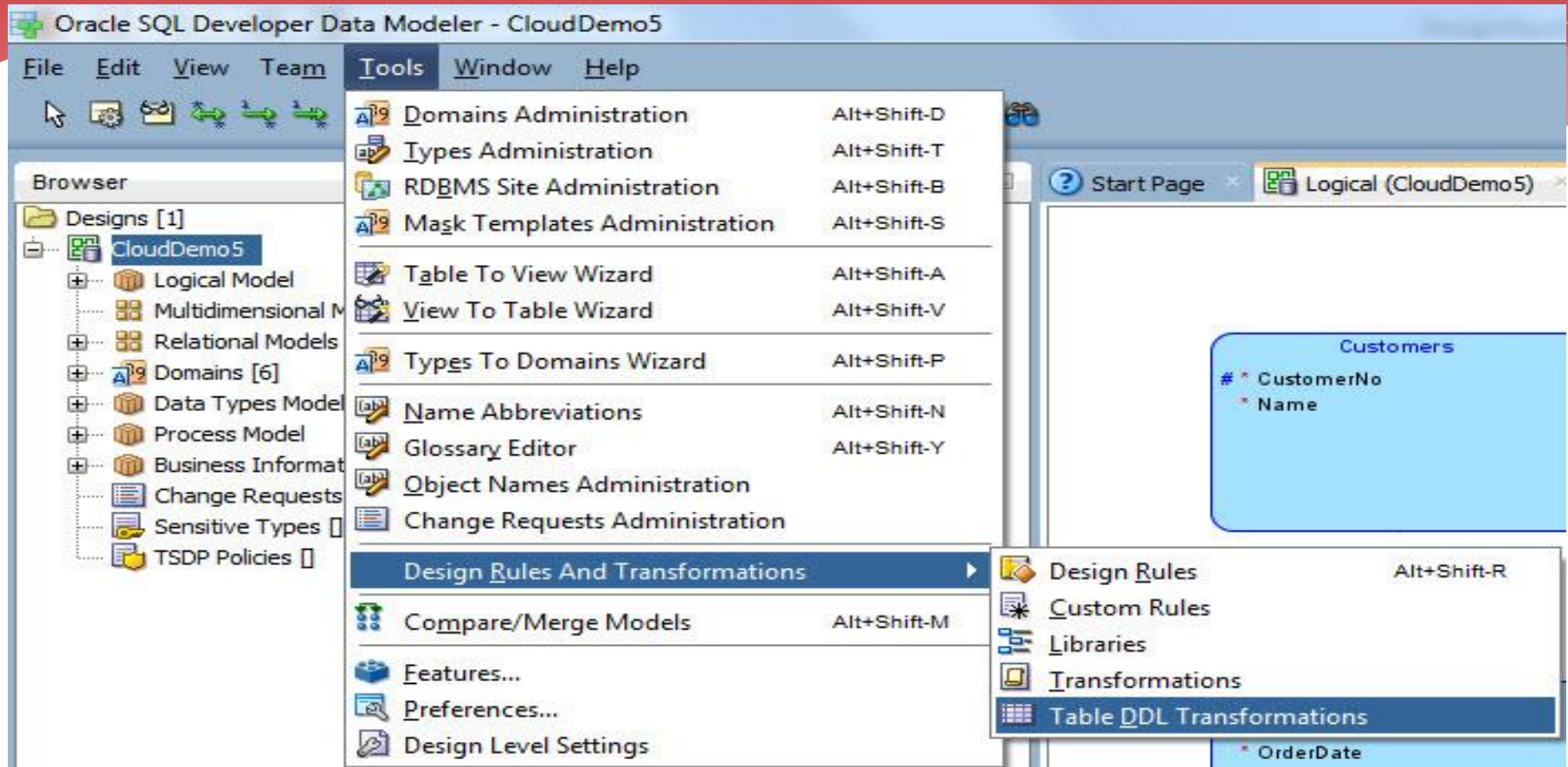
OK Apply Cancel

# Setting the Defaults

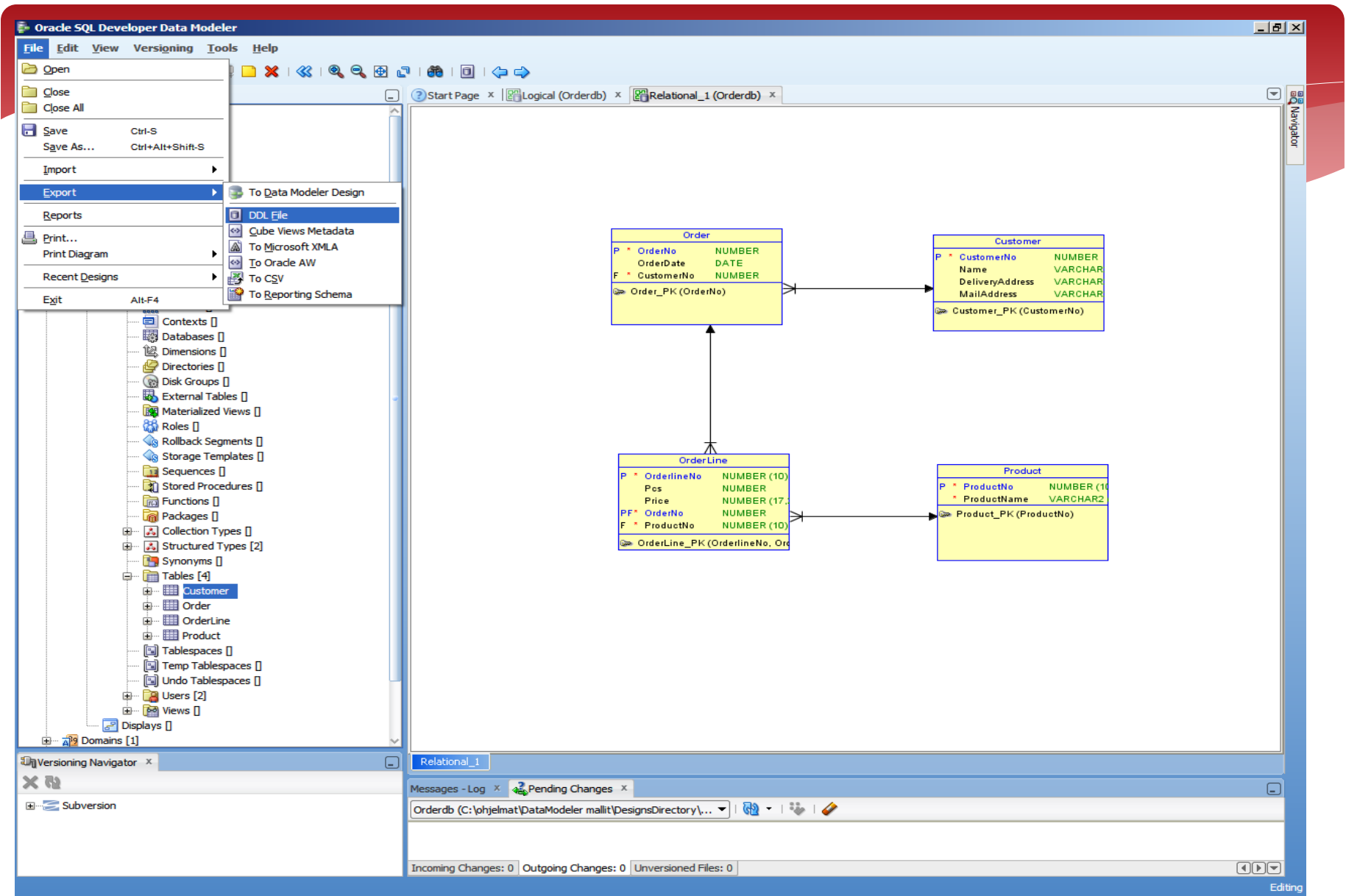


# Physical to DDLs

# Table DDL Transformations



# Demo (DDL)



DDL Generation Options

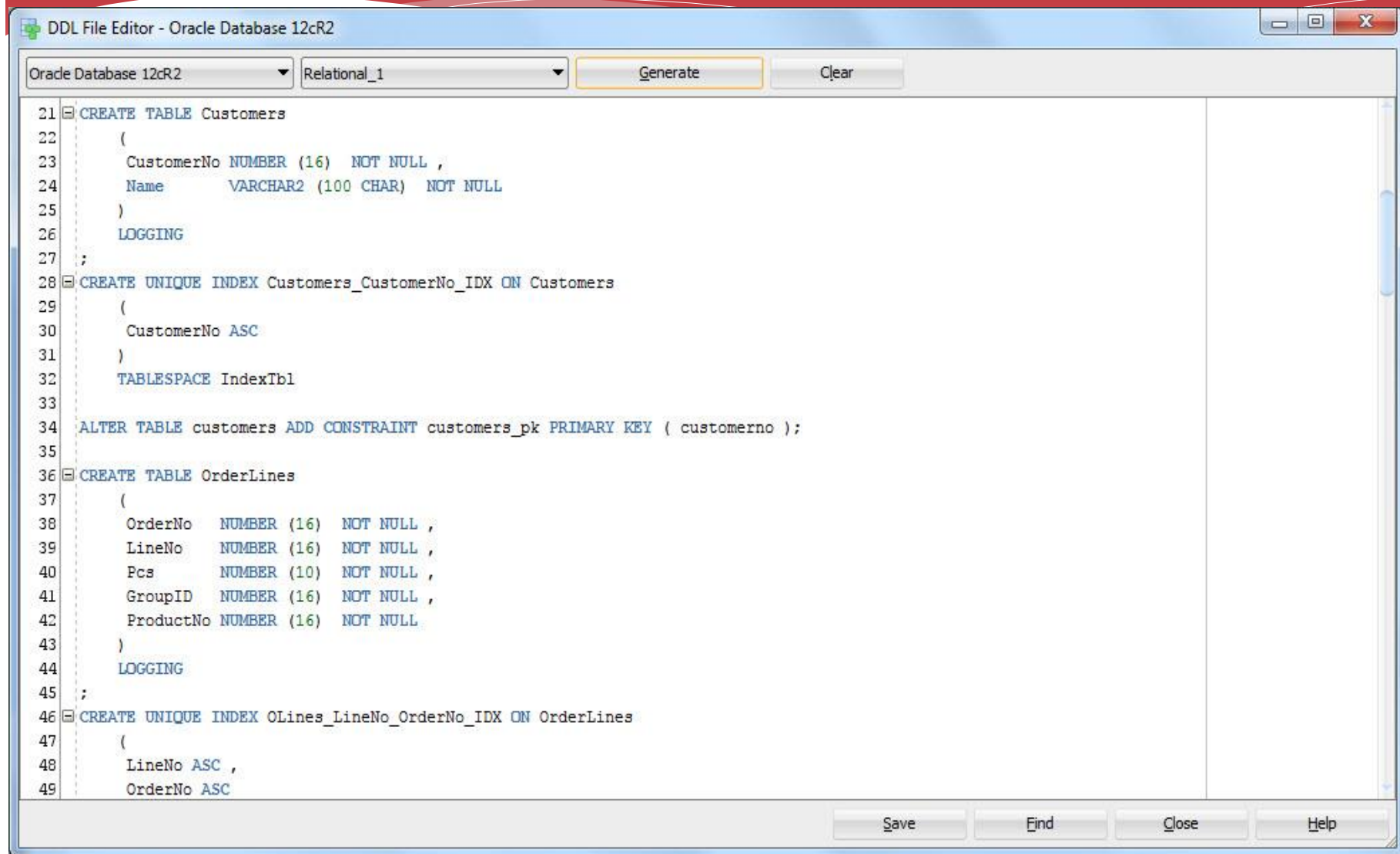
'Create' Selection 'Drop' Selection Name Substitution Include Table Scripts Include Table DDL Scripts Oracle Errors to Mask

☒ ☐ | Filter  | Active Script Set: Journal tables

Insert Scripts		Name
<input type="checkbox"/>		Customers
<input type="checkbox"/>		OrderLines
<input type="checkbox"/>		Orders
<input type="checkbox"/>		ProductGroups
<input type="checkbox"/>		Products

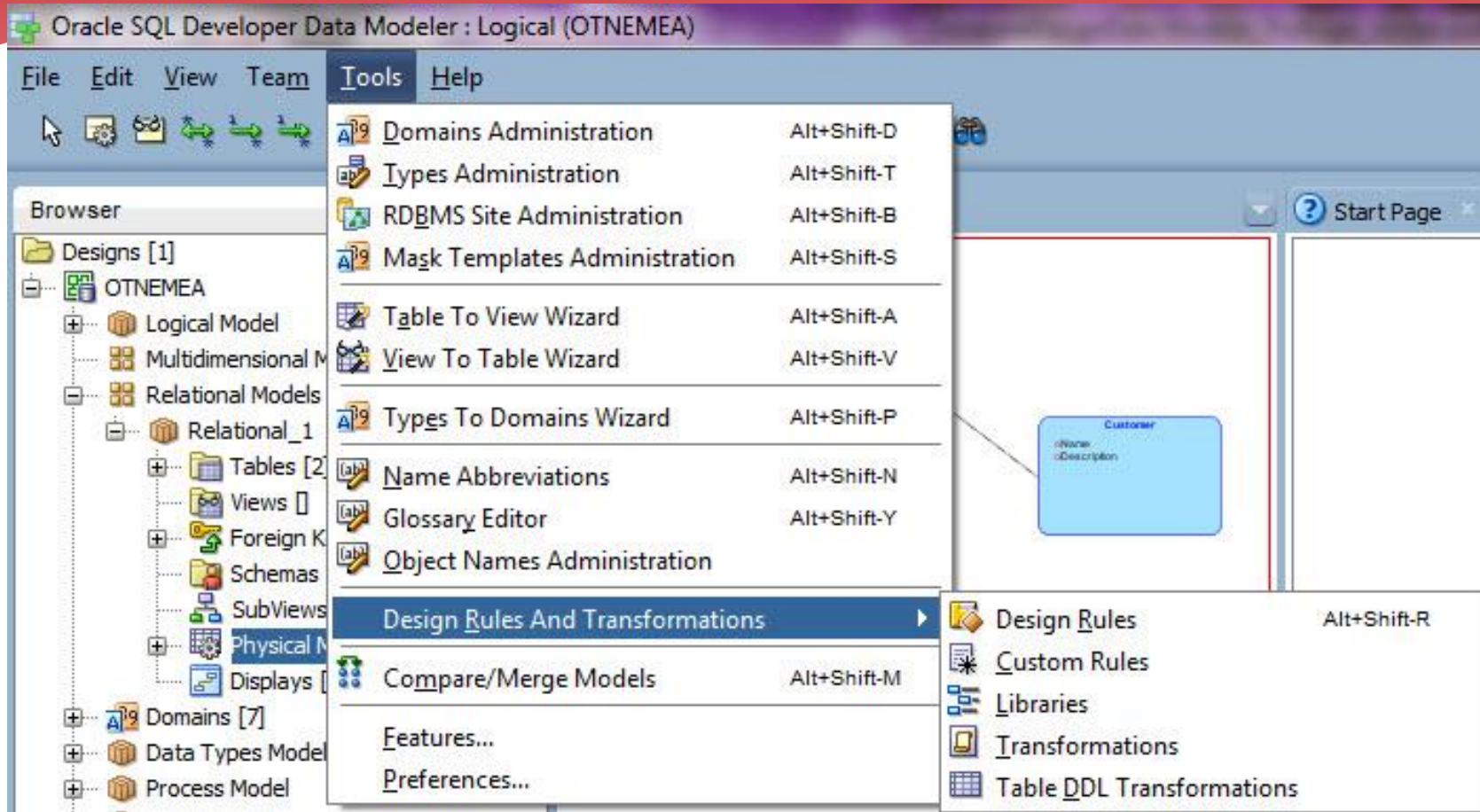
☒ Design Rules ☐ Include Comments ☐ Apply Name Substitution Regular DDL ☐ Generate DDL in Separate Files ☐ Generate REST Services

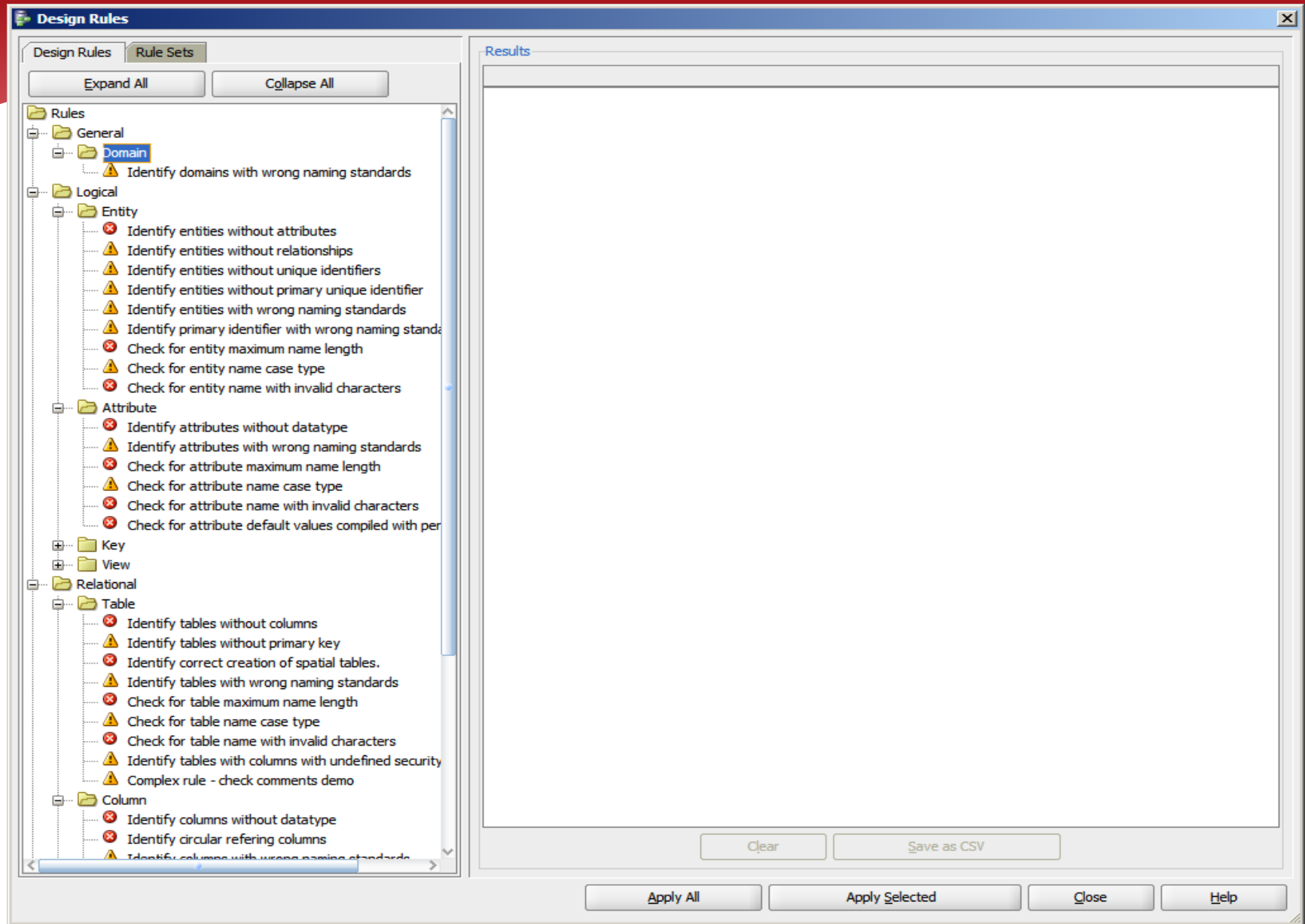
Save Configuration Load Configuration OK Cancel Help

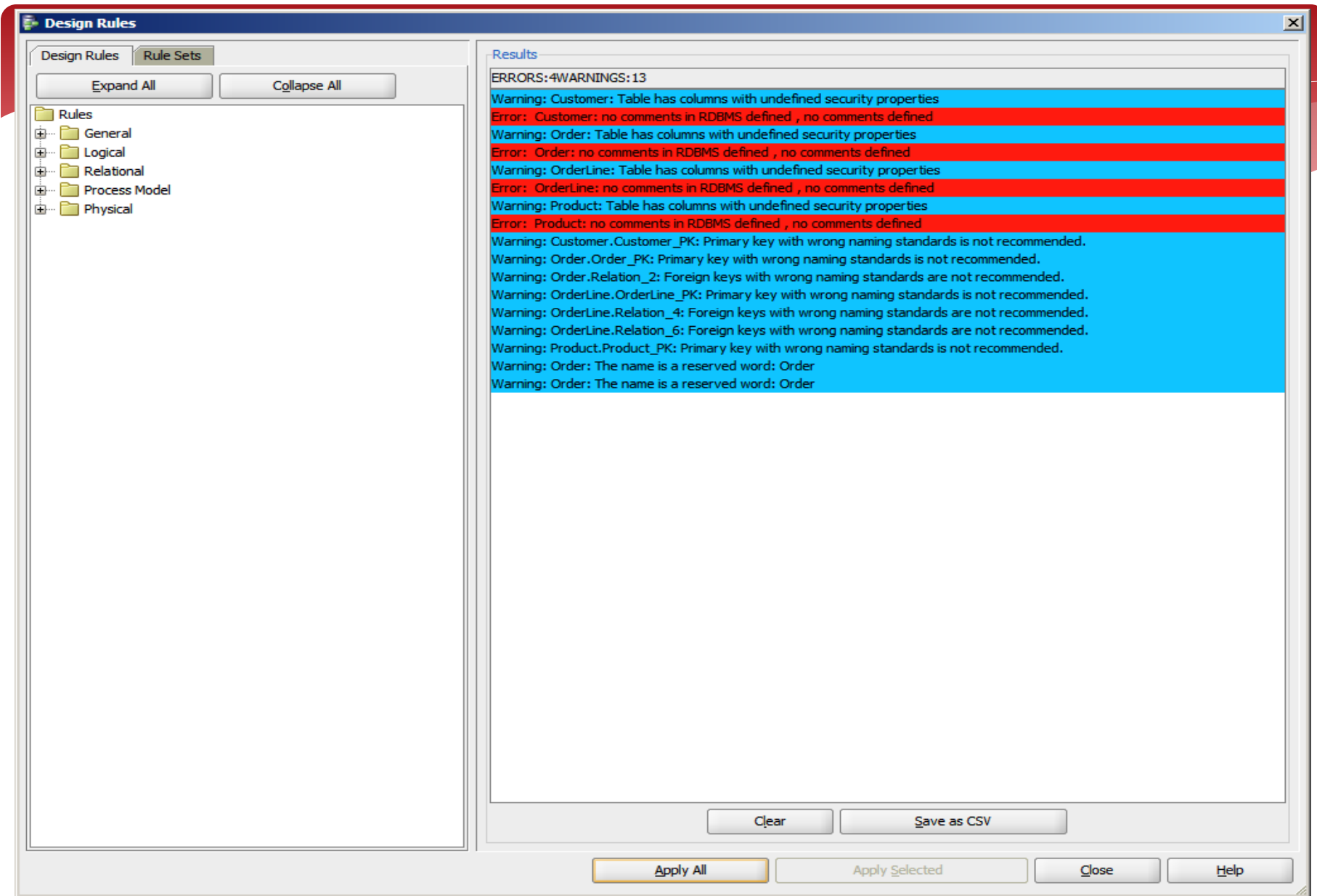


# Demo (executing the DDLs to the Cloud)

# Design Rules







# Different Compares

- \* Design vs Design
- \* Design vs Database
- \* Database vs Design

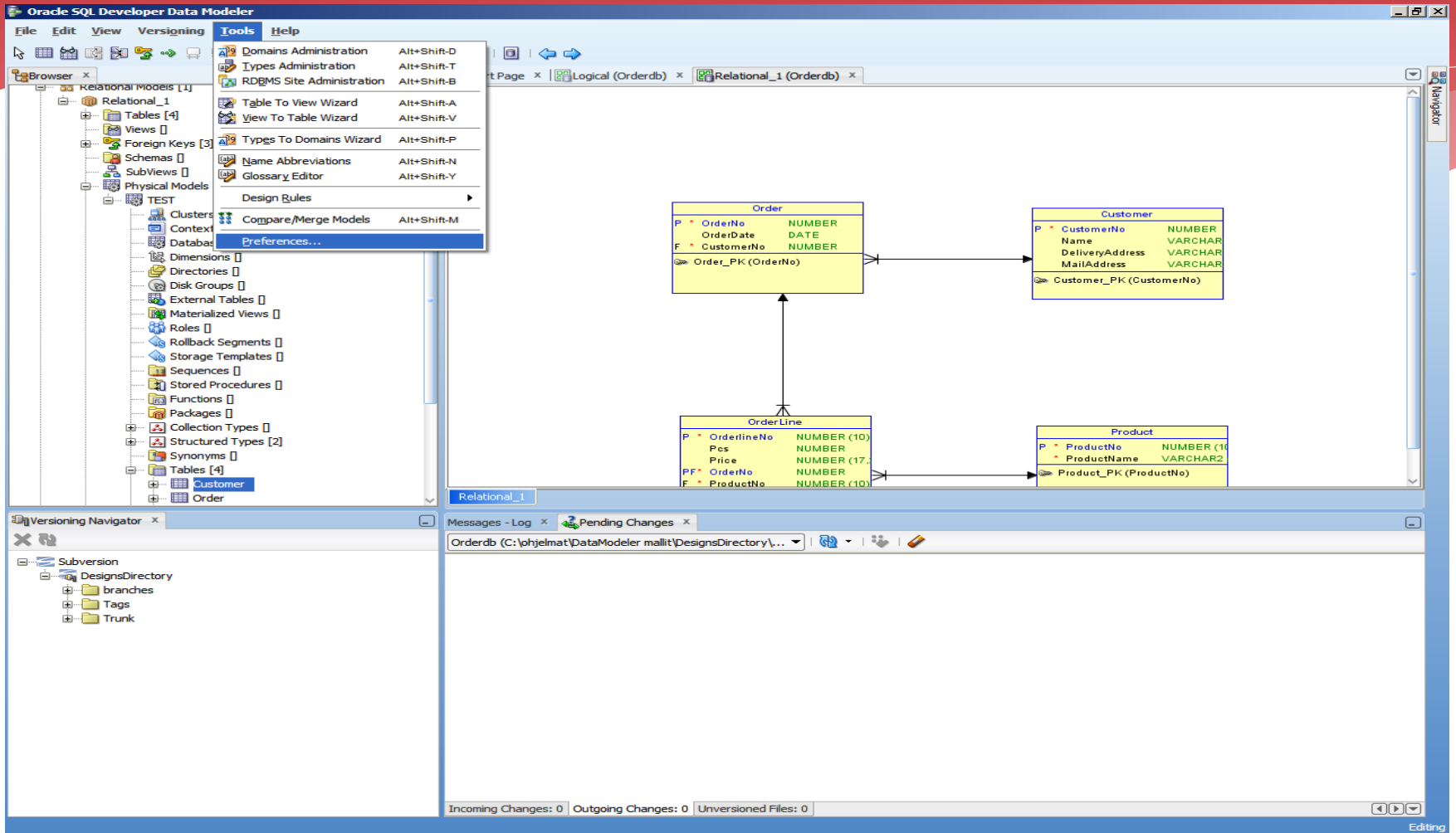
# Different Compares, Designs

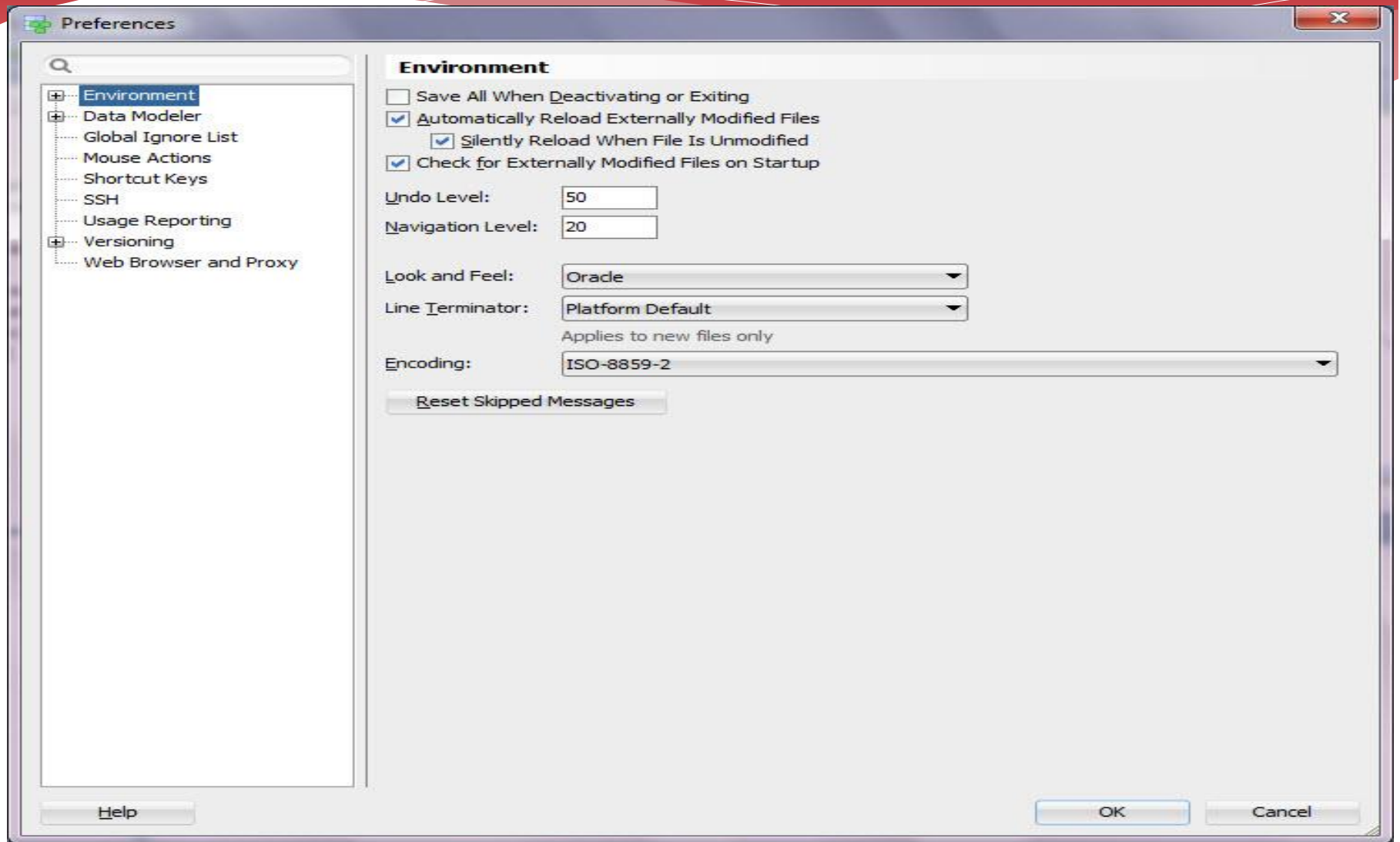
- \* File | Import | Data Modeler Design
  - \* Compares "everything"
- \* Tools | Compare/Merge Models
  - \* Compares only relational and physical models
  - \* ALTER DDLs can be generated
- \* These can be used for instance to compare different versions of the design from version control

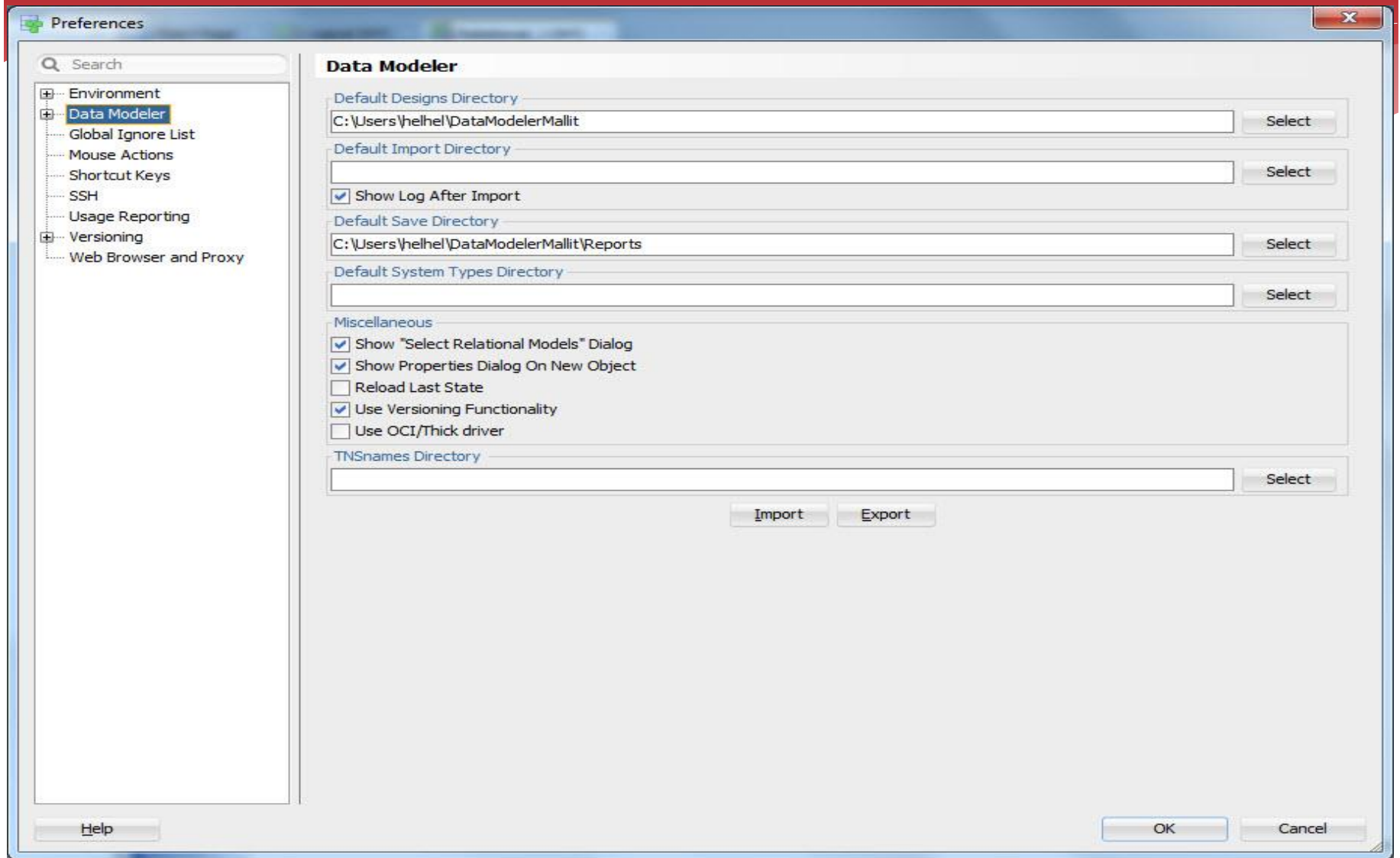
# Different Compares, Database

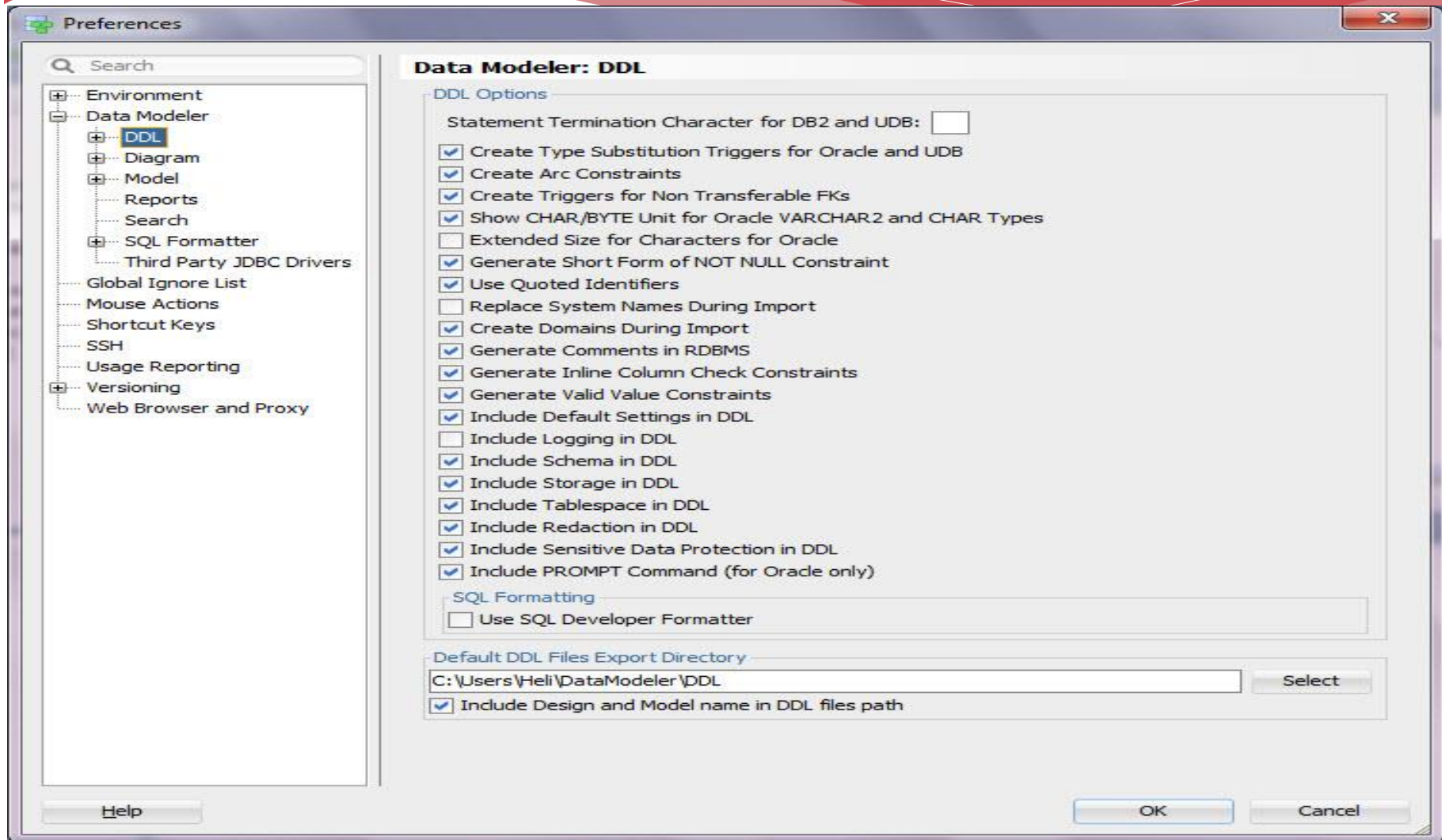
- \* Synchronize Model With Data Dictionary
  - \* Target: model
- \* Synchronize Data Dictionary With Model
  - \* Target: database
- \* File | Import | DDL File
- \* File | Import | Data Dictionary

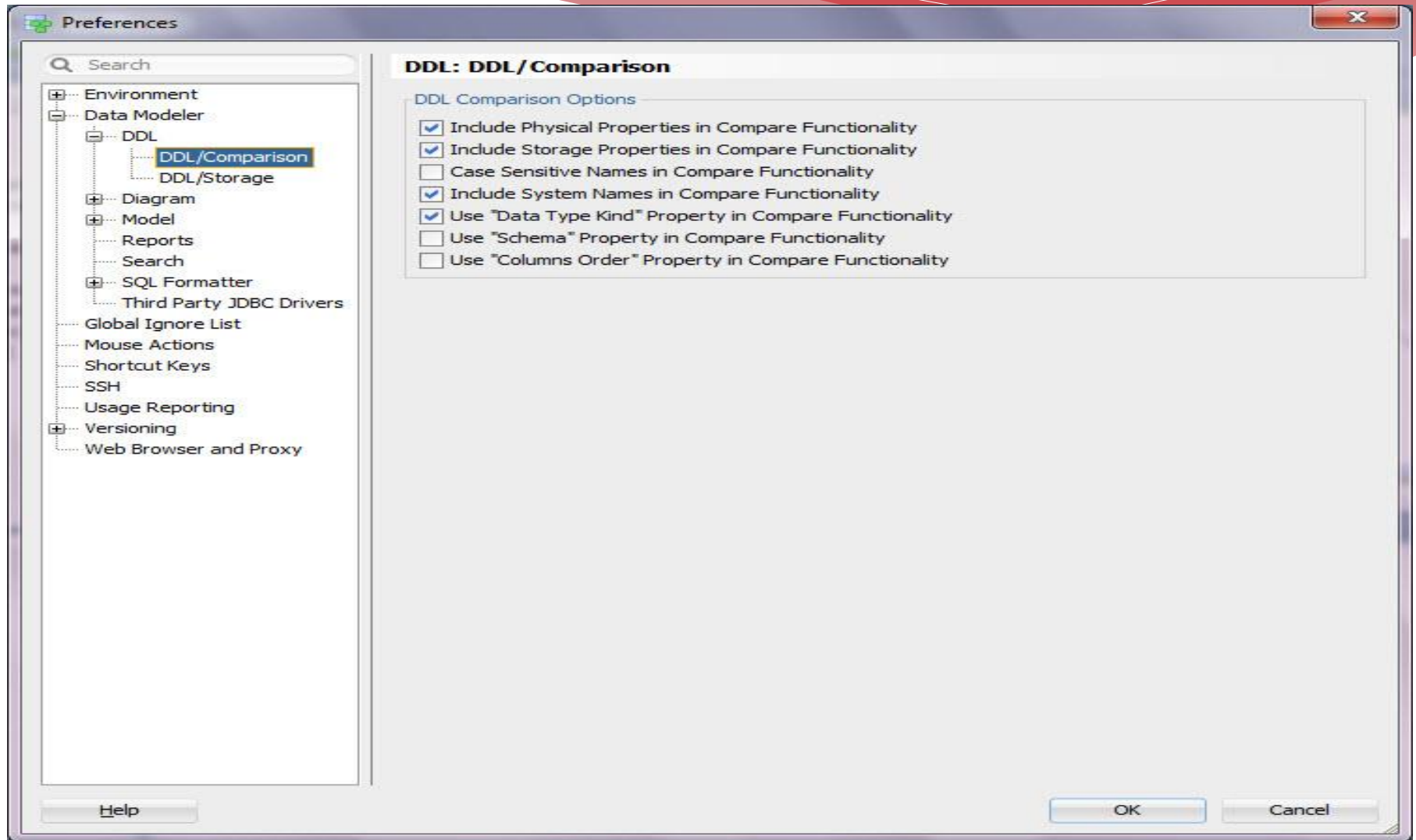
# Preferences

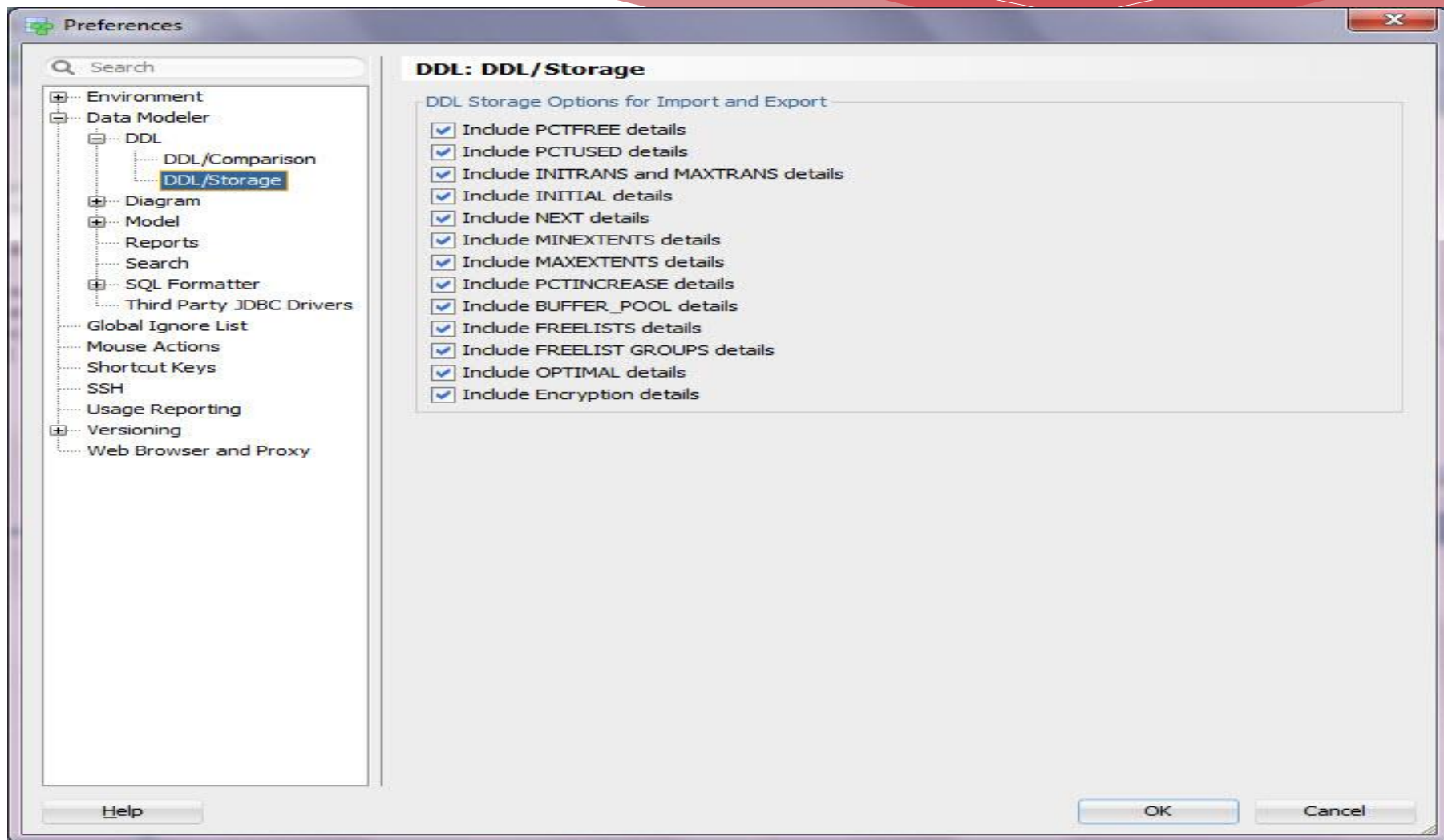


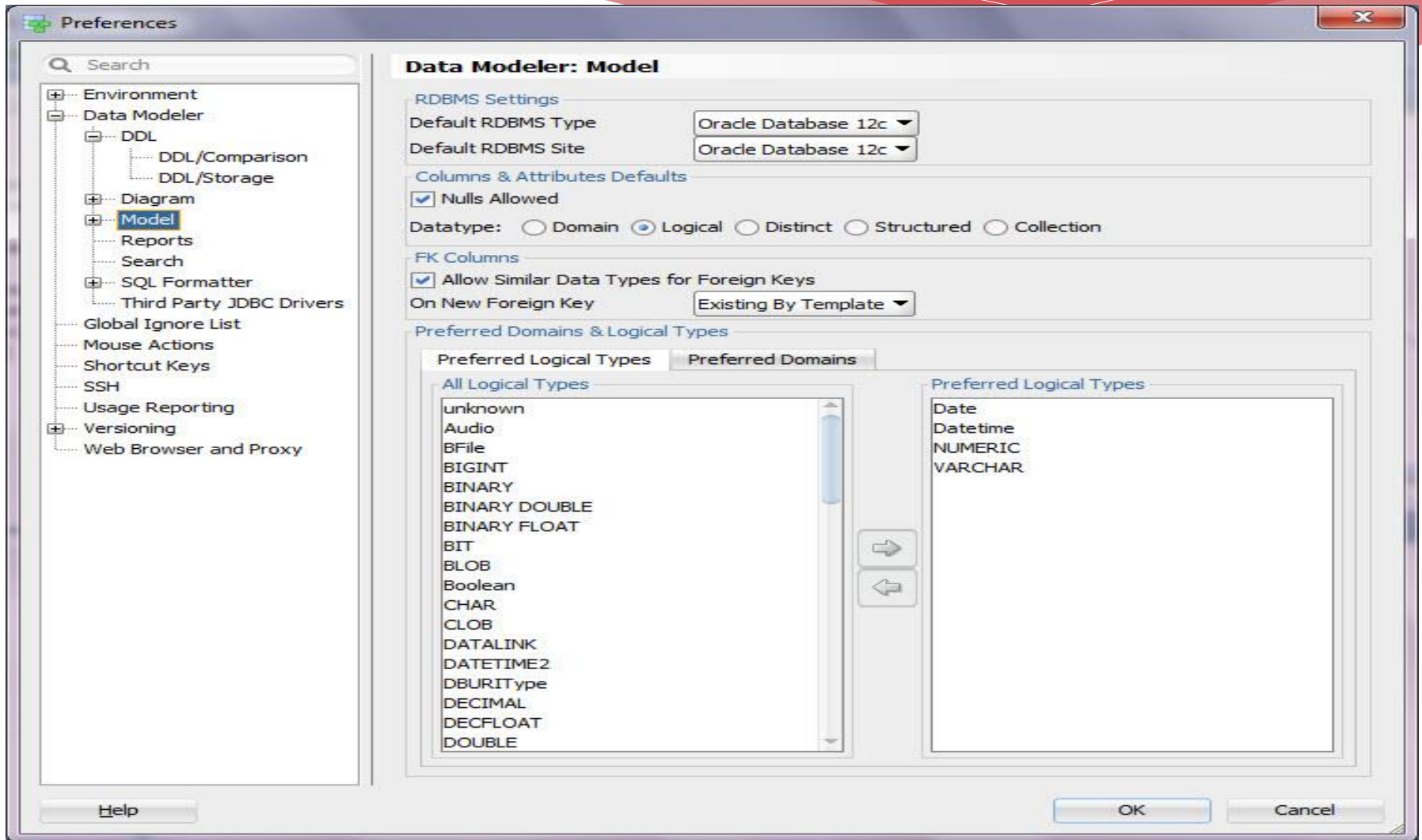




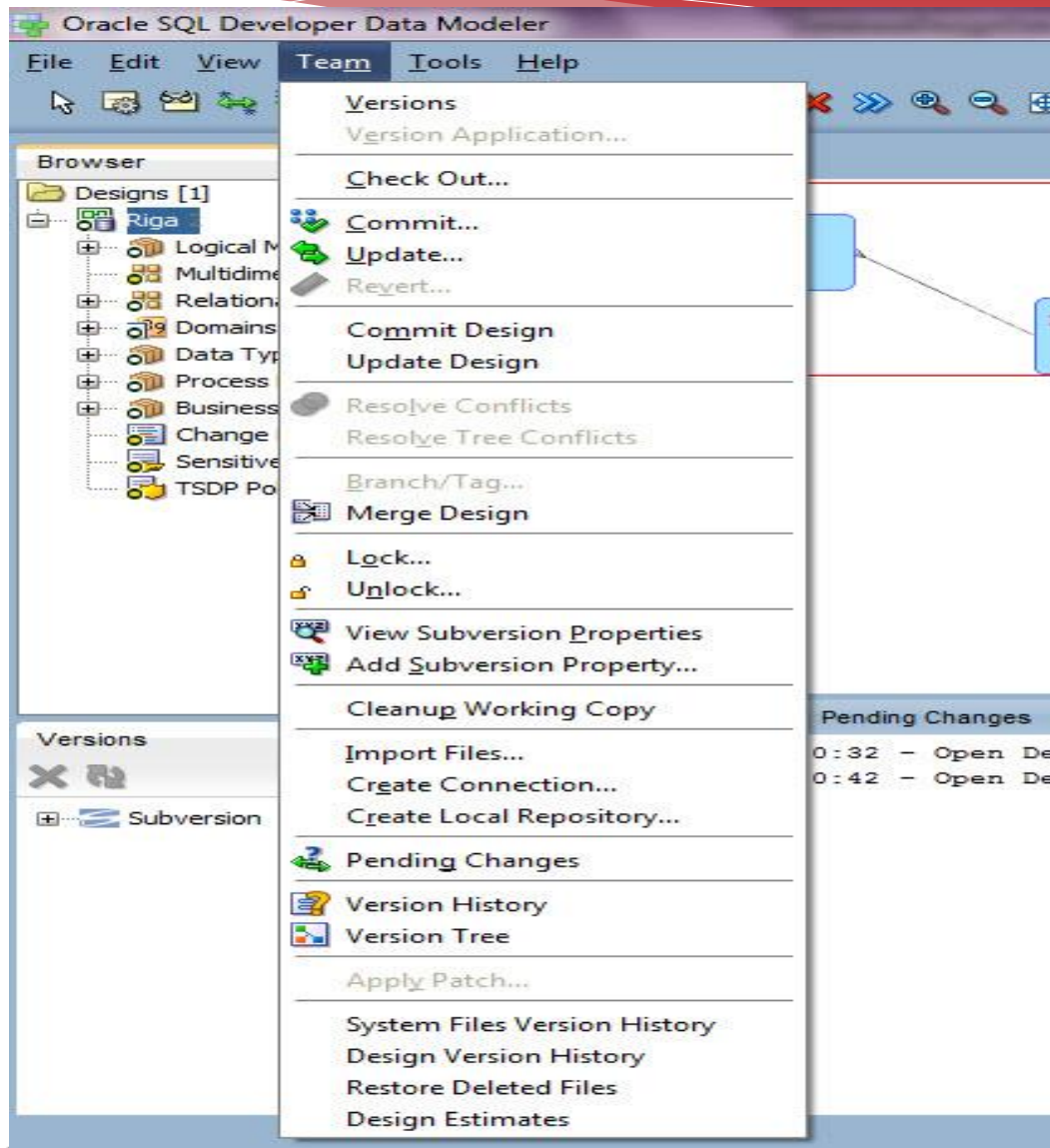


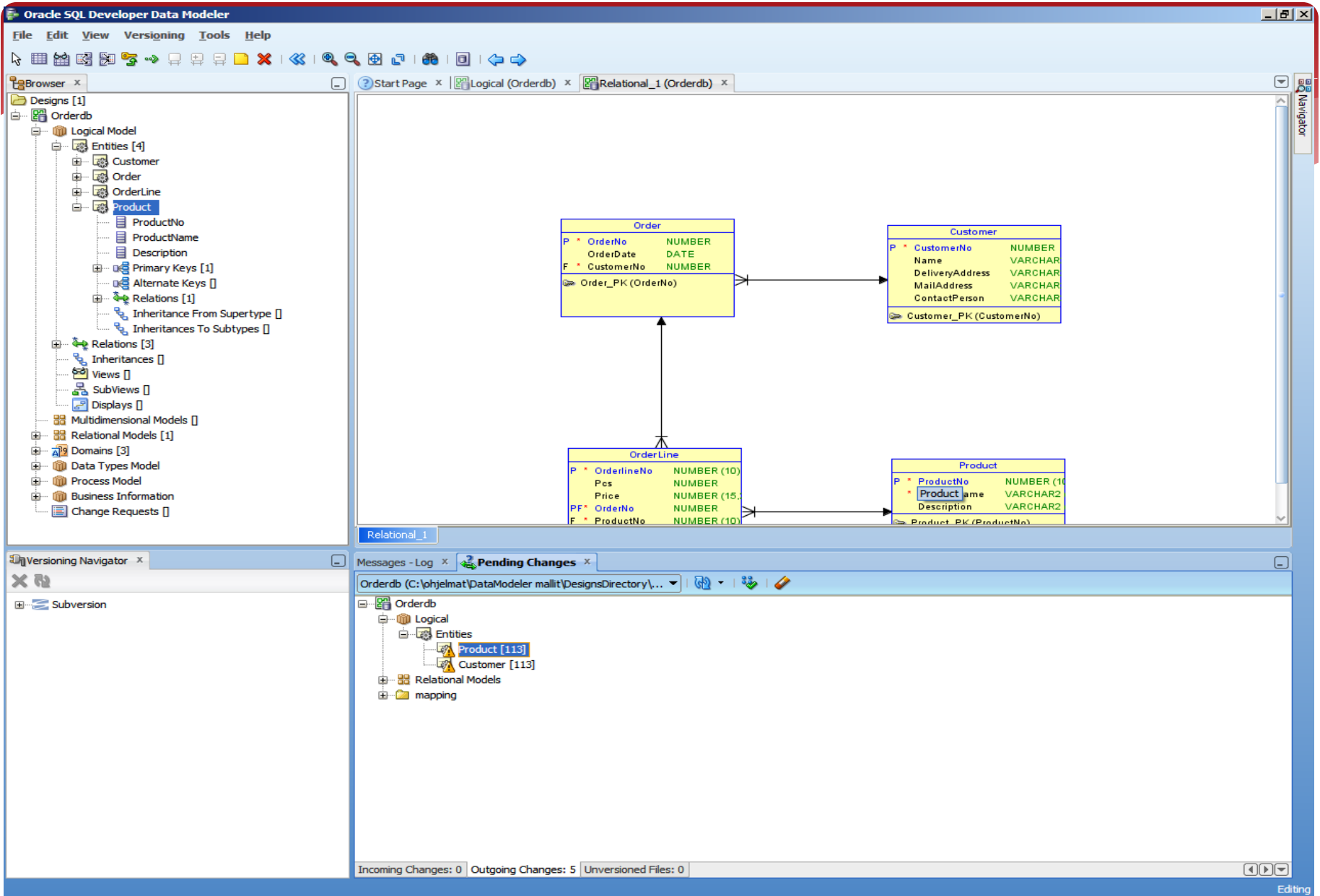


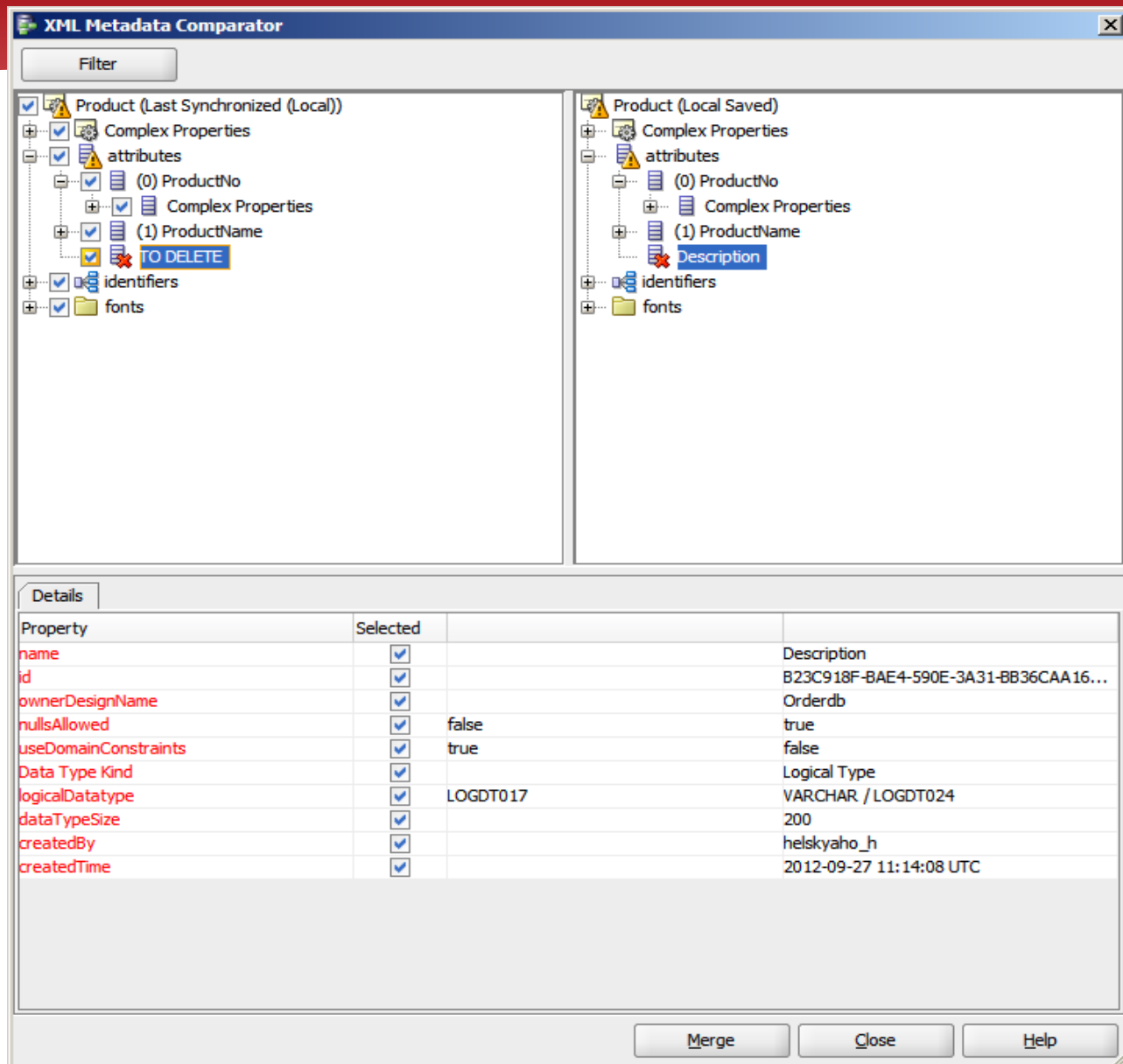




# Version control (Subversion)










Commit Resources

Name ▲	Location	Status	Select
 Customer	Logical \ Entities	M	<input checked="" type="checkbox"/>

☐ Keep Locks

Comments:

Template or Previous Comments:  
<Select>

This list is configured with [comment templates](#)

Ohje

OK

Peruuta

# Conclusions

- \* To be able to connect to the database, to see its content online and to maintain the data: **SQL Developer**
- \* To *design* the database and to maintain the data structures: **Data Modeler**
- \* To *design* the data architecture: **Data Modeler**

# Conclusions

- \* Data Modeler is a good tool; good support for iterative processes
- \* Enables documenting and versioning (and comparing the versions)
- \* Enables multiuser environment
- \* Is free to use
- \* Support for other databases as well
- \* I see no reason not to use it!

# THANK YOU!

QUESTIONS?

Heli:

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Blog: [Helifromfinland.com](http://Helifromfinland.com)