Design Your Databases Using Oracle SQL Developer Data Modeler

ITOUG Tech Day Milano

30.1.2019



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 semistructured 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 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





Real World SQL & PL/SQL

Advice from the Experts

Arup Nanda Brendan Tierney Heli Helskyaho Martin Widlake Alex Nuijten





Helskyaho Heli, Valin-Raki Elise

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



What is database design?

- * 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)



What is Data Modeler?

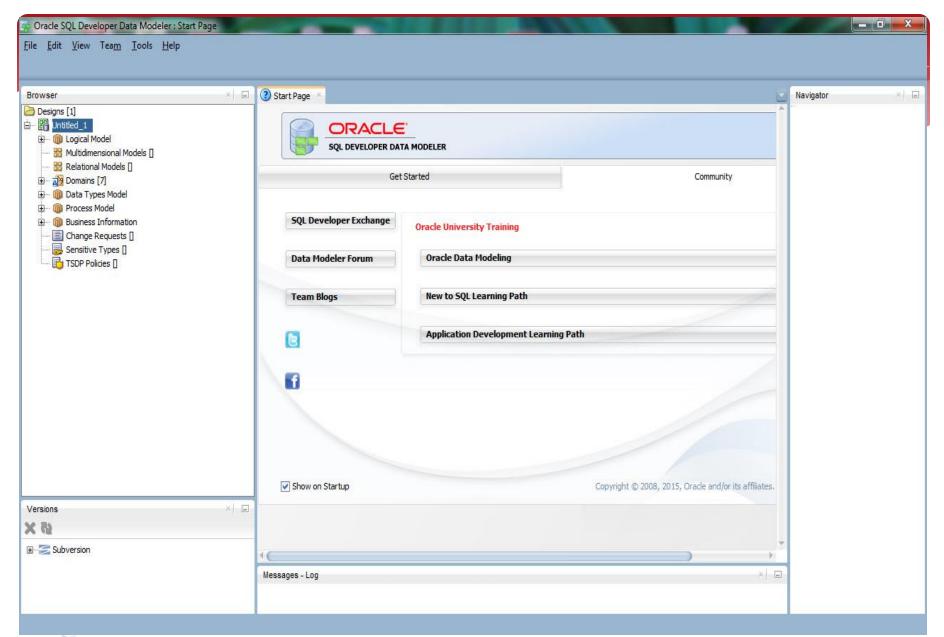
- A tool for database design (supports all the "new" Oracle features)
- * Logical, relational, physical models, DDLs,...
- * Multidimensional models (DW), Data Flows etc.
- For designing and documenting the data architecture and the database
- Support for all the phases in database design and easy moving from one to another, support for reverse engineering
- * Support for version control and multiuser environment: XML files and Subversion



What is Data Modeler?

- Import: Oracle repository, existing databases, Oracle
 Designer, file import (Erwin, Bachman), ...
- * Export: DDL, CSV, ...
- Reporting (in tool itself and also Reporting Repository)
- Standards: Design Rules, Preferences, Naming Standards, Domains, ...
- * Data Modeler viewer integrated in SQL Developer
 (3.0 ->), also reports

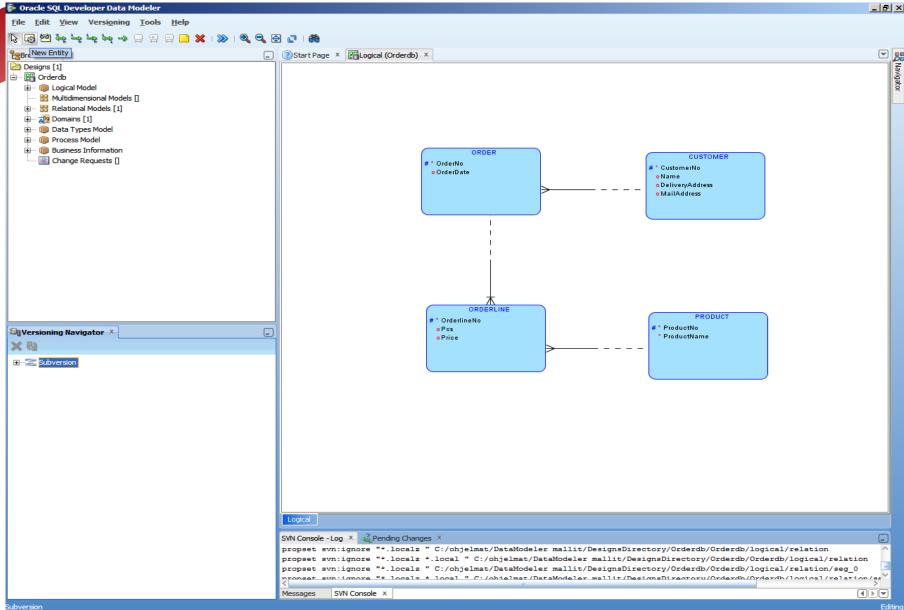






Logical model





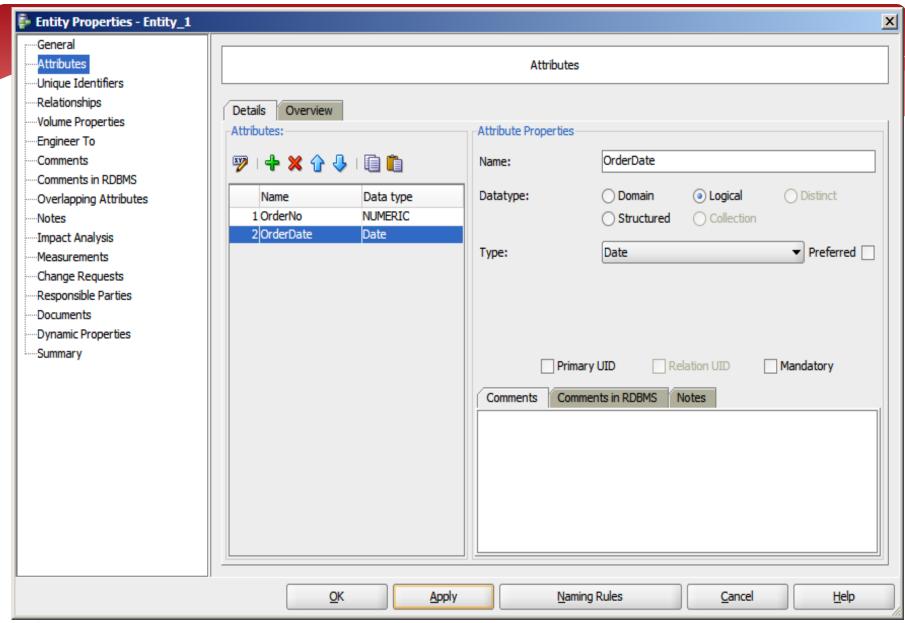






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🕞 Entity Properties - Order		x
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🕃 Entity Properties - Order	×
General	
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Comments	Relation_1
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Relationship



Engineer To		Ger	neral			
Comments Comments in RDBMS Notes	Name:	Name: Relation_4				
Attributes	Long Name:	Relation_4 (Order - 0	*:11 - OrderLine)			
impact Analysis	Source Cardinality		Target Cardinality			
Measurements Change Requests	Source:	Order 👻	Target:	OrderLine		
Responsible Parties Documents	Name on Source:		Name on Target:			
Oynamic Properties	Source Entity Synonym:	Order 👻	Target Entity Synonym:	OrderLine		
Summary	Source to Target Cardinality:	*	Target to Source Cardinality:	1		
	Source Optional:	V	Target Optional:			
	Dominant Role:	None 💌				
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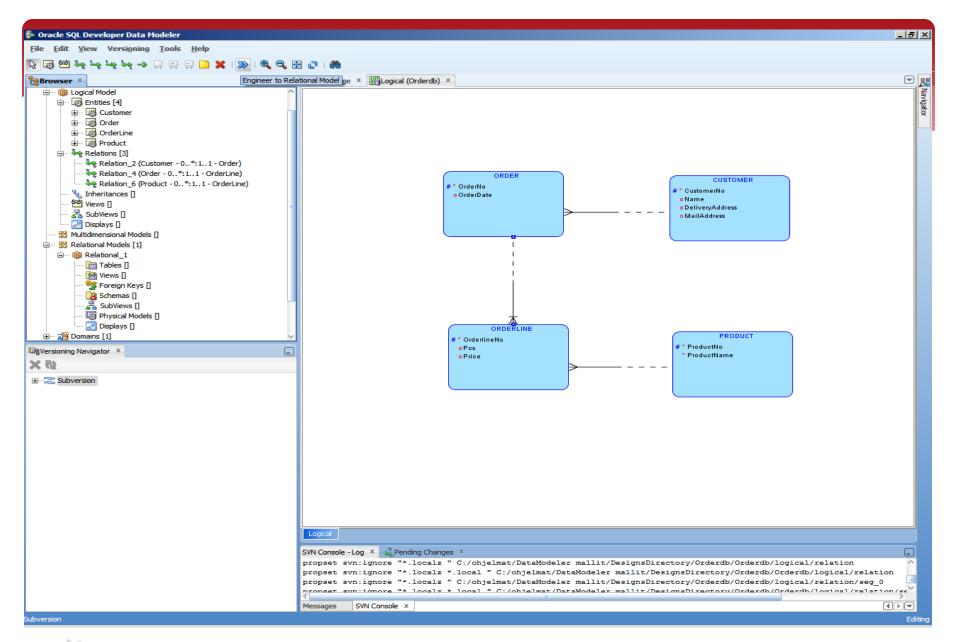


Relation Properties - Relation	L <u>4</u>	X				
General Engineer To	Summary					
Comments						
Comments in RDBMS	Object ID:	335E66D1-384E-C159-7406-4B1707E91E7F				
·····Notes ·····Attributes	Creator:	helskyaho_h				
Impact Analysis Measurements	Creation Time:	2012-09-17 10:04:52 EEST				
Change Requests Responsible Parties	Last Changed By:	helskyaho_h				
Documents Dynamic Properties	Last Changed Time:	2012-09-17 10:05:11 EEST				
Summary	Generator Name:	NONE				
	Design:	Orderdb				
	Repository OID:	NONE				
		<u>OK</u> <u>Apply</u> <u>Cancel</u> <u>H</u> elp				



From logical to relational







🐉 Engineer to Relational Model			×
Logical Til	ter Relati	ional_1	As SubView
Logical Control Entities Control Entity Hierarchies Control Control		elational_1 Tables Tables mapped to Hierarchies Objects mapped to relations Views Subviews	
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🖆 Engineer to Relational Model				×
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🖆 Engineer to Relational Model			<u>×</u>
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🖆 Engineer to Relational Model			×
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Details General Options Compare/Copy C	Options Synchronization of del	eted objects Overlapping ar	nd folding keys
Property	Selected Customer.Contact	Person	Customer.ContactPerson
Name ContactPerson			ContactPerson

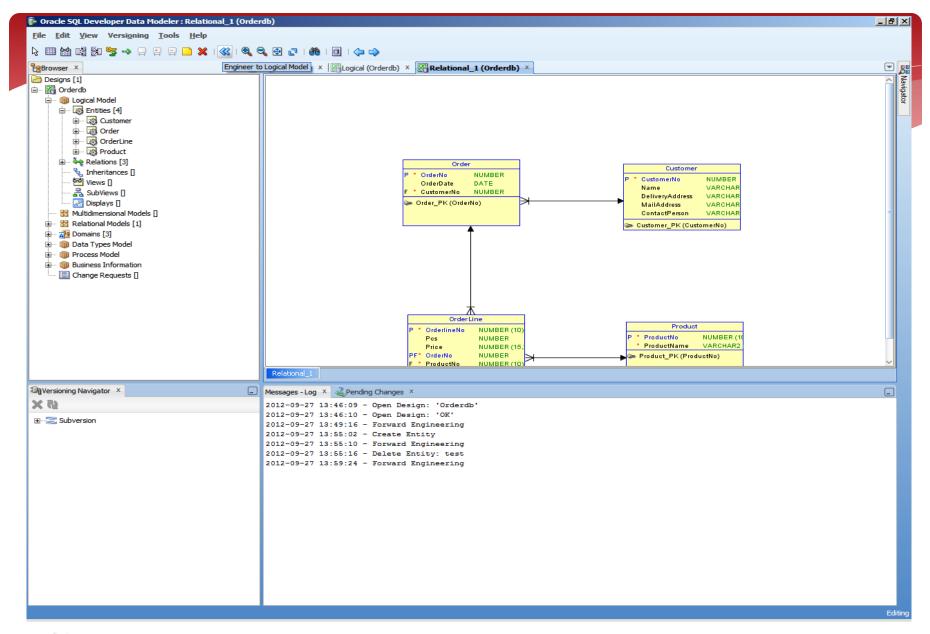
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Scope				
Type Substitution	true		true	
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Notes				
Comment in RDBMS				
Comment	Testing			
LOV Constraint				
Range Constraint				
Check Constraint				
Use Domain Constraint	false		false	
Check Constraint Name				
Default Value				
Mandatory	false		false	-
Data Type Kind		pe(VARCHAR)	Logical Type(VARCH	AR)
Data Type	VARCHAR		VARCHAR2 (100)	
Name	ContactPe	erson	ContactPerson	



Engineer to Relational I	Model							×
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Customer						er		
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Engineer to Relational Mo	odel	×
Logical	✓ <u>Filter</u>	Relational_1 As SubView
Logical Logical Logical Logical Logical Customer C		Relational_1 Tables Customer Order OrderLine Product Est Tables mapped to Hierarchies Objects mapped to relations Views Subviews
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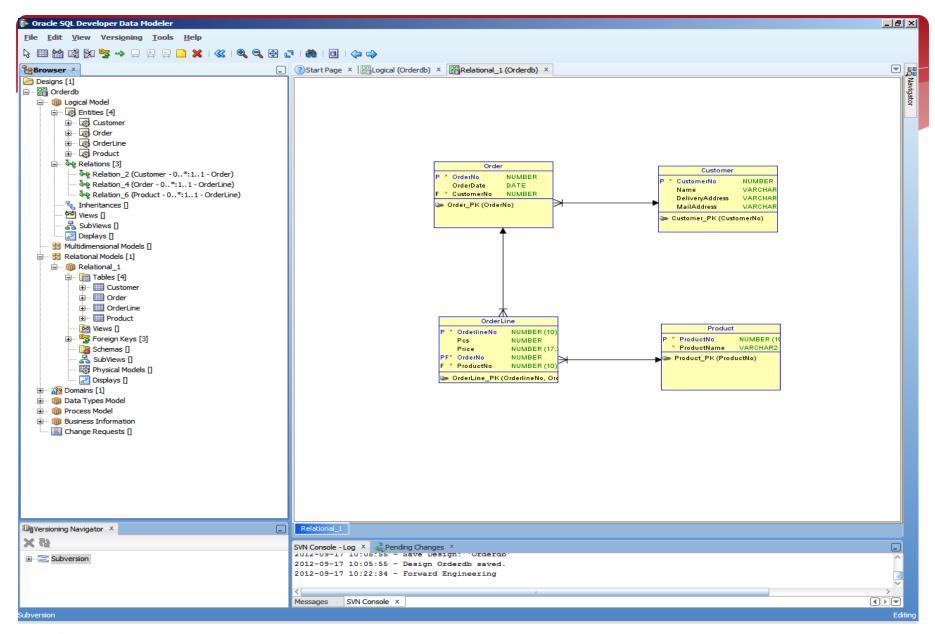




Relational model



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🐌 Table Properties - Customer					×
General					
Columns	General				
·····Primary Key					
·····Unique Constraints	Name:	C	ustomer		
Indexes					
·····Table Level Constraints	Long Name:	CL	ustomer		
Foreign Keys	Alberticker				
·····Nested Columns	Abbreviation	L			
·····Volume Properties	Engineer:	×	1		
Spatial Properties			1		
Column Groups	PK Name:	Cu	ustomer PK		
Comments					
Comments in RDBMS	Classification Type:				•
Notes	Toma Tabla Cooney				
Impact Analysis	Temp Table Scope:	L			
Measurements	Based on Structured Type:				•
Change Requests					
Responsible Parties	Schema				-
Documents					
Scripts	Register as Spatial Table:				
Dynamic Properties	Object Identifier is PK		1		
ⁱ Summary	Object Identifier IS PK]		
	Allow Type Substitution:	V]		
			*		
	Generate in DDL:]		
	<u>O</u> K	Apply	Naming Rules	Cancel	Help



튏 Table Properties - Customer				×
General Columns		Column	s	
Primary Key Unique Constraints Indexes Table Level Constraints Foreign Keys Nested Columns Volume Properties Spatial Properties Column Groups Comments Comments in RDBMS	Details Overview Security Columns: Name Data type 1 CustomerNo NUMERIC 2 name VARCHAR (50) 3 DeliveryAddress VARCHAR (200) 4 MailAddress VARCHAR (50)	Column Properties Name: Datatype: Type:	CustomerNo Domain CustomerNo CustomerNo	○ Distinct ▼ Preferred □
 Comments in Robbits Notes Impact Analysis Measurements Change Requests Responsible Parties Documents Scripts Dynamic Properties Summary 		Precision: Scale: PK Comments Comments	FK ments in RDBMS Notes	Mandatory
	<u>OK</u> <u>A</u> pply	<u>N</u> amin <u>c</u>	g Rules <u>C</u> ancel	Help



👵 Table Properties - Customer				
General				
Columns	Primary Key			
Primary Key				
Unique Constraints	🅎 I 🗙			
Indexes				
Table Level Constraints				
Foreign Keys	Name Customer PK			
Nested Columns	Columns			
Volume Properties	name			
Spatial Properties	DeliveryAddress			
Column Groups	MailAddress			
Comments				
Comments in RDBMS				
Notes				
Impact Analysis				
Measurements				
Change Requests Responsible Parties	Engineer Generate			
Documents				
Scripts	Notes Comments in RDBMS			
Dynamic Properties				
Summary				
Summary				
	OK Apply Naming Rules Cancel Help			



🐌 Table Properties - Customer			X
General			
Columns	Unique Constraints		
Primary Key			
Unique Constraints	💯 I 🕂 💥 🔂 🕹		
Indexes			
Table Level Constraints	Name	Generate	Engineer
Foreign Keys			-
Nested Columns			
Volume Properties			
Spatial Properties			
Column Groups			
Comments	Columns		
Comments in RDBMS	CustomerNo		
Notes	name		
Impact Analysis Measurements	DeliveryAddress		
Change Requests	MailAddress 🔂		
	3		
Documents			
Scripts			
Dynamic Properties			
Summary			
	Notes Comments in RDBMS		
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	OK Apply Naming Rules Cancel		Help

튏 Table Properties - Customer		×
General		
Columns	Indexes	
Primary Key		
Unique Constraints	🕎 🕂 💥 🔂 🕹	
Indexes		
·····Table Level Constraints	Name Unique Generate	Engineer Spatial
Foreign Keys		
Nested Columns		
Volume Properties		
Spatial Properties		
Column Groups		
Comments	Index Expression:	
Comments in RDBMS	Columns	
Notes	CustomerNo	Desc
····Impact Analysis	name	
Measurements	DeliveryAddress	
Change Requests	MailAddress	
Responsible Parties		
Documents		
Scripts		
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👵 Table Properties - Customer		X
General		
Columns	Summary	
Primary Key		
	Object ID: 3D8F3AA6-04B6-2FB7-A73D-CE677D82F540	
Indexes		_
·····Table Level Constraints	Creator: helskyaho_h	
Foreign Keys	Creation Time: 2011-12-13 11:35:20 EET	
·····Nested Columns		
·····Volume Properties	Last Changed By: helskyaho_h	
Spatial Properties		_
Column Groups	Last Changed Time: 2012-01-19 13:17:27 EET	
Comments	Generator Name: Customer	
Comments in RDBMS Notes		
Impact Analysis	Design: OrderDB	
Measurements		_
Change Requests	Repository OID: NONE	
Responsible Parties		
Documents		
Scripts		
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Summary		
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	<u>QK</u> <u>Apply</u> <u>Naming Rules</u> <u>Cancel</u> <u>Help</u>	



Column



Column Properties - Customer	No	×
General		
Default and Constraint		General
Auto Increment		
Security	Name:	CustomerNo
UI Defaults		
Permitted Subtypes Comments	Table:	Customer
Comments in RDBMS	Abbreviation	
Notes		
Impact Analysis	Engineer:	✓
Measurements		
Change Requests	Allow Nulls:	
Responsible Parties	Datatype:	NUMBER [NUMERIC]
Documents	Datatype.	
Dynamic Properties	Type:	▼
Summary		
	Computed:	
	Column Franciscu	
	Column Expression:	
	Auto Increment	Identity Column
	Scope:	· · · · · · · · · · · · · · · · · · ·
	Type Substitution:	ALL
	OK Apply	Cancel Help



🖆 Column Properties - Customer	No	×
General		
Default and Constraint	Defaul	t and Constraint
Auto Increment		
Security	Constraint Name:	
UI Defaults		
Permitted Subtypes	Not Null Constraint Name:	
Comments	Uses Default:	
·····Comments in RDBMS	Uses Default:	
····Notes	Default Value:	
·····Impact Analysis		
Measurements	Use Domain Constraints:	
Change Requests		LIGHT
Responsible Parties	Constraint:	NONE
Documents Dynamic Properties	List Of Ranges:	Values
Summary		
Juninary	List Of Values:	Values
L		
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Primary Key



🗊 Primary Key Properties - Custo	omer PK	×
General		
Comments		General
Comments in RDBMS		
Notes	Name:	Customer PK
····Impact Analysis		Customer.Customer PK
Measurements	Long Name:	Customer PK
Change Requests Responsible Parties	Engineer:	
Documents		
Dynamic Properties	Table:	Customer
Summary	Shahar	
,	State:	Primary Key 💌
	Schema	▼
	Generate in DDL:	
	Columns	
	name	Column
	DeliveryAddress	CustomerNo
	MailAddress	
		- ₽
L]		
	<u>Q</u> K <u>Apply</u>	<u>Cancel</u> <u>H</u> elp



Foreign Key



🕞 Foreign Ke	Properties -	Delation 1
	A LIODCICICO	

General		
Associated Columns	Gene	eral
·····Comments		
·····Notes	Name:	Relation_1
·····Impact Analysis		
·····Dynamic Properties	Table:	OrderLine
ⁱ Summary	PK / UK Index:	Order.Order PK 🔹
	Delete Rule:	
	Source Table Synonym:	Order 💌
	Target Table Synonym:	OrderLine 👻
	Mandatory:	✓
	Transferable (Updatable):	
	Generate in DDL:	✓
	In Arc:	
		Cancel <u>H</u> elp

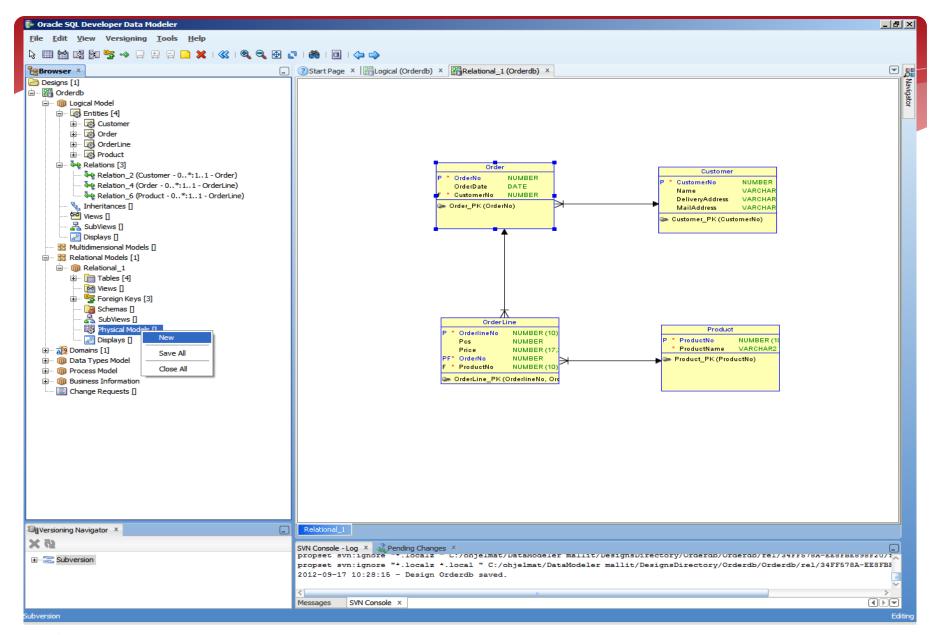


Foreign Key Properties - Relatio	n_1		×
General Associated Columns Comments	Associat	ed Columns	
 Notes Impact Analysis Dynamic Properties Summary 	Parent Column OrderNo	Child Column OrderNo	
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From relational to physical







Select Site:		
Oracle Database 12c		
Oracle Database 11g		
Oracle Database 10g		
Oracle9i		
SQL Server 2012		
SQL Server 2008		
SQL Server 2005		
SQL Server 2000		
DB2/390 8		
DB2/390 7		
DB2/UDB 9		
DB2/UDB 8.1		
DB2/UDB 7.1		
TEST11		
TEST 10		



ata Modeler

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A ³ 9	Domains Administration	Alt+Shift-D
2	Types Administration	Alt+Shift-T
20	RDBMS Site Administration	Alt+Shift-B
A]9	Mask Templates Administration	Alt+Shift-S
B	T <u>a</u> ble To View Wizard	Alt+Shift-A
2	View To Table Wizard	Alt+Shift-V
AP9	Types To Domains Wizard	Alt+Shift-P
(ap)	Name Abbreviations	Alt+Shift-N
(ab)	Glossary Editor	Alt+Shift-Y
(ap)	Object Names Administration	
3	Design Rules And Transformations	
11	Compare/Merge Models	Alt+Shift-M
	Features	
	Preferences	



🖗 RDBMS Site Editor	×
Current Design Edit external file with sites	
RDBMS Sites	RDBMS Site Properties
Orade Database 11g	
Orade Database 10g	Name:
Orade9i	
SQL Server 2005	RBDMS Type: Orade Database 11g 💌
SQL Server 2000	
DB2/390 8 DB2/390 7	
DB2/UDB 8.1	
DB2/UDB 7.1	
Add Site Remove Site	
OK	Apply <u>Close</u> <u>Help</u>



RDBMS Site Edito	r					
Current Design Ed	dit external file with sites					
RDBMS Sites			RDBMS	Site Properties-		
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SQL Server 2005			RBDN	IS Type:	Oracle Database 11g	-
SQL Server 2000						
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DB2/390 7						
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DB2/UDB 7.1						
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🖗 RDBMS Site Editor

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Oracle9i						
SQL Server 2005				RBDMS Type:	Orade Database 11g	-
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DB2/390 7 DB2/UDB 8.1						
DB2/UDB 7.1						
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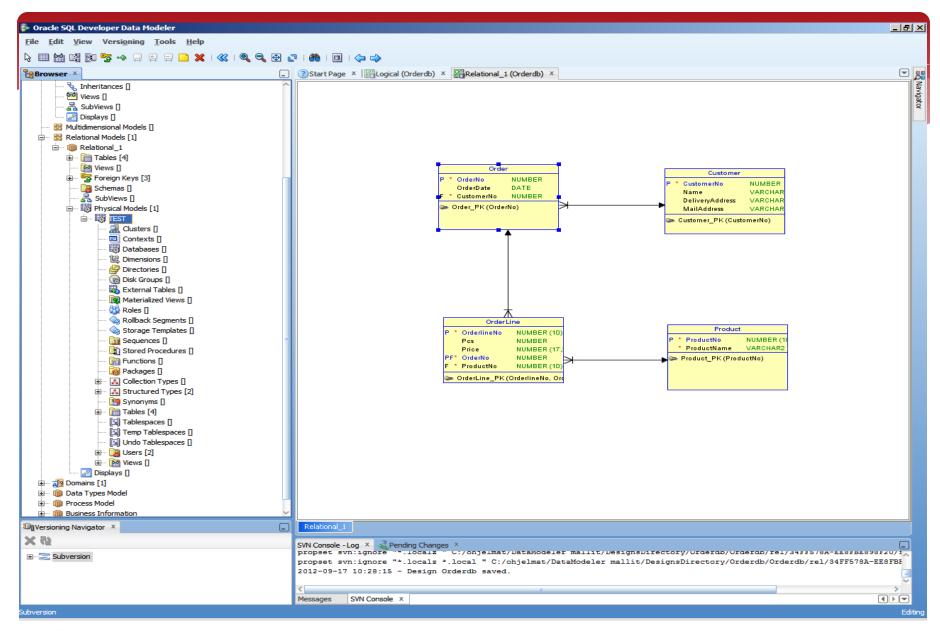


Database Sites
Select Site:
Oracle Database 11g
Oracle Database 10g
Oracle9i
SQL Server 2005
SQL Server 2000
DB2/390 8
DB2/390 7
DB2/UDB 8.1
DB2/UDB 7.1
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Physical model





Properties



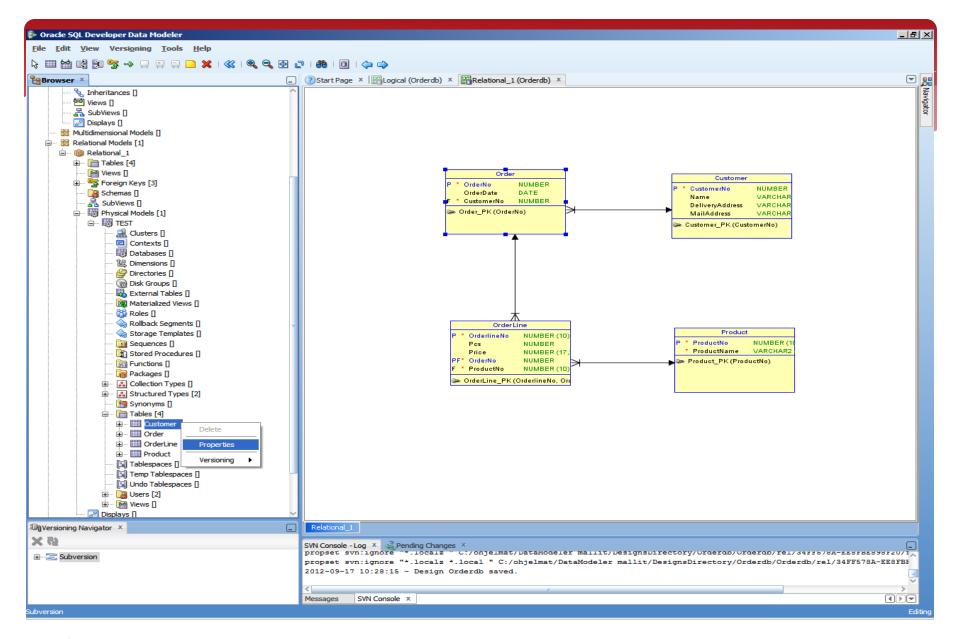


Table Propertie					×	
upplemental Log	OID Properties	XMLType Properties	Comments			
General	Cluster Columns	Partitioning	IC	OT Properties		
lame:		Customer				
lser:					.	
					-	
emporary:		NO			-	
ableSpace:						
abicopace.					-	
)rganization:		HEAP			-	
luster:					•	
					-	
ogging:		YES			-	
torage:					51	
waye.					-	
ache:		NO			•	
arallel:						
arancı.		NO			-	
egree:						
ow Dependency:						
tow Dependency:		NO			-	
artitioned:		NO			-	
And Managements					51	
ow Movement:		ENABLE			-	
ata Compression:		NO			•	
have been a to the second						
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mplement as Mater	ialized View:				-	
🔅 Propagate P	Properties	A_Pe	ermissions			
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		Apply				



operties ected			
elected			
	Name	Value	
~	User		
~	Temporary	NO	
~	Preserve Rows	YES	
~	TableSpace		
×	Organization	HEAP	
~	Cluster		
~	Logging	YES	
~	Storage		
~	Cache	NO	
~	Parallel	NO	
~	Degree		
~	Row Dependency	NO	
~	Partitioned	NO	
~	Row Movement	ENABLE	
~	Data Compression	NO	
bjects			
elected	Name		
	Order		
	OrderLine		
	Product		



🕞 TableSpace Prope	rties - TableSpace	1	×
Indexes Storage	Materialized Views	Comments	
General	Default Storage	Clusters	Tables
Name:		TableSpace 1	
Datafiles:		NO	
File Type:			-
Min. Ext Len:		0	
Block size:		0	
Logging:		LOGGING	
Force Logging:		NO	-
Status:		ONLINE	
Contents:		PERMANENT	_
Default Compression:			_
Ext. Management:		LOCAL	_
EM Local SubType:		AUTOALLOCATE	
EM Uniform Size:		0	
Seg. Management:			
Flashback Mode:		ON	
Propagate Prop	perties		
<u>0</u>		ply <u>C</u> ancel	



Role Properties - Role1	×
General Roles SystemPrivileges	Comments
Name:	Role1
Identified:	NO
Identification Type:	BY_PASSWORD
Password:	
Schema:	
Serence.	
Package:	
	🇞 Permissions
<u>O</u> K	Apply <u>C</u> ancel



equences Synonyms	s Procedures Con	nments		
Materialized Views	Triggers	Views	Dim	ensions
General Roles	System Privileges	Clusters	Tables	Indexes
lame:	Use	r3		
uthentication:	BY	PASSWORD		•
dentifier:		-		
uenuner:				
ableSpace:				-
emp TableSpace:				
emp TS Group:				
rofile:				
assword Expire:	NO			•
ccount Lock:	NO			-
xternal Name:				
mplements Schema:				
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		🛛 🐍 Pe	rmissions	
OK	Apply		ancel	1

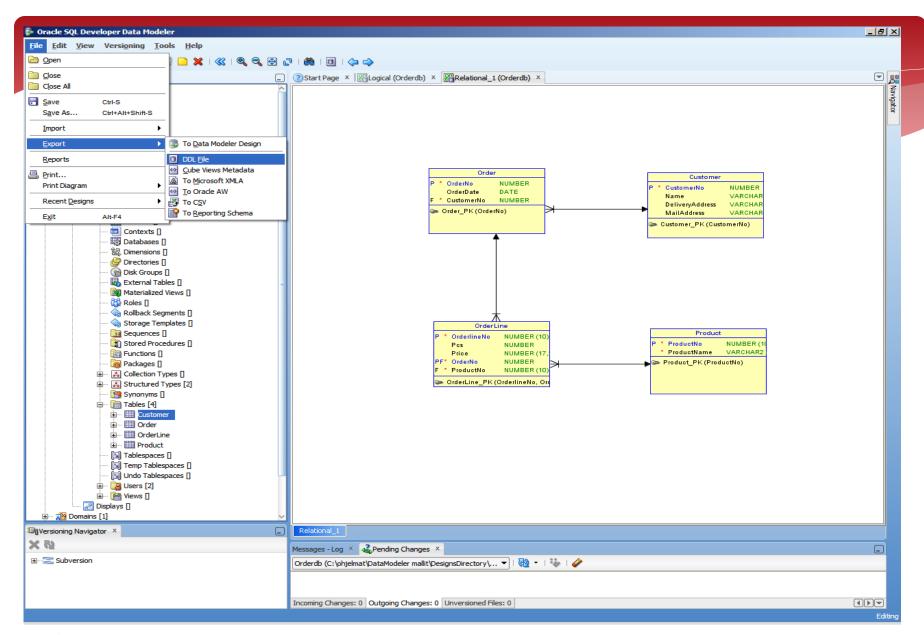


Permissions						×
All Users/Roles]	Privileg	ged Users/Roles-			
Users Roles		Туре	User/Role		Privileges/Permissions	
MDSYS						
PUBLIC						
		Availa	able Privileges		Granted Privileges	
				F	Privilege	
Columns		<u>0</u> K		ply		



Physical to DDLs





DDL File Editor				_ 🗆
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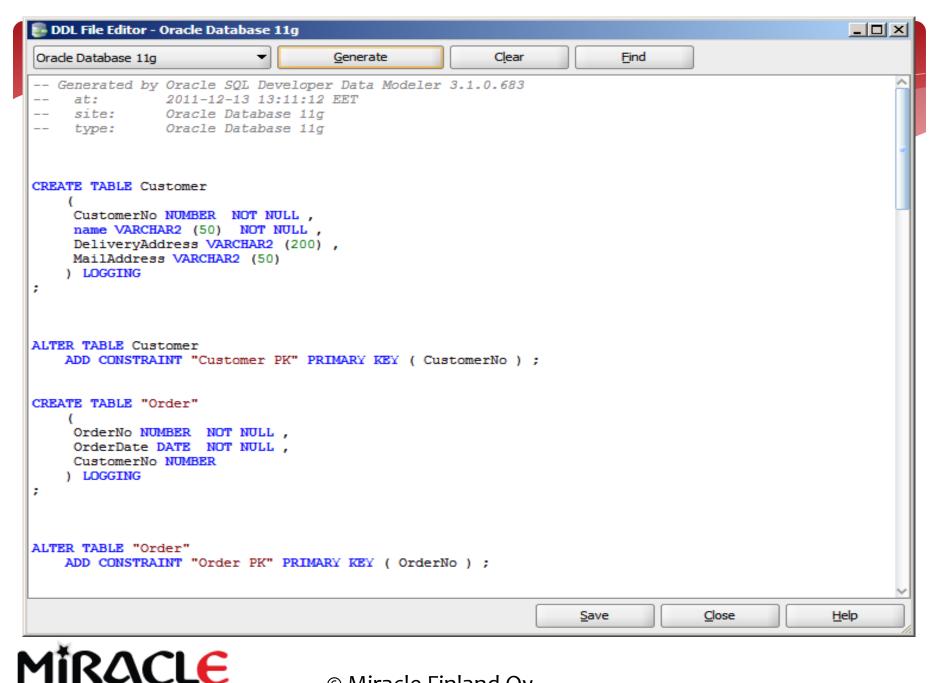


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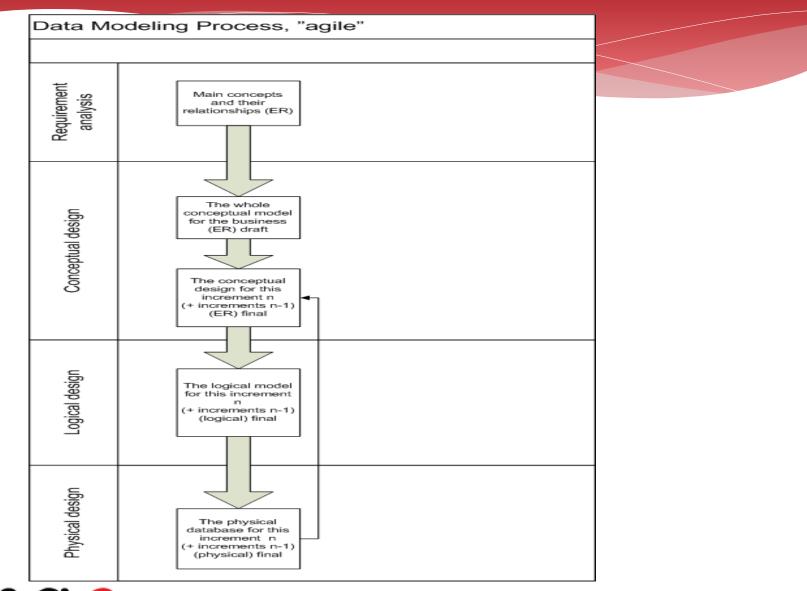
Requirement analysis (Logical, ER: main concepts)

Conceptual design (Logical, ER: the big picture)

Logical design (Logical ER: iteration 1-n, Relational iteration 1-n)

Physical design (Relational iteration 1-n, Physical iteration 1-n, DLLs 1-n iteration)





Other functionalities



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Export/Import



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Domains Administration

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Domains Administration

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Column Properties - Price		×
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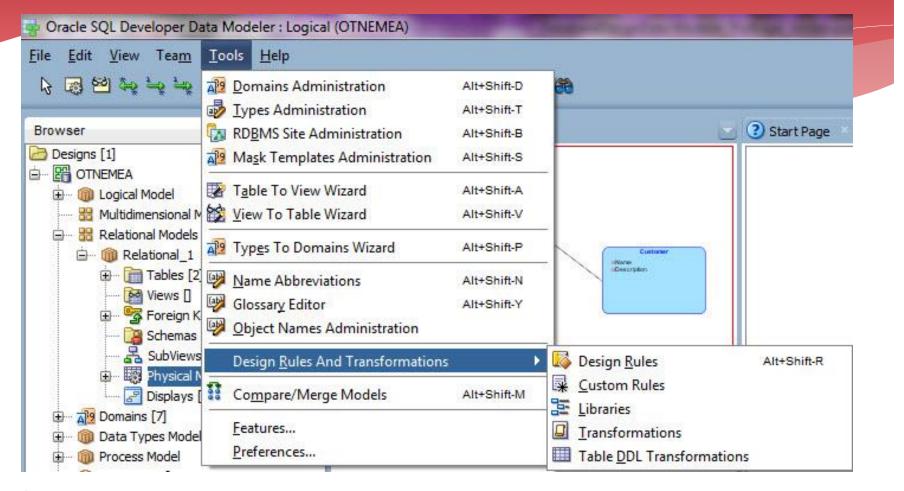
Types Administration

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8	Table To View Wizard	Alt+Shift-A	
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F Types Administration					×
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Design Rules





📮 Design Rules

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🐉 Design Rules

Design Rules Rule Sets	Results				
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Rules	Error: Customer: no comments in RDBMS defined, no comments defined				
🖶 🛅 General	Warning: Order: Table has columns with undefined security properties				
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	Warning: Customer_Customer_PK: Primary key with wrong naming standards is not recommended.				
	Warning: Order.Order_PK: Primary key with wrong naming standards is not recommended.				
	Warning: Order.Relation_2: Foreign keys with wrong naming standards are not recommended.				
	Warning: OrderLine.OrderLine_PK: Primary key with wrong naming standards is not recommended. Warning: OrderLine.Relation_4: Foreign keys with wrong naming standards are not recommended.				
	Warning: OrderLine.Relation_4: Foreign keys with wrong naming standards are not recommended. Warning: OrderLine.Relation_6: Foreign keys with wrong naming standards are not recommended.				
	Warning: OrderLine.Relation_6: Foreign keys with wrong naming standards are not recommended. Warning: Product.Product_PK: Primary key with wrong naming standards is not recommended.				
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	Warning: Order: The name is a reserved word: Order				
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Different Compares

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



Different Compares, Designs

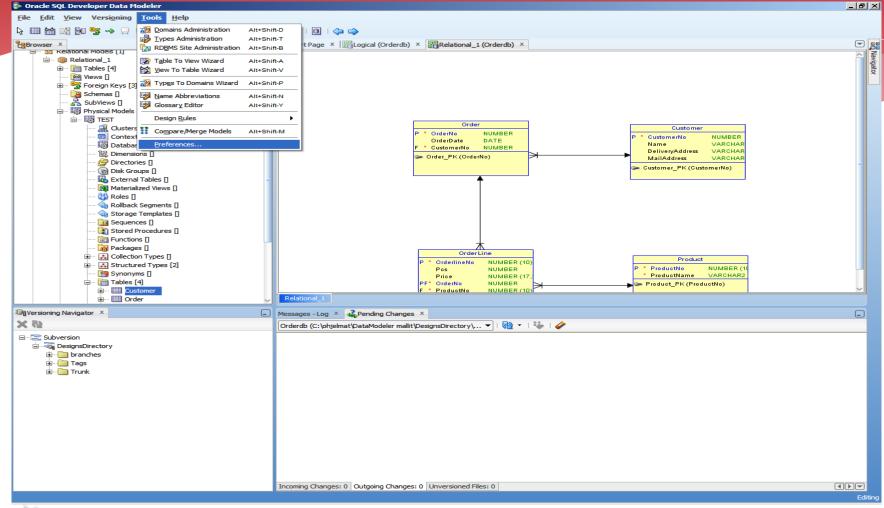
- * File | Import | Data Modeler Design
 - * Compares "everything"
- * Tools | Compare/Merge Models
 - * Compares only relational and physical models
 - * ALTER DDLs can be generated
- These can be used for instance to compare different versions of the design from version control



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







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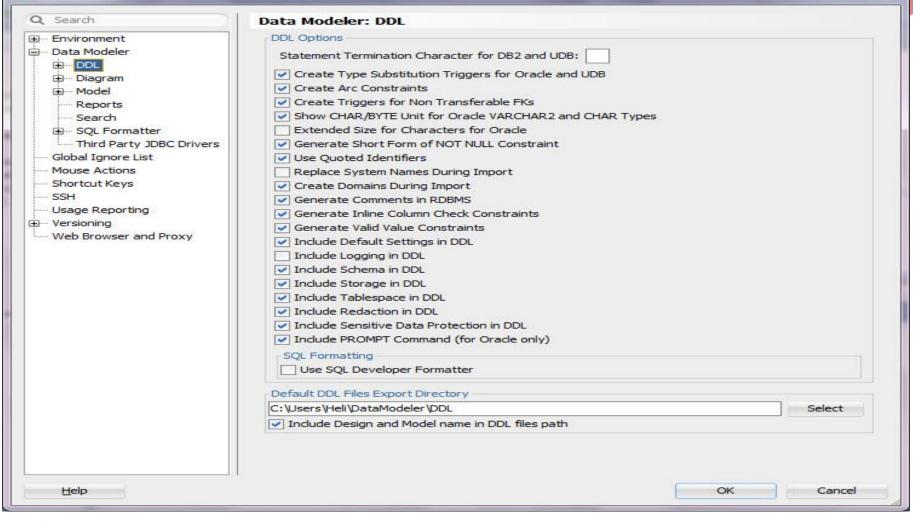
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- Web Browser and Proxy	Default System Types Directory	
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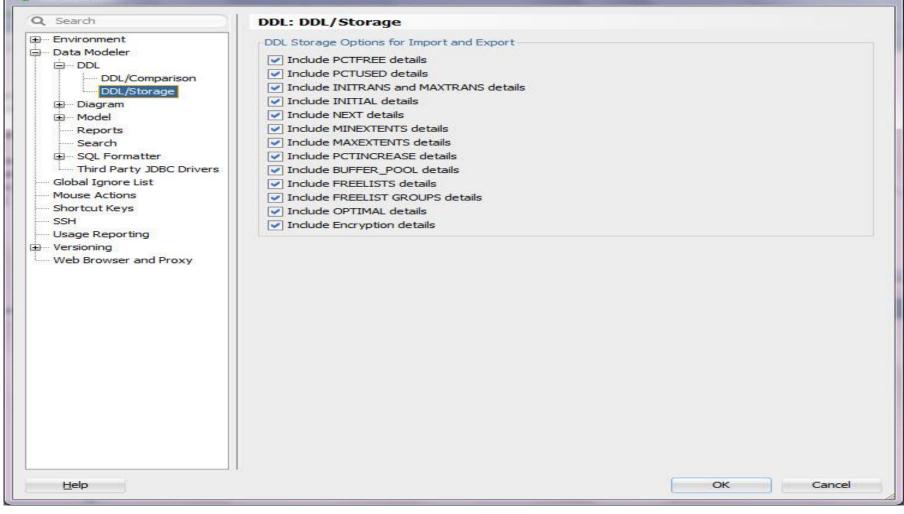


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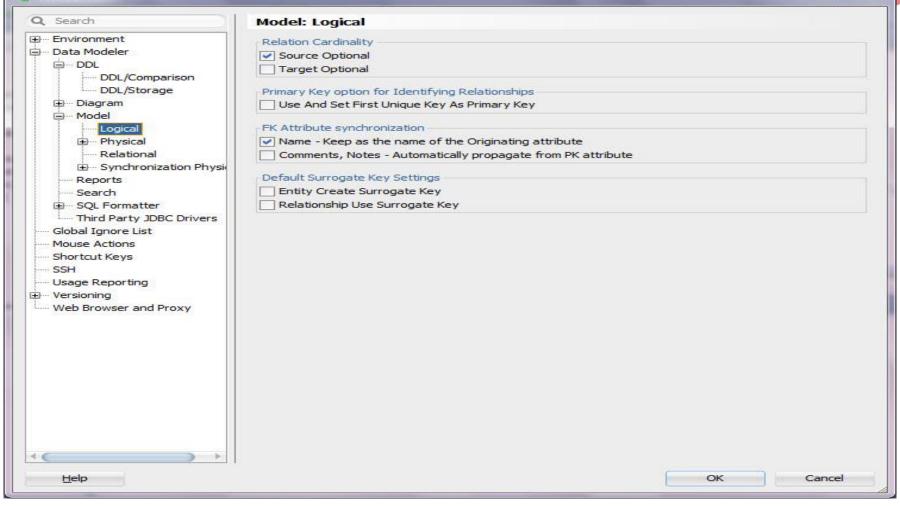
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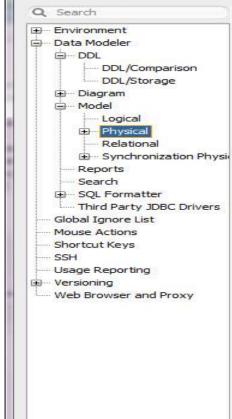
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✓ Use Index Template	Vi	ew/Edit		
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Default Sequence Name:		{table}_{column}_SEQ		Add Variable
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Design Properties



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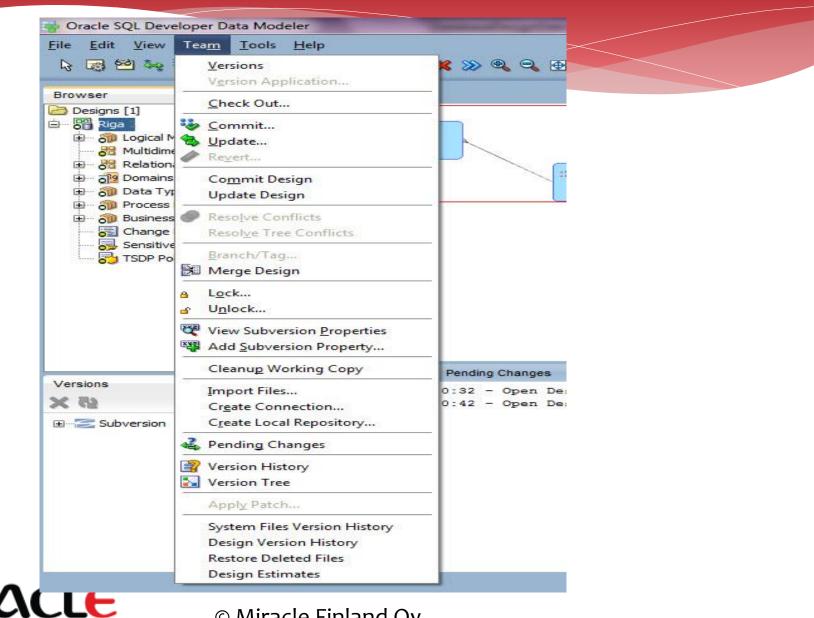
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Compare Mappings	Table Constraints						
⊕…Diagram ⊡…DDL	Primary Key	{table}_PK	Add Variable				
Migration	Foreign Key	{child}_{parent}_FK	Add Variable				
Naming Standard	Check Constraint	(table}_CK	Add Variable				
Attribute	Unique Constraint	Unique Constraint {table}_{column}_UN					
Column Domain Entity Table <mark>Templates</mark>	Index {table}_{column}_IDX						
	Automatic Index {table}_{column}_IDX						
	Column Check Constraint	nt CK_{table}_{column}					
	Not Null Constraint	nstraint NNC_{table abbr}_{column}					
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Comments	Surrogate Key	{table abbr}_PK	Add Variable				
Notes	Surrogate Key Column Discriminator Column	{table abbr}_ID	Add Variable				
Summary		{table abbr}_TYPE	Add Variable				
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	Primary Identifier {entity	PK	Add Variable				
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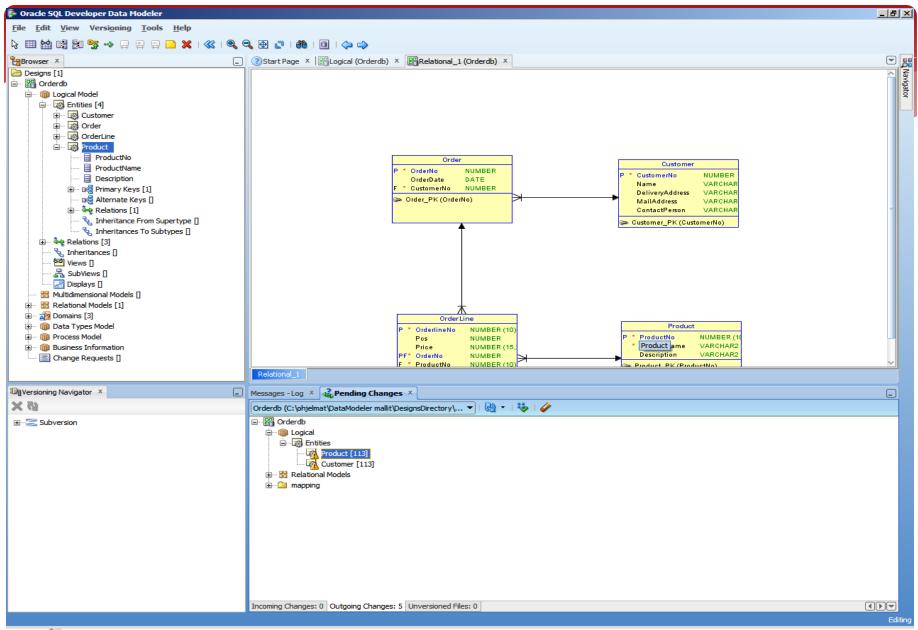
Version control (Subversion)



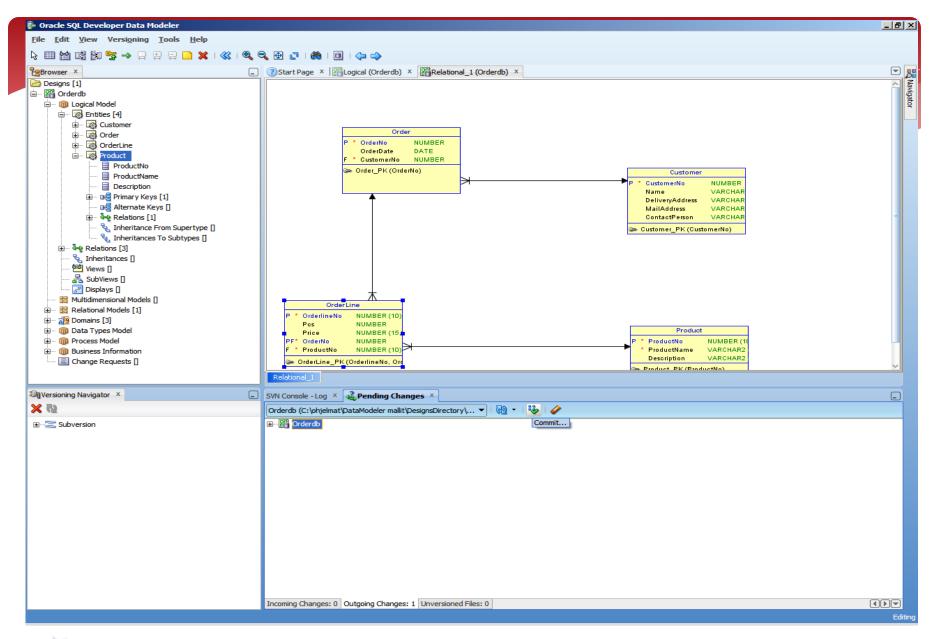
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Conclusions

- * 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?

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