Information Systems Project

Innovator 12.3 HOWTO

Please be patient with the Innovator. It can be quite slow.

In the virtual machine of the databases lab (machine Schoop) start Innovator 12.3:

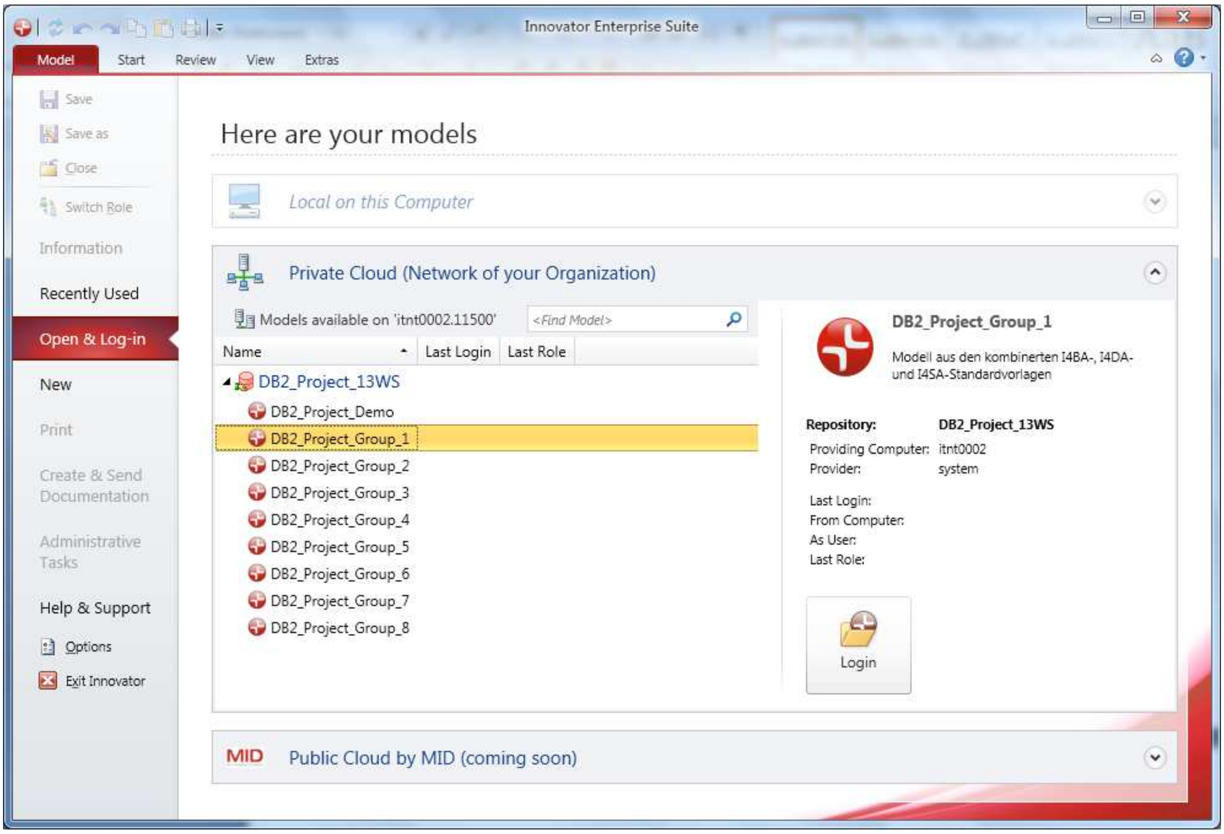
Start → Innovator

or

Start → All Programs → Innovator 12.3 → Innovator

Select the model for your group:

Choose „Open & Log-in" on the left and then choose the model of your group (e.g. **InfoSys_Group_1**) in the repository **InfoSys_17SS**. Click on the button "Login" on the right. Select "OOER_Mappinguser" in the role "Software Architect" with an empty password. The role "Software Architect" is necessary for the UML modeling. The role "Database Architect" will be used later for the ER modeling (conceptual modeling). The data repository, where the model is stored, is located on a server. Consequently, you can work on your model sitting at various locations.



Here are your models

Models available on 'itnt0002.11500'

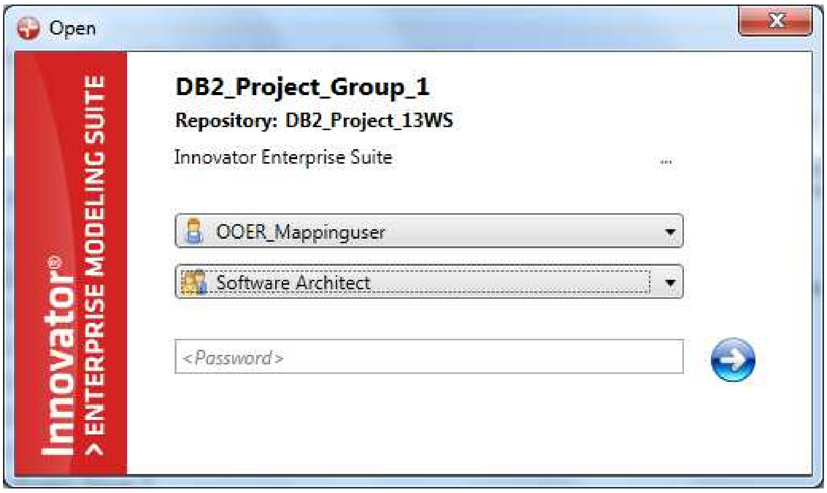
Name	Last Login	Last Role
DB2_Project_13WS		
DB2_Project_Demo		
DB2_Project_Group_1		
DB2_Project_Group_2		
DB2_Project_Group_3		
DB2_Project_Group_4		
DB2_Project_Group_5		
DB2_Project_Group_6		
DB2_Project_Group_7		
DB2_Project_Group_8		

DB2_Project_Group_1

Modell aus den kombinerten I4BA-, I4DA- und I4SA-Standardvorlagen

Repository: DB2_Project_13WS
Providing Computer: itnt0002
Provider: system

Last Login:
From Computer:
As User:
Last Role:



DB2_Project_Group_1

Repository: DB2_Project_13WS

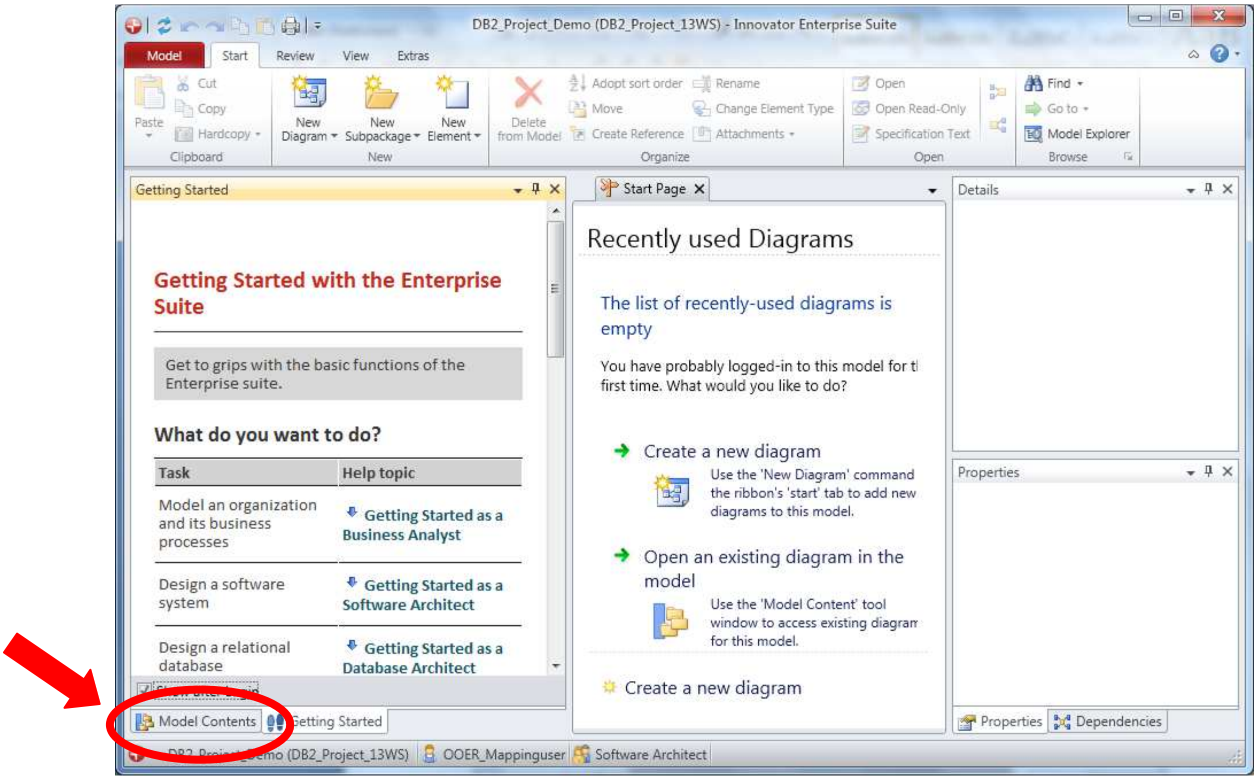
Innovator Enterprise Suite

OOER_Mappinguser

Software Architect

<Password>

In the window, which opens, click on the tab “Model Contents” in the bottom left corner and then on “Model Structure” to see the structure of the model´s contents in the panel on the left. In the first step, a UML data model is to be constructed.



Getting Started with the Enterprise Suite

Get to grips with the basic functions of the Enterprise suite.

What do you want to do?

Task	Help topic
Model an organization and its business processes	Getting Started as a Business Analyst
Design a software system	Getting Started as a Software Architect
Design a relational database	Getting Started as a Database Architect

Recently used Diagrams

The list of recently-used diagrams is empty

You have probably logged-in to this model for t first time. What would you like to do?

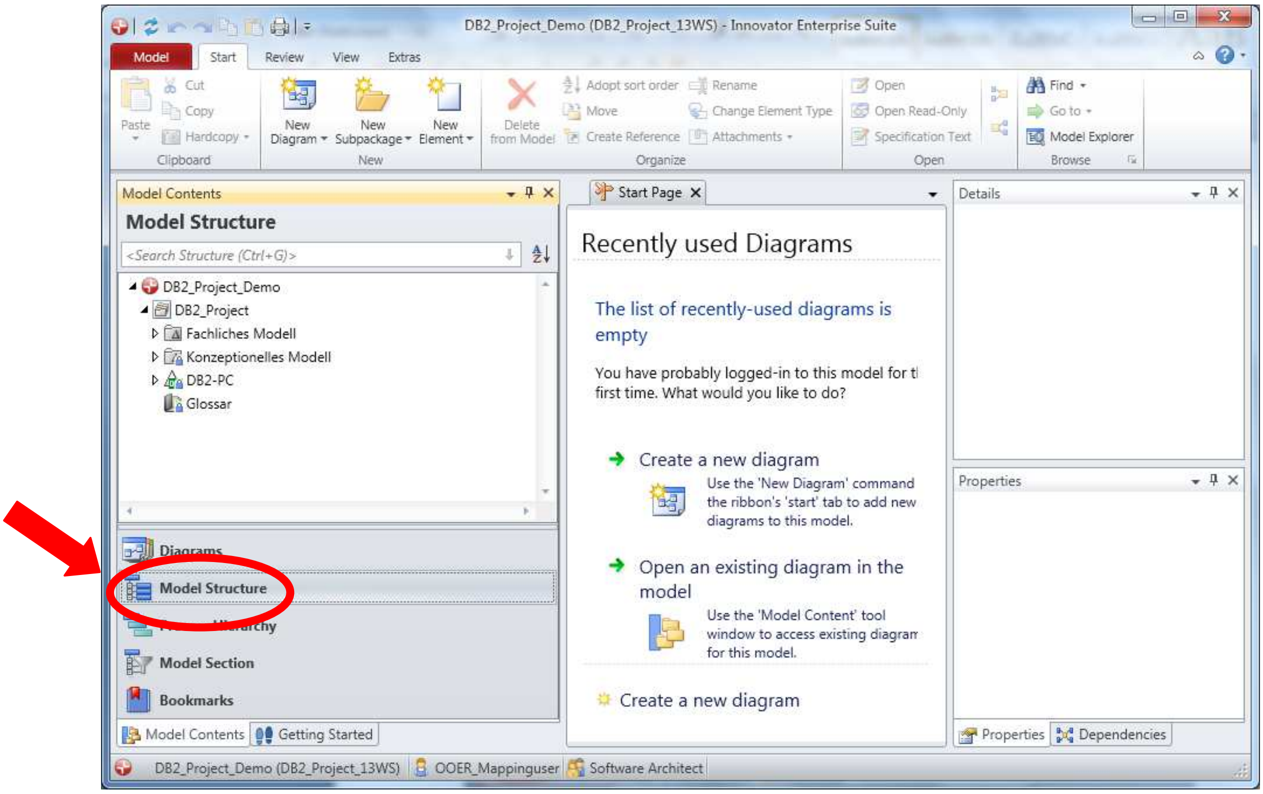
Create a new diagram

Use the 'New Diagram' command the ribbon's 'start' tab to add new diagrams to this model.

Open an existing diagram in the model

Use the 'Model Content' tool window to access existing diagram for this model.

Create a new diagram



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Use the 'Model Content' tool
window to access existing diagram
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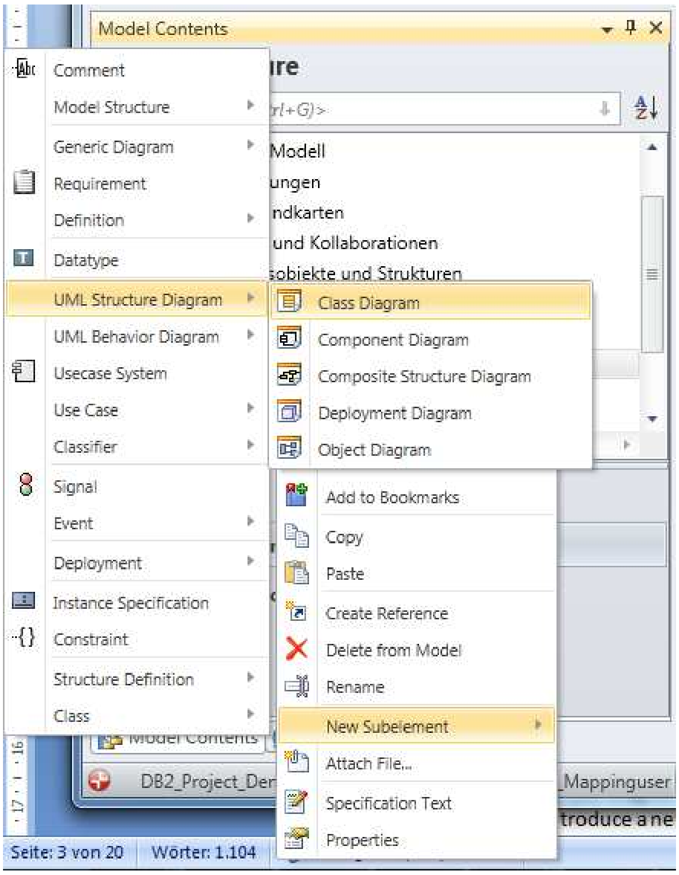
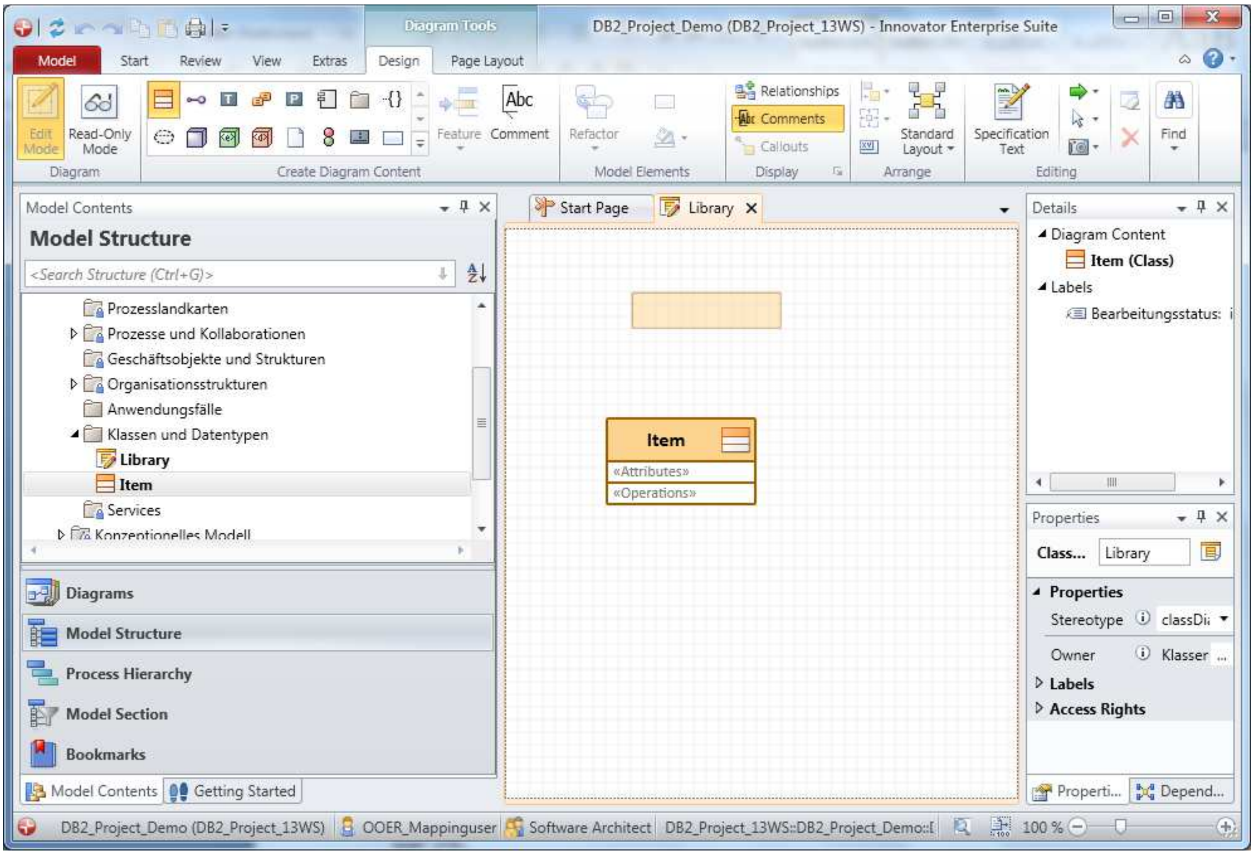
Create a new diagram

The folder „Fachliches Modell“ will contain the UML data model. The folder “Konzeptionelles Modell” will hold the ER model generated from the UML data model. And finally, the folder “DB2-PC” will contain the data model for the DB2 database, i.e. the physical model.

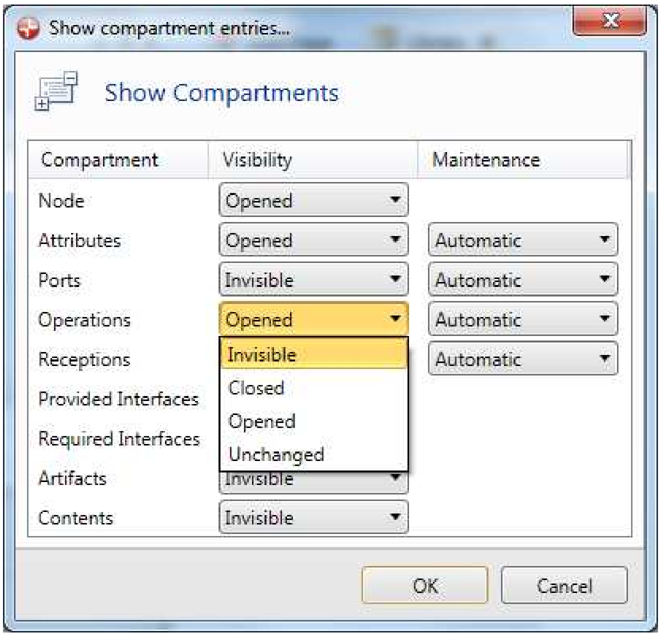
Open the folder “Fachliches Modell” and right-click on “Klassen und Datentypen“. Select „New Subelement“ → „UML Structure Diagram“ → “Class Diagram” from the pop-up menu. Give the diagram a name. New entities can be defined in the diagram. Note that you can have various diagrams and that the existence of entities is not dependent on their occurrence in diagrams. Moreover, the same entity can occur in several diagrams at the same time. The removal of an entity from a diagram does not result in the deletion of the entity. To delete an element permanently you have to choose “Delete from model” in the context menu.



Choose the menu “Design”, select the class icon and drag it into the diagram. Note that the new entity is also listed under “Klassen und Datentypen”.



Since we do not need the compartment “Operations”, it can be made invisible by right-clicking on an entity, selecting “Show compartments entries…” and selecting “Operations” to be invisible. To resize an entity to the minimal size you can select the entity and click on “Design” → “Optimize Size” (F8).

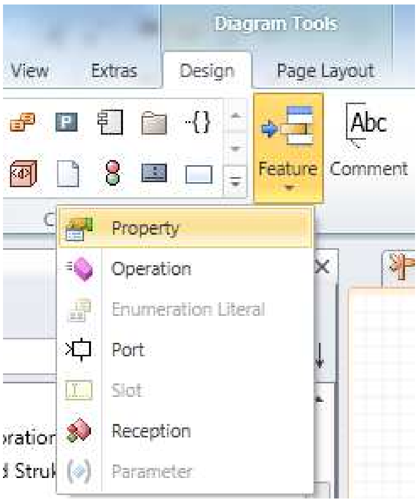


Show compartment entries...

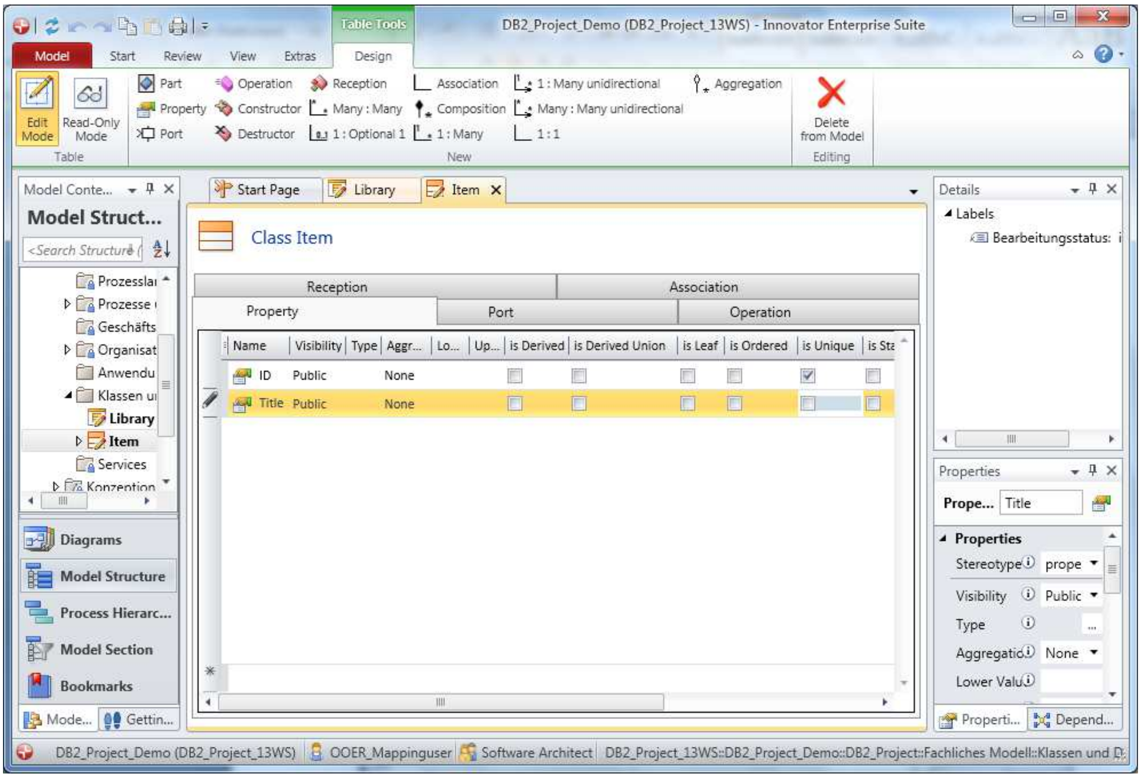
Show Compartments

Compartment	Visibility	Maintenance
Node	Opened	
Attributes	Opened	Automatic
Ports	Invisible	Automatic
Operations	Opened	Automatic
Receptions		Automatic
Provided Interfaces		
Required Interfaces		
Artifacts	Invisible	
Contents	Invisible	

From the feature menu select “Property” to add an attribute. Select a name for the attribute.



When you double-click on the list of attributes in the entity you get an overview of the attributes. Do not specify data types, default values, uniqueness, specification texts etc. since they will not be mapped into the ER data model. In particular, it is not possible to select a primary key yet.



Class Item

Reception | Association

Property | Port | Operation

Name	Visibility	Type	Aggr...	Lo...	Up...	is Derived	is Derived Union	is Leaf	is Ordered	is Unique	is Sta
ID	Public		None			□	□	□	□	☑	□
Title	Public		None			□	□	□	□	□	□

Prope... Title

Properties

Stereotype: prope

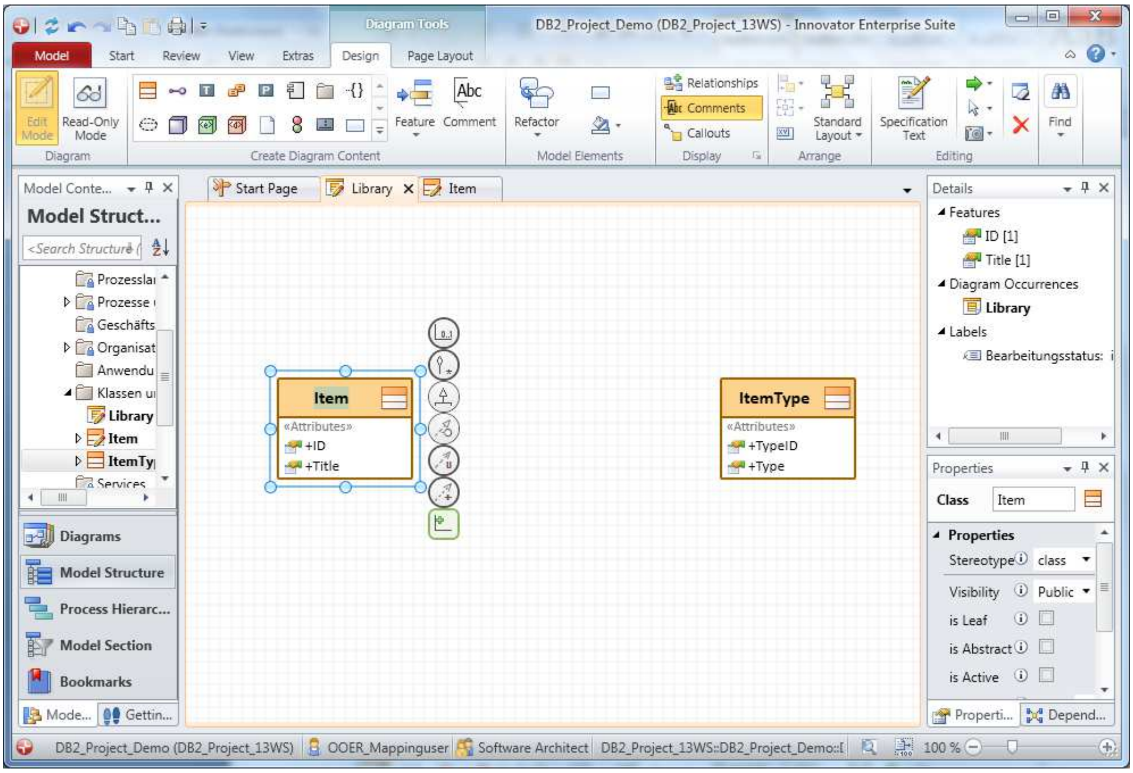
Visibility: Public

Type: ...

Aggregatio: None

Lower Valu:

When the mouse is over an entity in the diagram, there is a context menu (usually to the right) of the entity which allows you to relate entities. The first submenu allows you to define relationships. The third submenu allows you to define generalizations.



Class Item

Properties

Stereotype: class

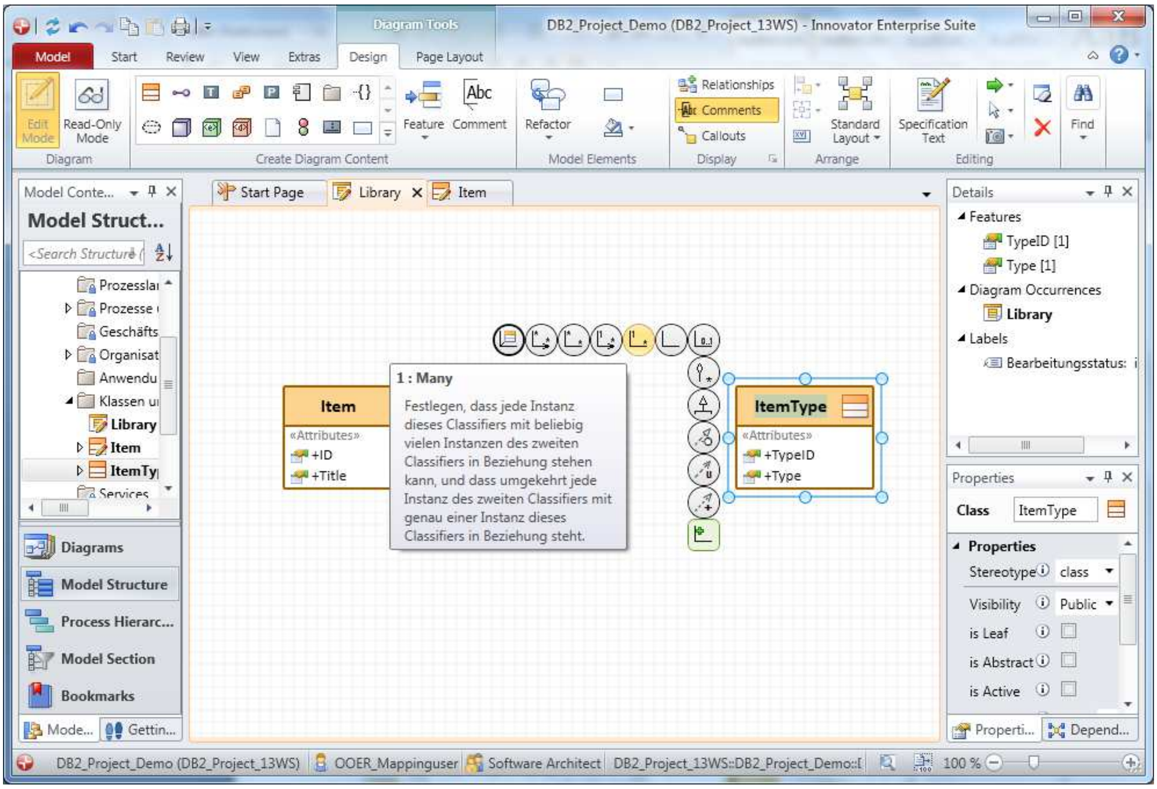
Visibility: Public

is Leaf: □

is Abstract: □

is Active: □

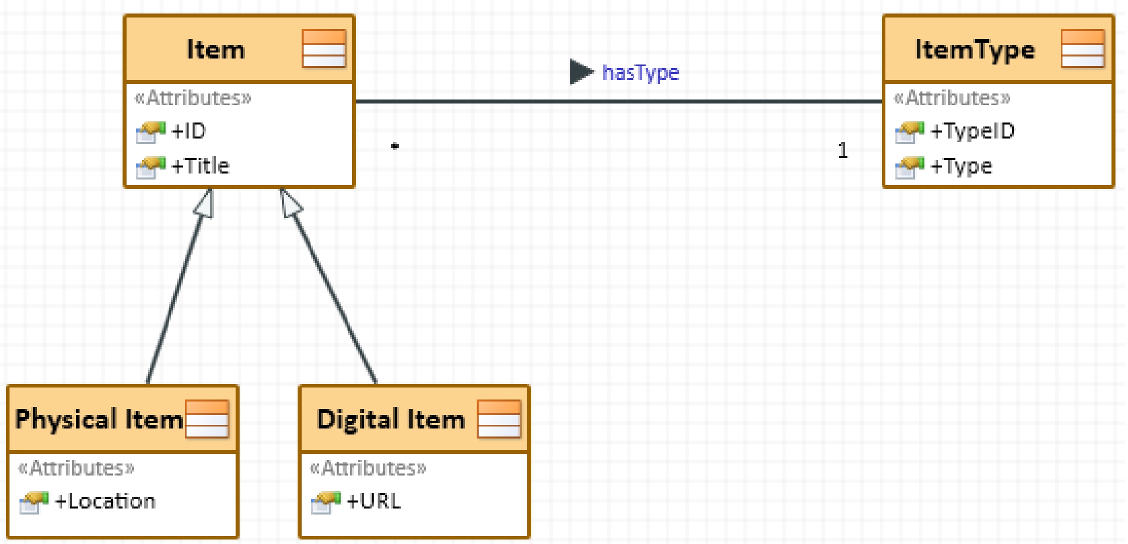
You can select the relationship type you need and drag the end of the relationship type to the other entity. You may choose the multiplicity of the relationship (1-1, 1-*, *-*). However, these can be changed later in the properties sub-pane in the bottom right.



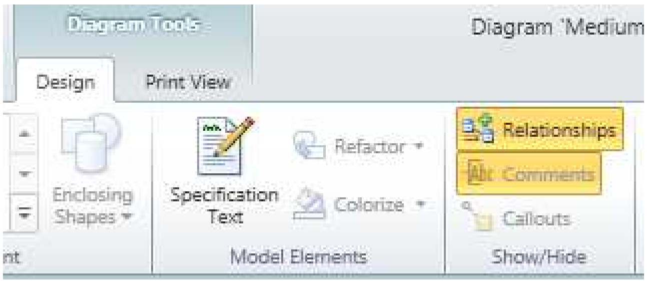
1 : Many

Festlegen, dass jede Instanz dieses Classifiers mit beliebig vielen Instanzen des zweiten Classifiers in Beziehung stehen kann, und dass umgekehrt jede Instanz des zweiten Classifiers mit genau einer Instanz dieses Classifiers in Beziehung steht.

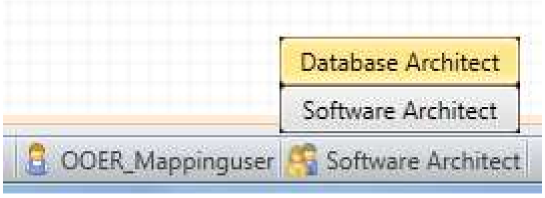
Implementation of relationship and generalization:



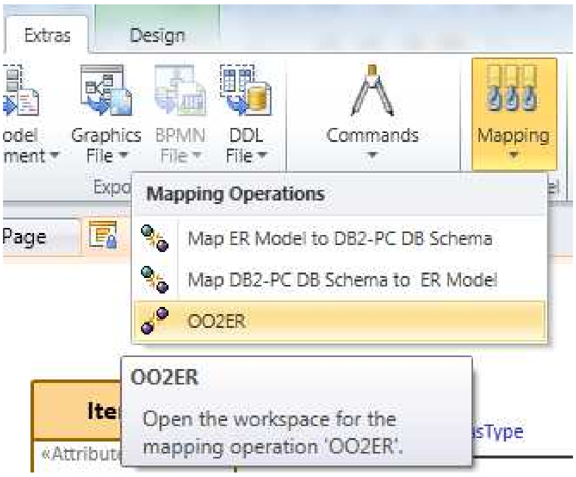
When you have removed a relationship from a diagram or a relationship has been defined in some other diagram, you can make those relationships visible by clicking on “Relationships” in the design menu. All available relationships (shown in light grey) are offered to be included into the diagram. You can select an individual relationship or all relationships to be included in the diagram by right-clicking on them. Deselecting the button “Relationships” will insert the relationships permanently.



To convert the data model into an ER data model, change your role to Database Architect:



Then select “Extras” → “Mapping” → “OO2ER”.

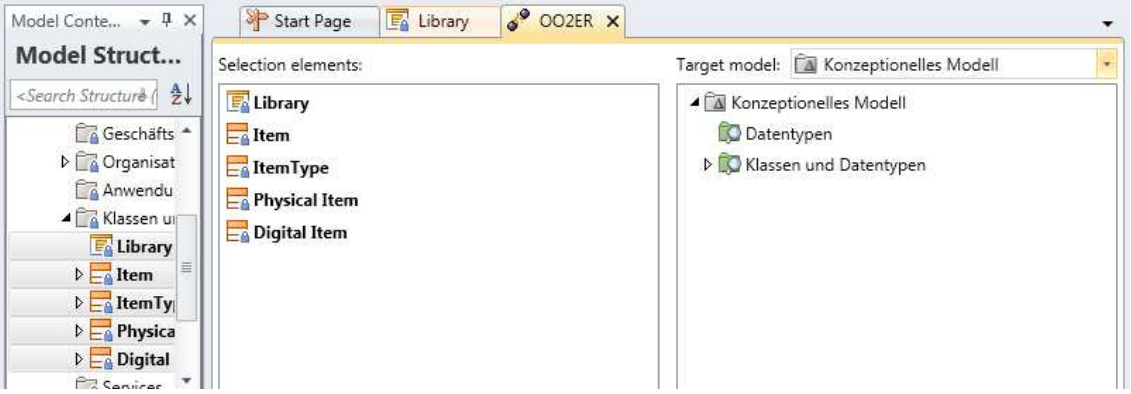


OO2ER

Open the workspace for the mapping operation 'OO2ER'.

Drag the elements you want to map (usually all elements, including the diagrams) into “Selection elements”. Choose “Konzeptionelles Modell” as the “Target model”. Then press “Execute” in the top left menu and wait patiently. The mapping can take quite a long time.

Note also that the mapping does not map specializations correctly in a hierarchy like A < B < C. In that case the mapping generates A < B, B < C and (!) A < C. You have to delete the additional specialization if you do not want it.



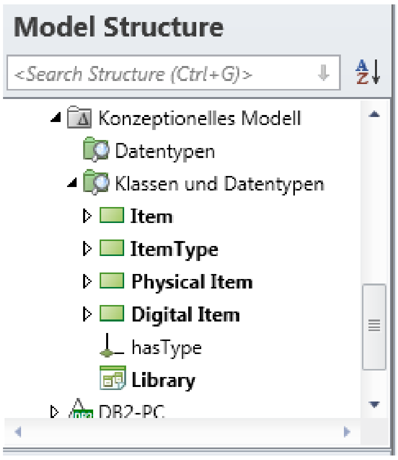
Selection elements:

Library
Item
ItemType
Physical Item
Digital Item

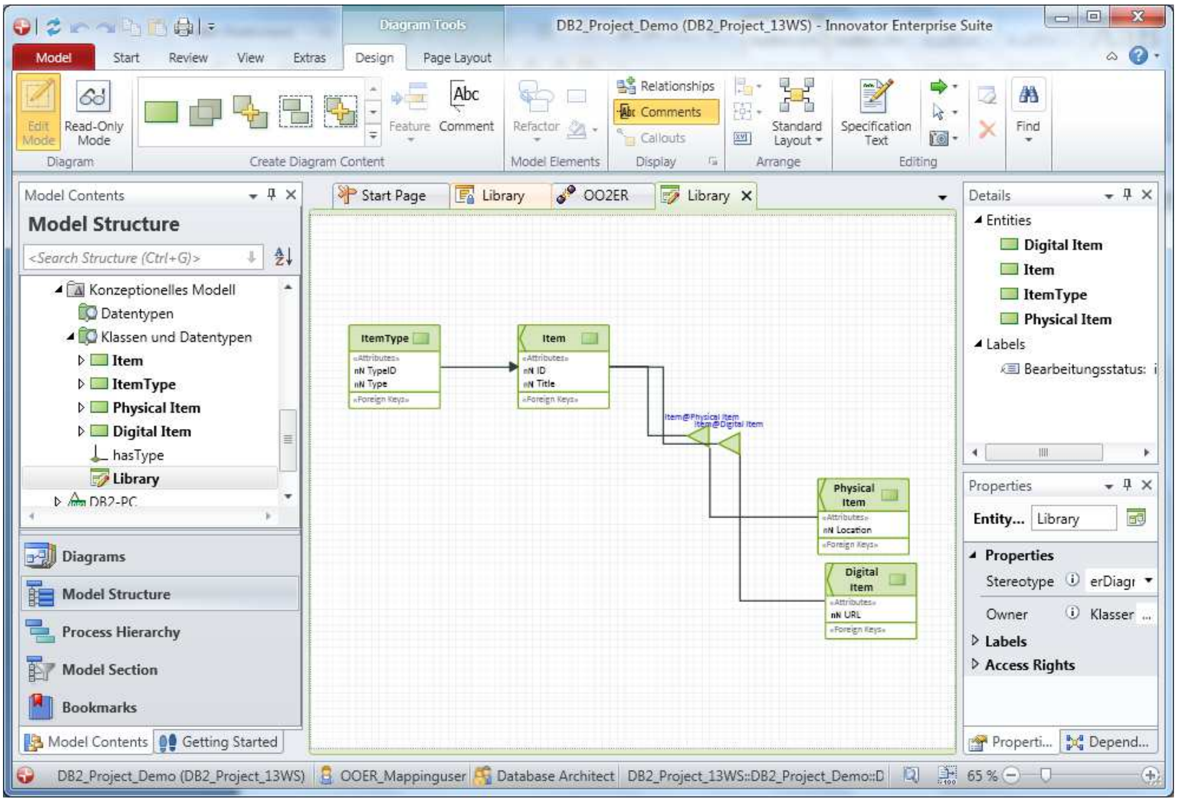
Target model: Konzeptionelles Modell

Konzeptionelles Modell
Datentypen
Klassen und Datentypen

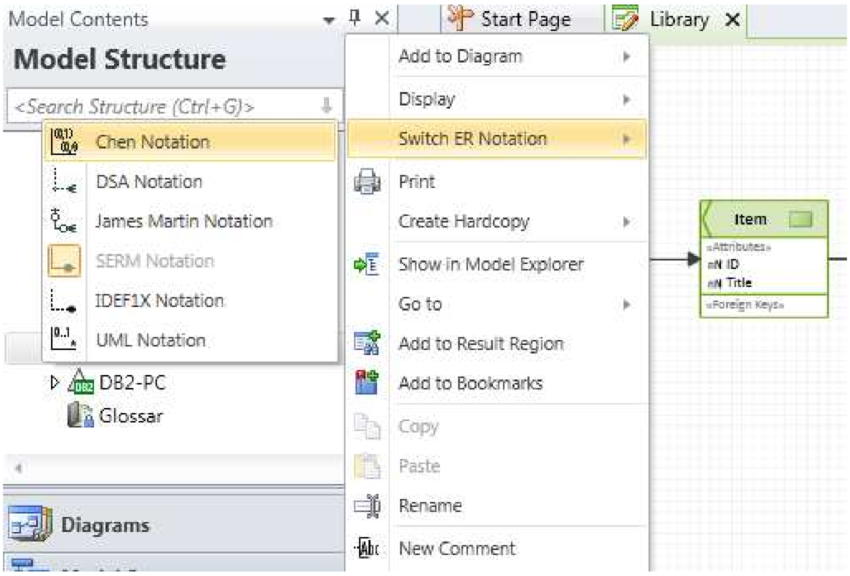
The ER model generated from the UML model will be shown in the Model Structure under “Konzeptionelles Modell” → “Klassen und Datentypen”.



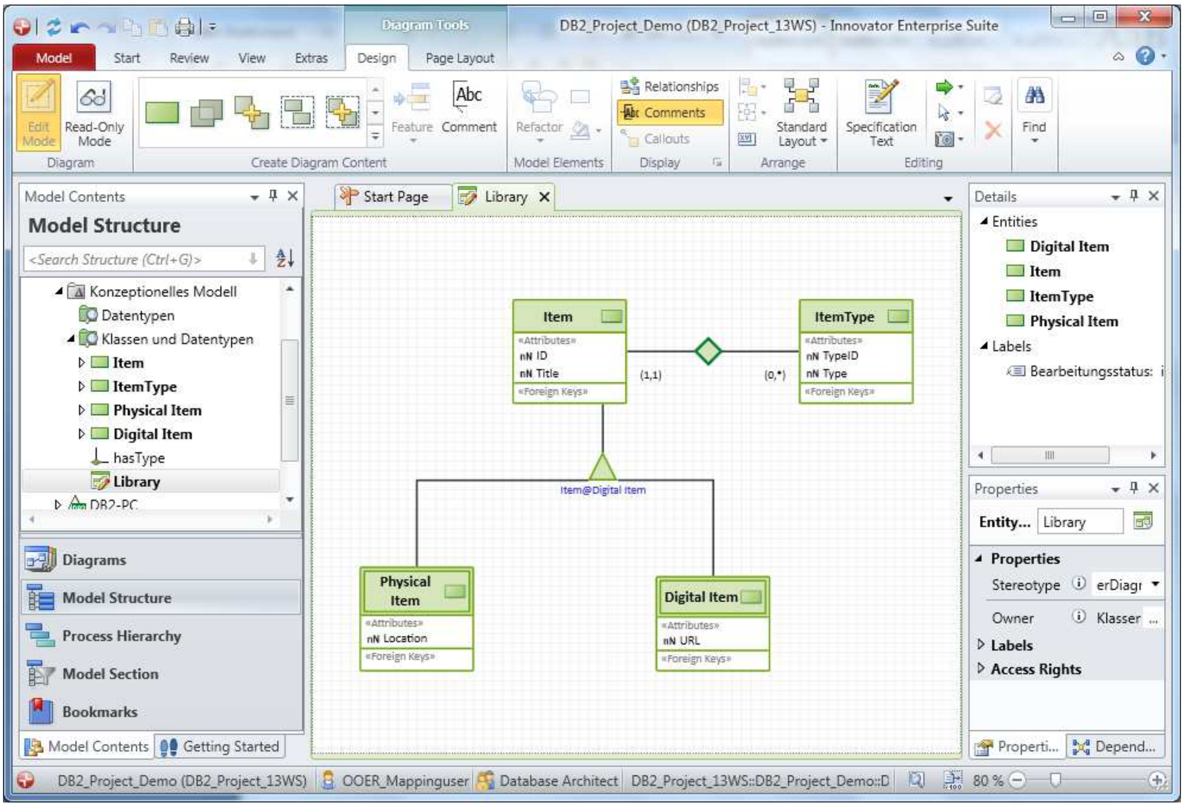
When you double-click the diagram the model will be displayed, possibly not in a very nice layout and not in Chen or UML notation.



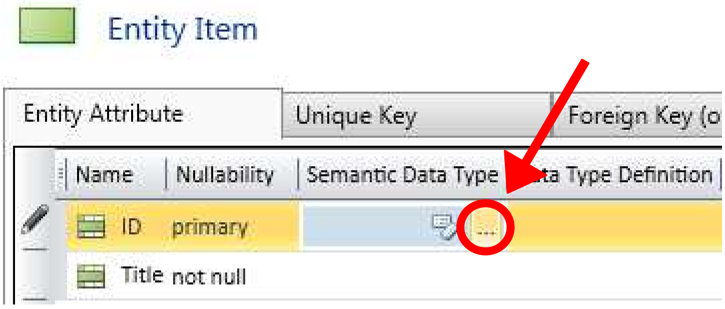
Right-click into the diagram and choose “Switch ER Notation” → “Chen Notation” (or “UML notation” if you prefer) to change the notation to Chen MIN/MAX notation. Note that in the MIN/MAX notation the multiplicities are **reversed** in comparison to the original Chen notation. You can also change the notation back to UML.



Possibly you have to realign your diagram. Sometimes clicking “Design” → “Standard Layout” is helpful. Note that Innovator’s ER diagram does not allow for many-to-many relationships and will introduce for such a relationship an additional entity (R-type) with the name of the relation.



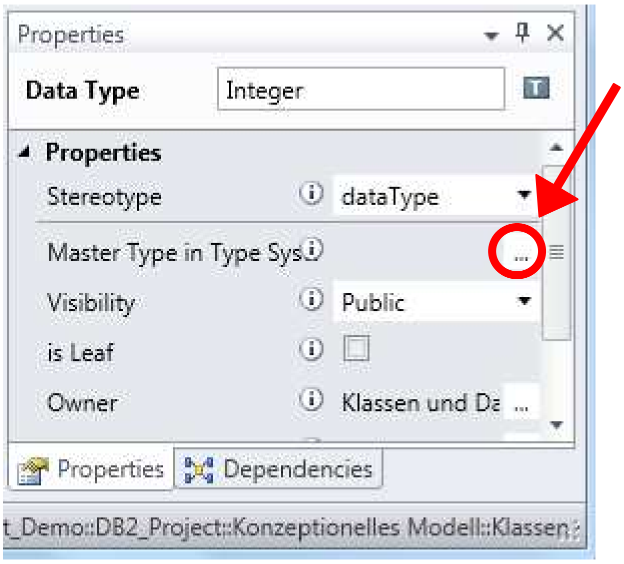
Via the attribute properties (double-click on attributes in an entity to get the list of attributes or do a right-click and choose option with CTRL pressed) you can select which attributes are primary keys and define the attribute data types. Since several of your attributes in various entities will have the same data type (domain) it is useful to define Semantic Data Types. A Semantic Data Type defines a real data type, e.g. an integer or a VARCHAR(15). You can reuse the semantic data type in other entities. When you decide to change the real data type of a Semantic Data Type the real data type will be automatically changed in all the places where you use the Semantic Data Type.


Entity Item

Name	Nullability	Semantic Data Type	ta Type Definition
ID	primary	...	
Title	not null		

When no Semantic Data Type has been defined yet, click “yes” to create one and give it a suitable name, e.g. Integer. The type of the Semantic Data Type should be “Datatype” not “Sequence”. Choose “Konzeptionelles Modell” → “Klassen und Datentypen” as the location for the new Semantic Data Type.

To link the Semantic Data Type to a real data type, select the newly created Semantic Data Type (e.g. in the Model Structure) and click on “…” in the row “Master Type in System”.

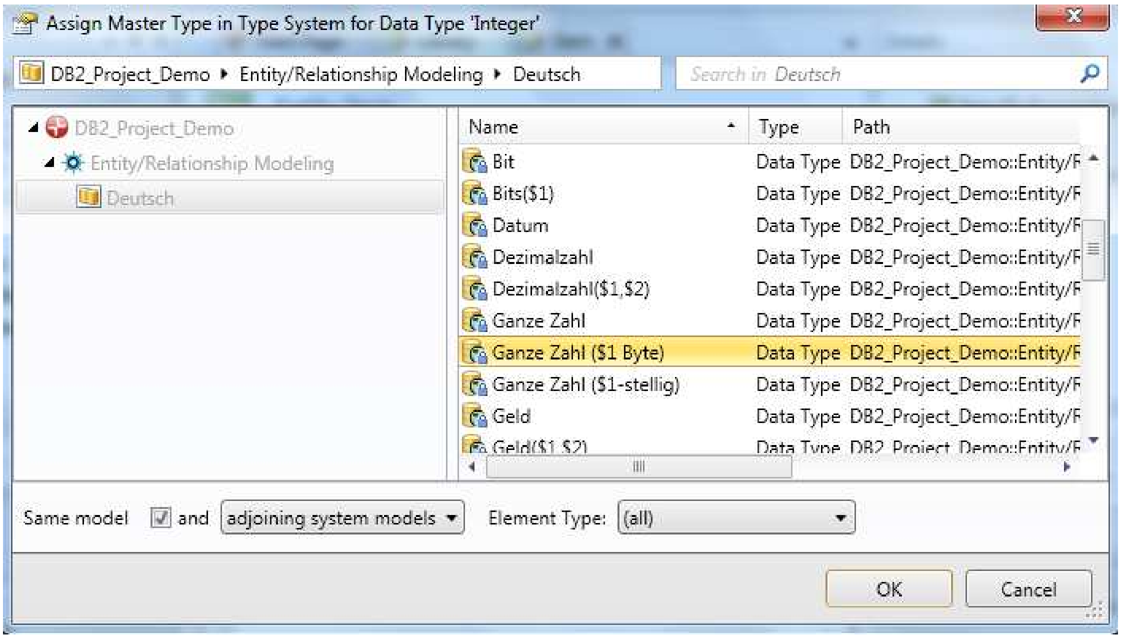


Data Type: Integer

Properties
Stereotype: dataType
Master Type in Type Sys: ...
Visibility: Public
is Leaf: □
Owner: Klassen und Da ...

t_Demo::DB2_Project::Konzeptionelles Modell::Klassen

A list of real data types opens and you can choose the one suitable for your purpose.



Assign Master Type in Type System for Data Type 'Integer'

DB2_Project_Demo ▸ Entity/Relationship Modeling ▸ Deutsch

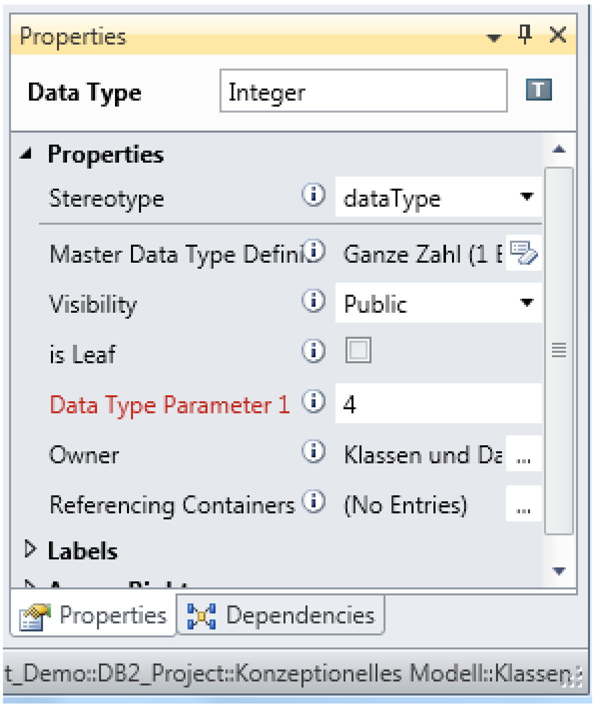
Search in Deutsch

- DB2_Project_Demo
  - Entity/Relationship Modeling
    - Deutsch

Name	Type	Path
Bit	Data Type	DB2_Project_Demo::Entity/R
Bits($1)	Data Type	DB2_Project_Demo::Entity/R
Datum	Data Type	DB2_Project_Demo::Entity/R
Dezimalzahl	Data Type	DB2_Project_Demo::Entity/R
Dezimalzahl($1,$2)	Data Type	DB2_Project_Demo::Entity/R
Ganze Zahl	Data Type	DB2_Project_Demo::Entity/R
Ganze Zahl ($1 Byte)	Data Type	DB2_Project_Demo::Entity/R
Ganze Zahl ($1-stellig)	Data Type	DB2_Project_Demo::Entity/R
Geld	Data Type	DB2_Project_Demo::Entity/R
Geld($1,$2)	Data Type	DB2_Project_Demo::Entity/R

Same model ☑ and adjoining system models ▾ Element Type: (all) ▾

Depending on the choice of your real data type you might need a parameter (e.g. for 4-byte integer, string with 15 chars, VARCHAR(15) or CHAR(15)). That parameter can be provided at the row “Data Type Parameter”.



Properties

Data Type: Integer

Properties

Stereotype	dataType
Master Data Type Defini	Ganze Zahl (1 E
Visibility	Public
is Leaf	□
Data Type Parameter 1	4
Owner	Klassen und Da
Referencing Containers	(No Entries)

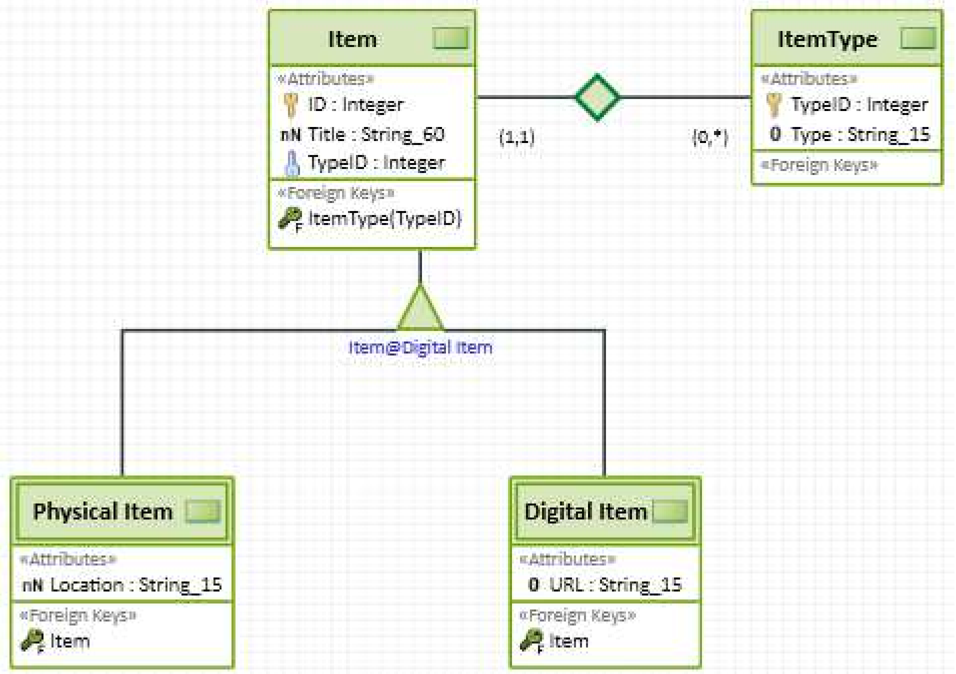
Labels

t_Demo::DB2_Project::Konzeptionelles Modell::Klassen

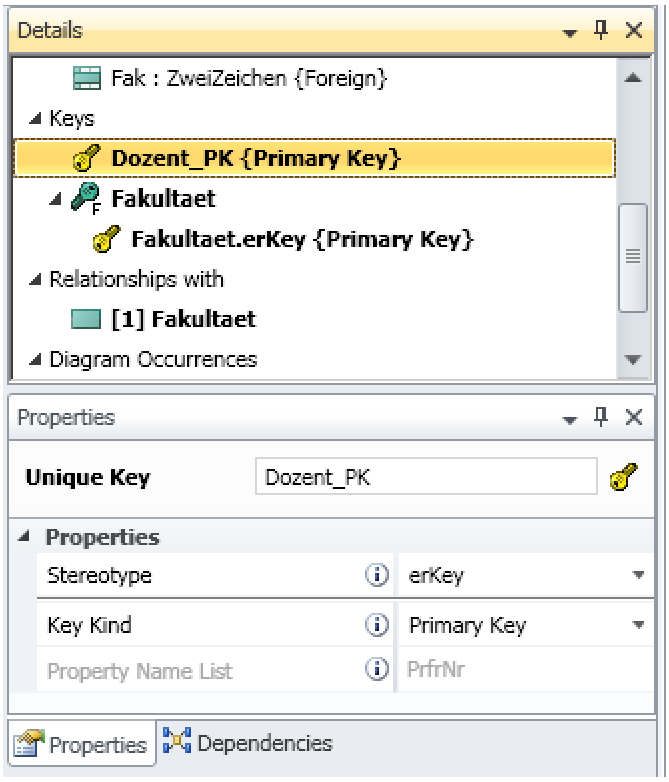
Now primary keys, foreign keys and data types show up also in the entities in the diagram. In particular, note that the foreign keys are generated and placed automatically into the entities. An nN in front of an attribute name means “not Null”, 0 stands for “possibly Null”, a yellow key indicates the primary key and a blue key stands for a foreign key attribute. The green keys with the ‘F’ indicate a foreign key constraint.

To assign Semantic Data Types to other attributes you can simply drag the Semantic Data Type from the Model Structure onto the attribute of your choice.

The final model of the example might look like this:



You can give your primary and foreign key constraints a sensible name. The names chosen automatically are sometimes a bit confusing.


Details

Fak : ZweiZeichen {Foreign}

Keys

Dozent_PK {Primary Key}

Fakultaet

Fakultaet.erKey {Primary Key}

Relationships with

[1] Fakultaet

Diagram Occurrences

Properties

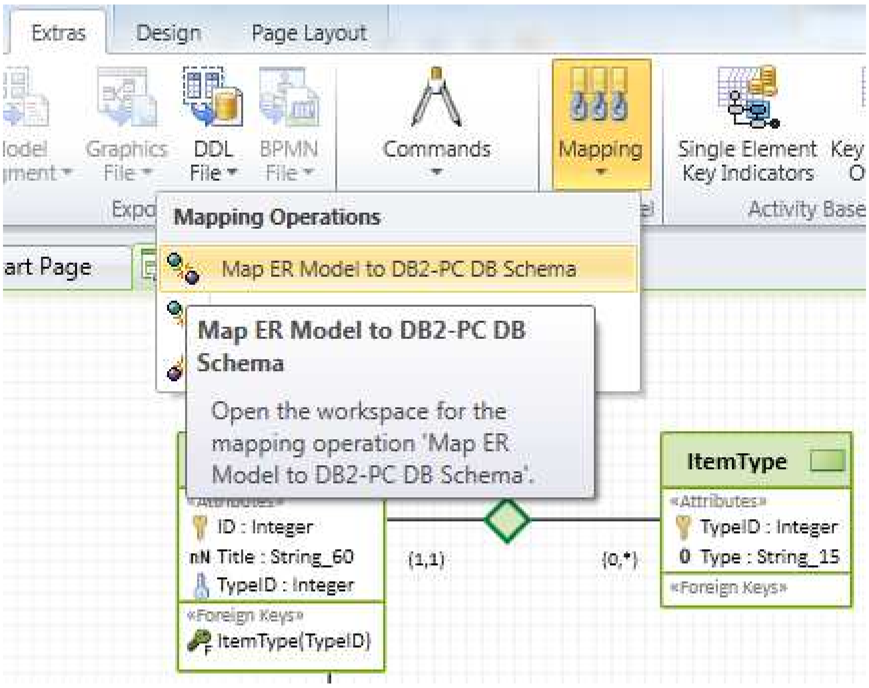
Unique Key Dozent_PK

Properties

Stereotype	erKey
Key Kind	Primary Key
Property Name List	PrfrNr

You should **not** define Check Constraints in the ER data model since they are not mapped into the physical model and work would be lost. However, you can define default values. They are mapped into the physical data model.

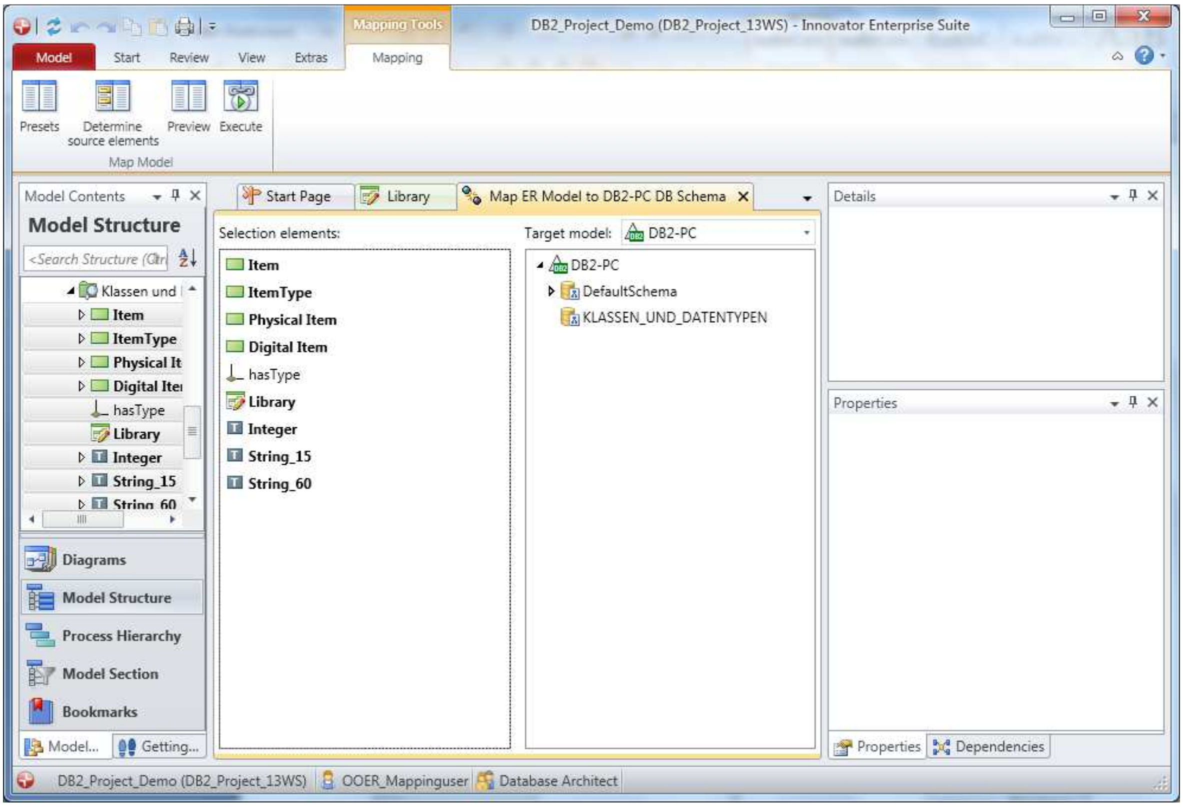
If you are done with the ER data model you can proceed with the next step and define the physical data model. To do this, select "Extras" → "Mapping" → "Map ER Model to DB2-PC DB Schema".



Map ER Model to DB2-PC DB Schema

Open the workspace for the mapping operation 'Map ER Model to DB2-PC DB Schema'.

Again you have to drag the entities into the left mapping panel (however, now the entities of the ER data model) and select "DB2-PC" as the target model on the right. Then click on execute. Again all elements will be mapped, including diagrams.



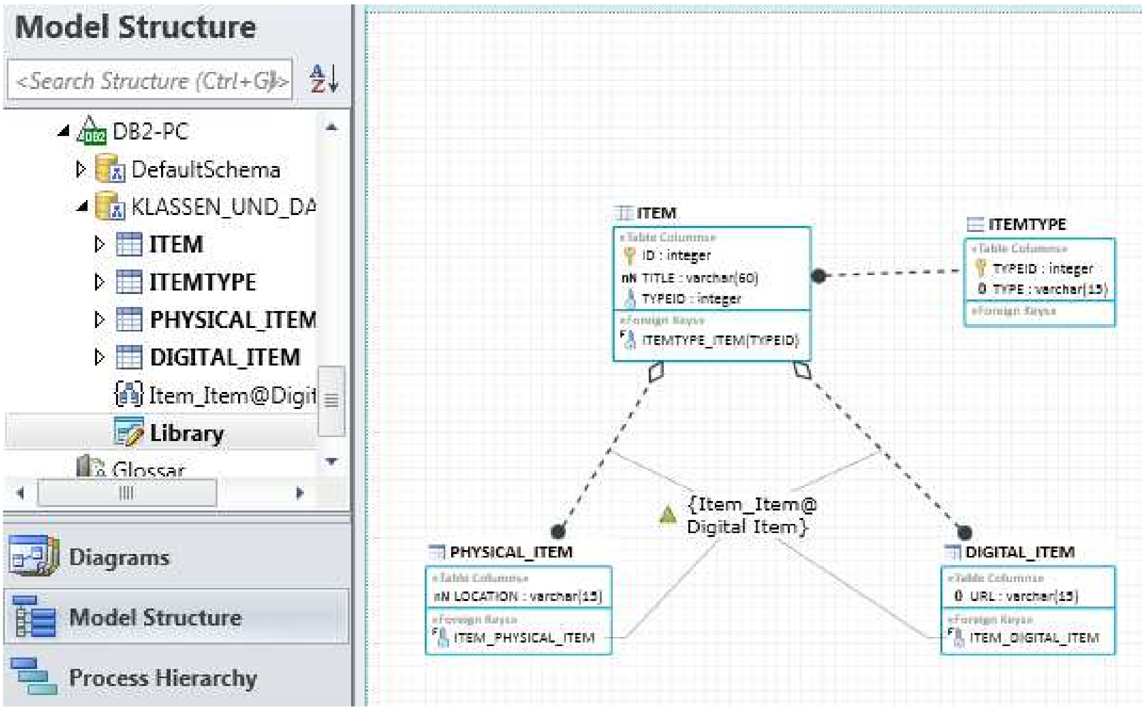
Selection elements:

- Item
- ItemType
- Physical Item
- Digital Item
- hasType
- Library
- Integer
- String_15
- String_60

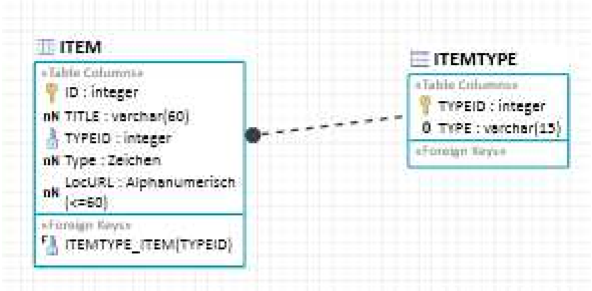
Target model: DB2-PC

- DB2-PC
  - DefaultSchema
  - KLASSEN_UND_DATENTYPEN

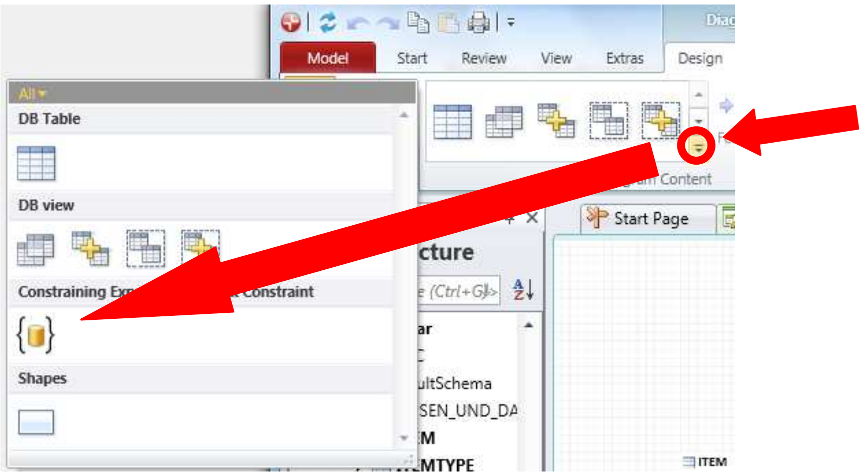
You can find the newly constructed elements in the Model Structure under “DB2-PC” → “Klassen und Datentypen”.



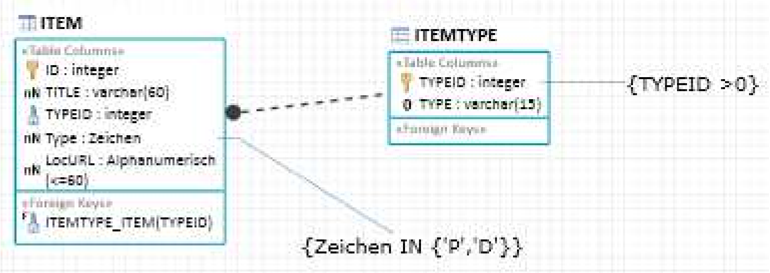
Now you can modify this physical model. For example, you might choose not to implement specialisations as individual tables.



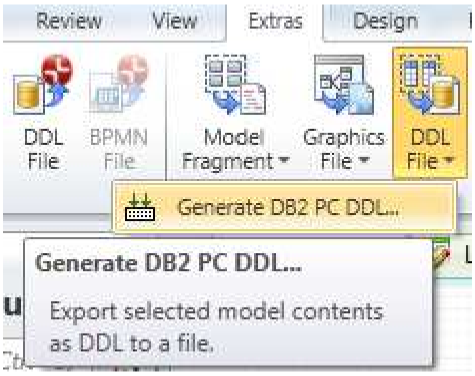
You can specify Check Constraints in the physical model. In the menu “Design” open up the elements that can be added to the diagram and drag a Constraint Expression into the diagram.



Constraints will be integrated into the DDL generated from the physical model.



Change to the role “Information Architect”. To generate the DDL script for the tables, select all elements you need (Ctrl-a usually will do) and execute the Engineering Action “Extras” → “DDL File ▼” → “Generate DB2 PC DDL…”.



Generate DB2 PC DDL...

Export selected model contents as DDL to a file.

The resulting file then can be worked on with some SQL editor, e.g. Toad (see Toad Howto).

To exit the Innovator choose “Model” → “Exit Innovator”.