COMP 3311
Database Management Systems

Lab 1

Oracle Data Modeler

Lab Topics

- How to construct an E-R diagram using Oracle Data Modeler.

If you have not already done so, activate your CSD PC account **now** by following the instructions at

http://cssystem.cse.ust.hk/UGuides/activation.html

Ask for help if you encounter problems.

Oracle Data Modeler

- Oracle Data Modeler is a database design tool that allows you to:
  - create, browse and edit E-R diagrams;
  - reduce an E-R diagram to a relational schema.
- Oracle Data Modeler is included with Oracle SQL Developer, which can be downloaded from

  https://www.oracle.com/tools/downloads/sqldev-downloads.html
  - Requires registration/login; Windows, Mac, Linux available. Latest version is 20.2 (requires JDK 8 or 11).

    (There is also a standalone version of Oracle Data Modeler.)
  - For Windows you should download the 64-bit version that includes JDK 8.

Oracle SQL Developer (1)

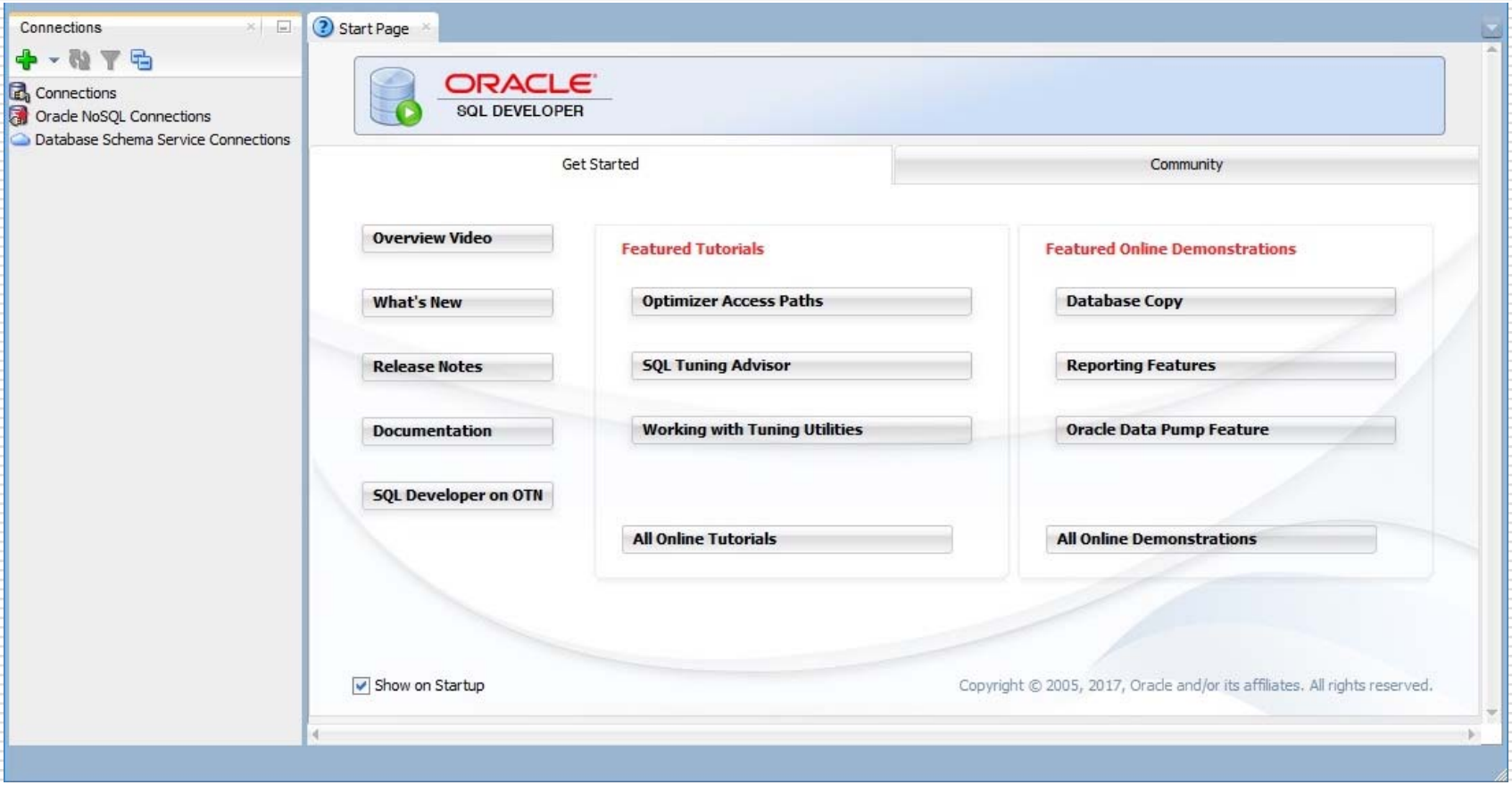
- Run the program "sqldeveloper".

  Double click the app.

  SQL Developer opens in the Start Page as shown on the next slide.

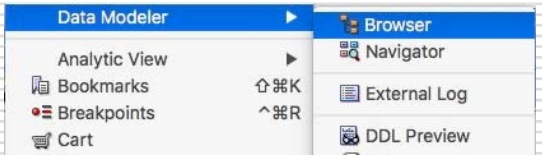
Oracle SQL Developer (2)

- Close the Connections and the Start Page tabs; you will use the Connections tab in the next lab.

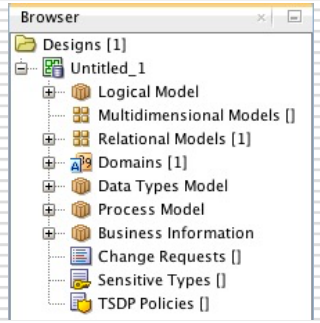


Create A Database Design

- To create a database design:
  - select View in the Oracle SQL Developer menu and then select Data Modeler→Browser as shown in the figure;
  - right-click on the Logical Model node in the Browser tab and select Show from the popup menu to open the design surface.



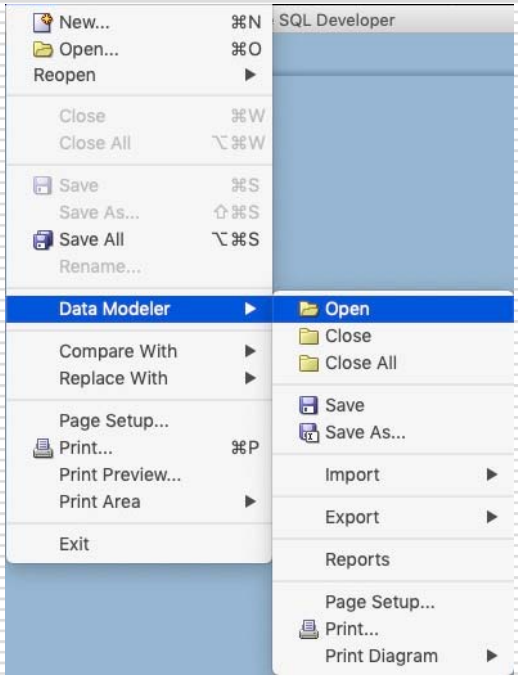
- As shown in the figure on the right, the Browser tab contains a default template called Unititled_1 for creating a database design.



- This template will be renamed when you save your design as explained on the next slide.

Save, Open, Print A Database Design

- To save a design (see figure):
  - select File in the Oracle SQL Developer menu;
  - select Data Modeler→Save or Data Modeler→Save As....

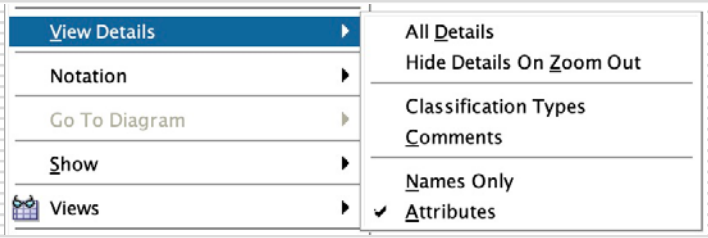


- To open a saved design (see figure):
  - select File in the Oracle SQL Developer menu;
  - select Data Modeler→Open;
  - navigate to the folder containing the design and select its .dmd file.

- To print a design:
  - right-click in the design surface;
  - select Print Diagram from the popup menu.
  - select one of the options shown in the figure.

Oracle Data Modeler Design Settings

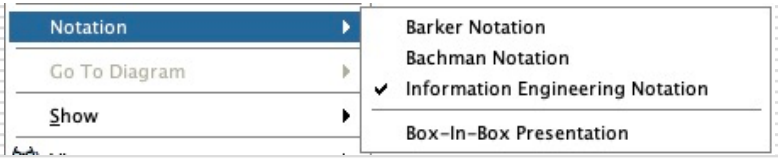
- Right-click in the design surface of the Logical tab and make the following selections from the popup menu.
  - View Details: check only Attributes



Note

If options other than Attributes is selected in View Details, Oracle Data Modeler will show many additional details about entities that are not relevant for the purpose of constructing only an E-R diagram.

  - Notation: check Information Engineering Notation; uncheck Box-in-Box Presentation



  - Show: check Labels, Relationship Attributes, Legend

Oracle Data Modeler Toolbar

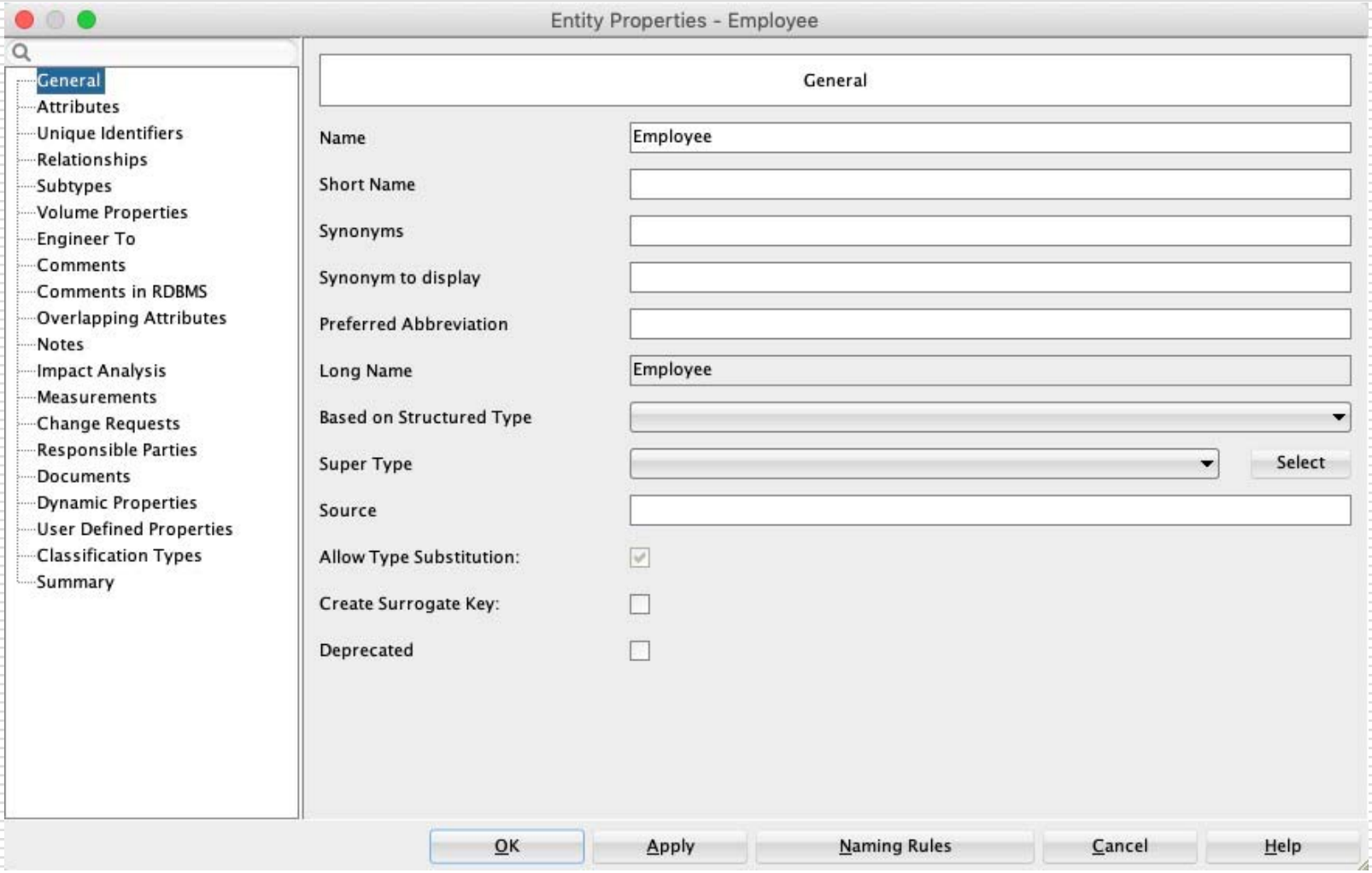
- The Oracle Data Modeler toolbar contains buttons for the following operations (among others):
  - Select allows selection of diagram elements.
  - New Entity creates a new entity type.
  - New N:M Relation creates a new N:M relationship type.
  - New 1:N Relation creates a new 1:N relationship type.
  - New 1:N Relation Identifying creates a new 1:N relationship type for a weak entity.
  - New 1:1 Relation creates a new 1:1 relationship type.
  - New Arc creates an XOR (exclusive or) constraint.
  - New Note creates a new note.

Create An Entity Type (1)

- Select the **New Entity** button  and click anywhere in the design surface.
- In the Entity Properties dialog, shown on the next slide:
  - Enter a name for the entity type in the Name field.
  - Click the **OK** button.
- An entity appears on the design surface like those shown on slide 12.

Note: Until another toolbar button is selected, several entities can be created sequentially by simply clicking in the design surface.

Create An Entity Type (2)

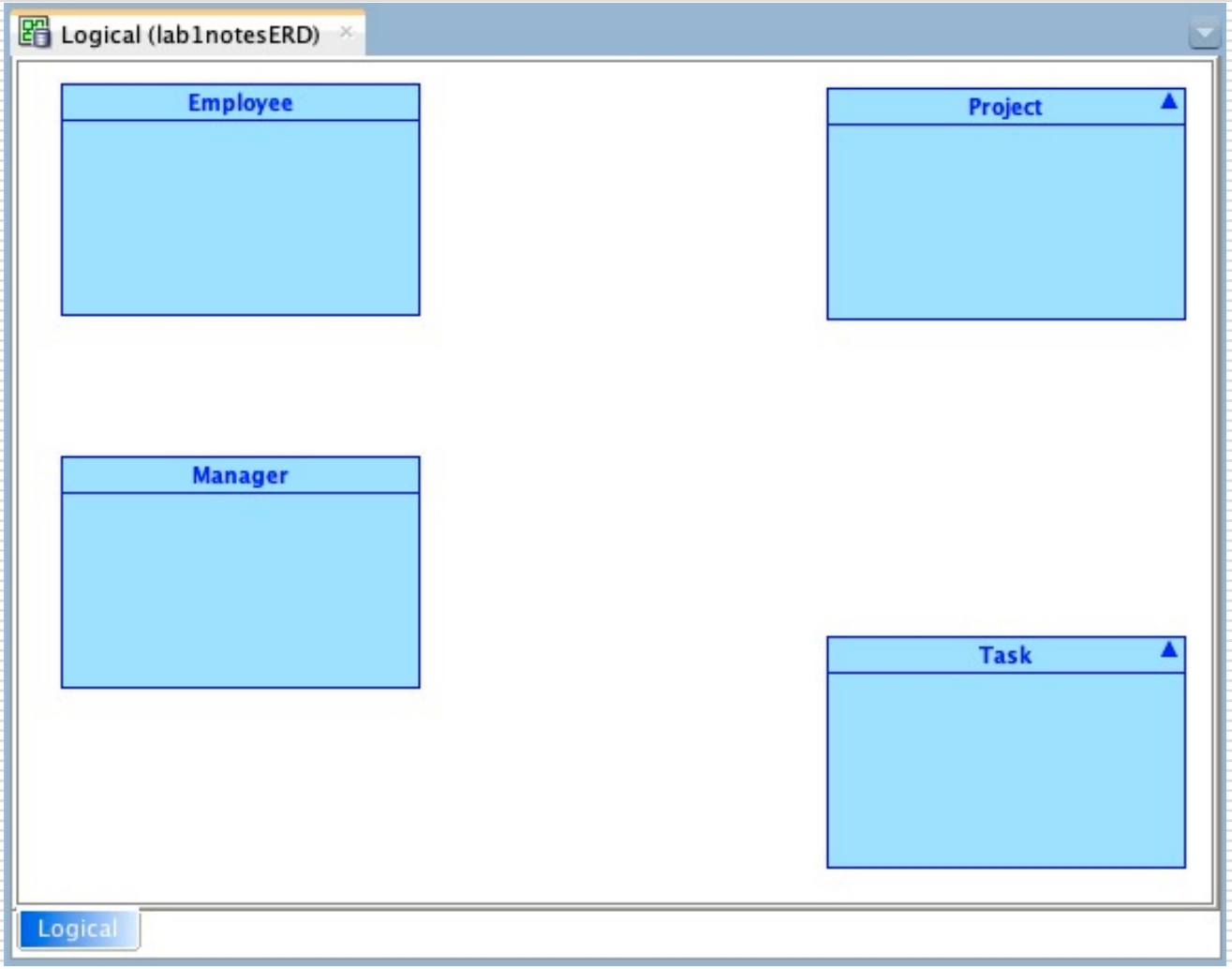


Create An Entity Type (3)

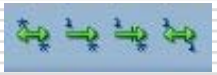
Reposition an entity type by selecting it and dragging it to the desired position.

Resize an entity type by selecting it and dragging one of its handles.

To better help align entities you can select Layout→Snap to Grid in the design surface.

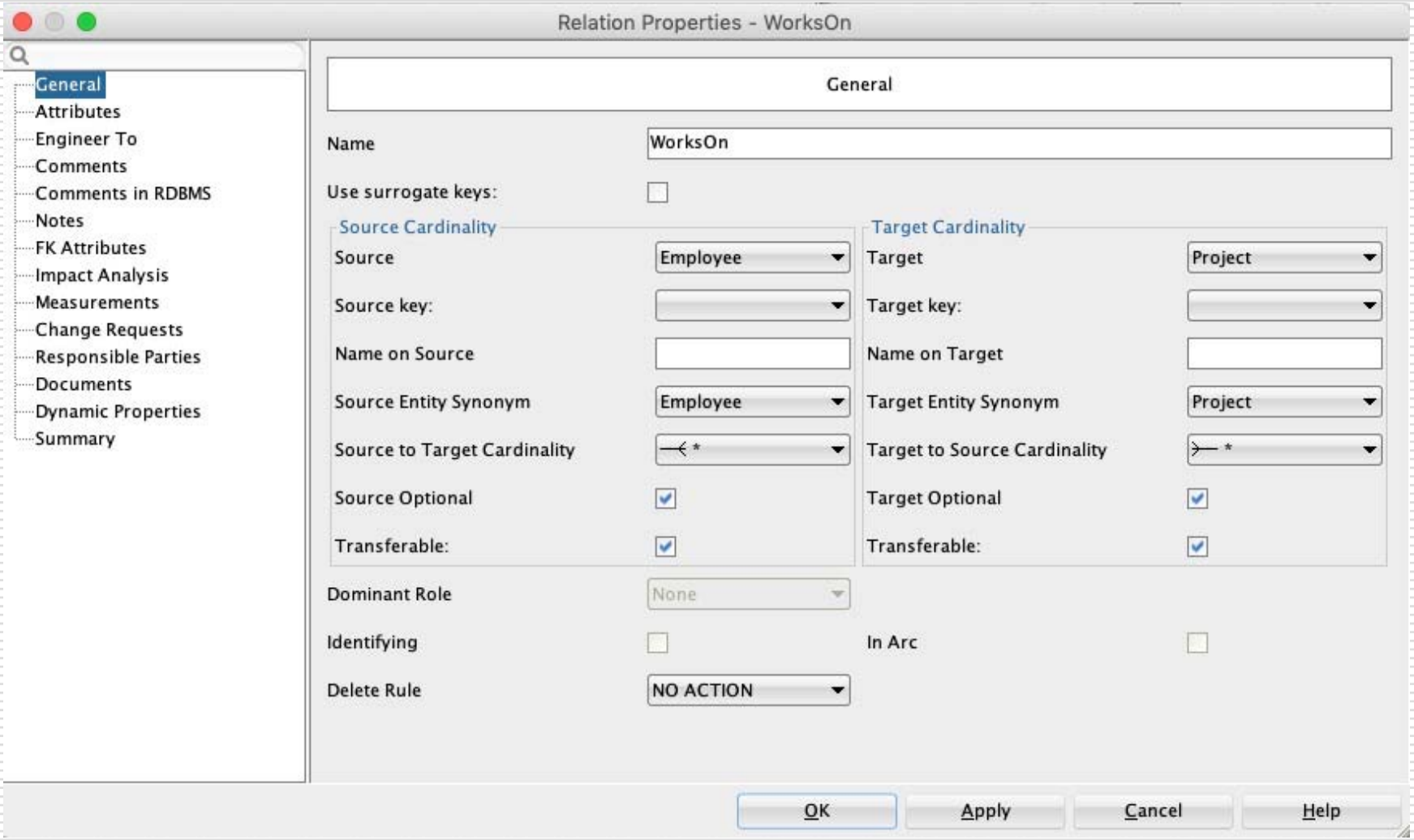


Create A Relationship Type (1)

- Select one of the Relation buttons  and click inside one entity and then inside the other entity.
- In the Relation Properties dialog shown on the next slide:
  - Enter a name for the relationship type in the Name field.
  - Edit the cardinality and participation constraints, if necessary.
  - Click the **OK** button.
- A relationship appears on the design surface like those shown on slide 15.

Note: Until another toolbar button is selected, several relationships can be created sequentially by selecting the source and target entities.

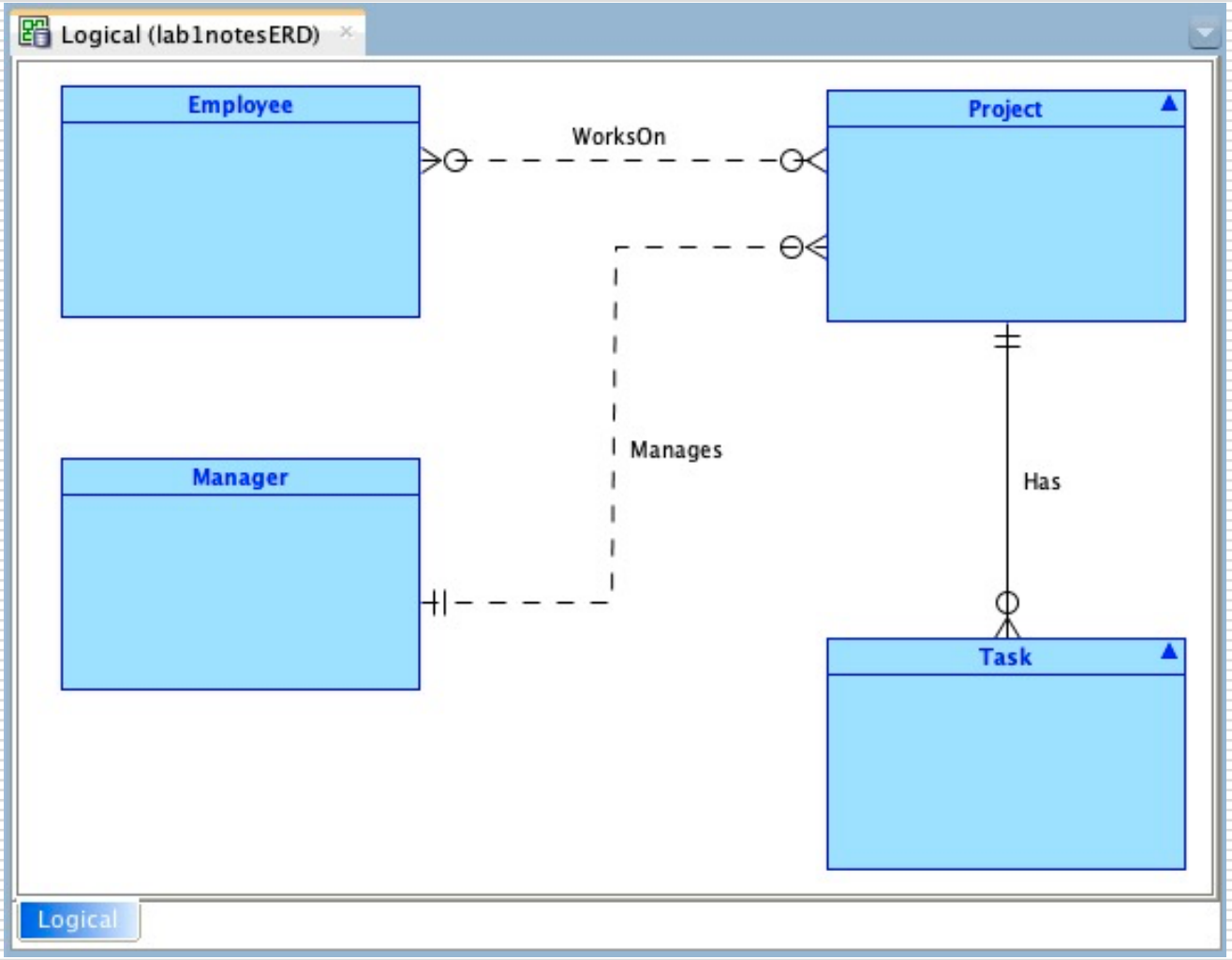
Create A Relationship Type (2)



Create A Relationship Type (3)

Reposition a relationship type by selecting it and dragging its endpoints to the desired positions.

Add elbows to a relationship type by right-clicking on it, selecting Add Elbow from the popup menu and dragging the elbow to the desired position.



Create A Relationship Type (4)

- On the previous slide, Task is a weak entity.
- However, Oracle Data Modeler cannot draw a double line around a weak entity.
- Instead, Oracle Data Modeler indicates that an entity is weak by using only identifying relationships (solid relationship lines) as shown for the Has relationship on the previous slide.

Create A Relationship Type (5)

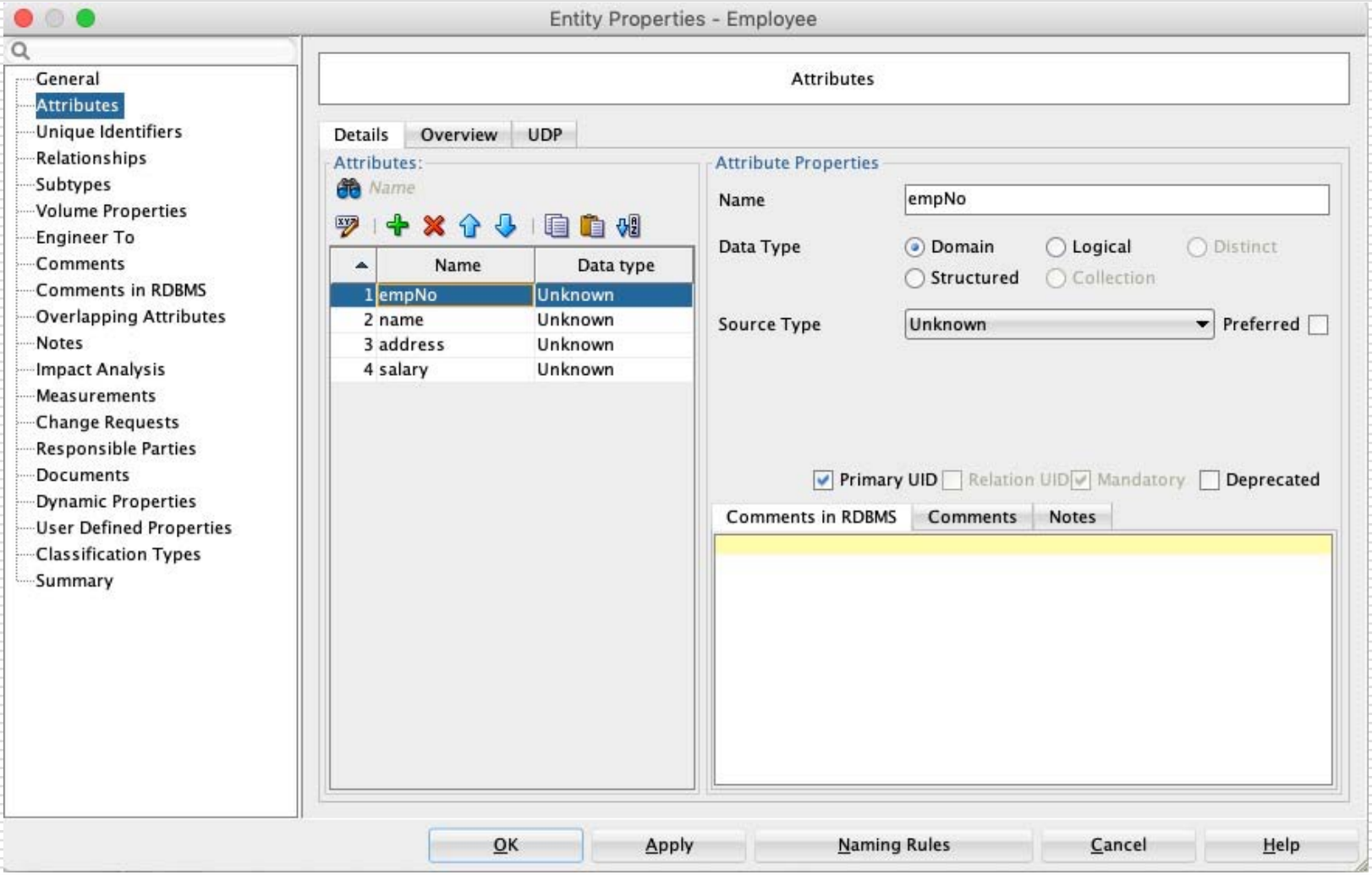
- Due to a bug in Oracle Data Modeler, relationship names do not display.
- A work around is to add relationship names manually via a Note element as shown in slide 15.
- To remove the background colour and border of a note, right-click it, select Format from the popup menu and
  - unselect Use Default Format.
  - set the Background Color and Border Color to white.

Note: It is advisable to add relationship names only after completing the diagram to avoid having to move them as relationships are moved.

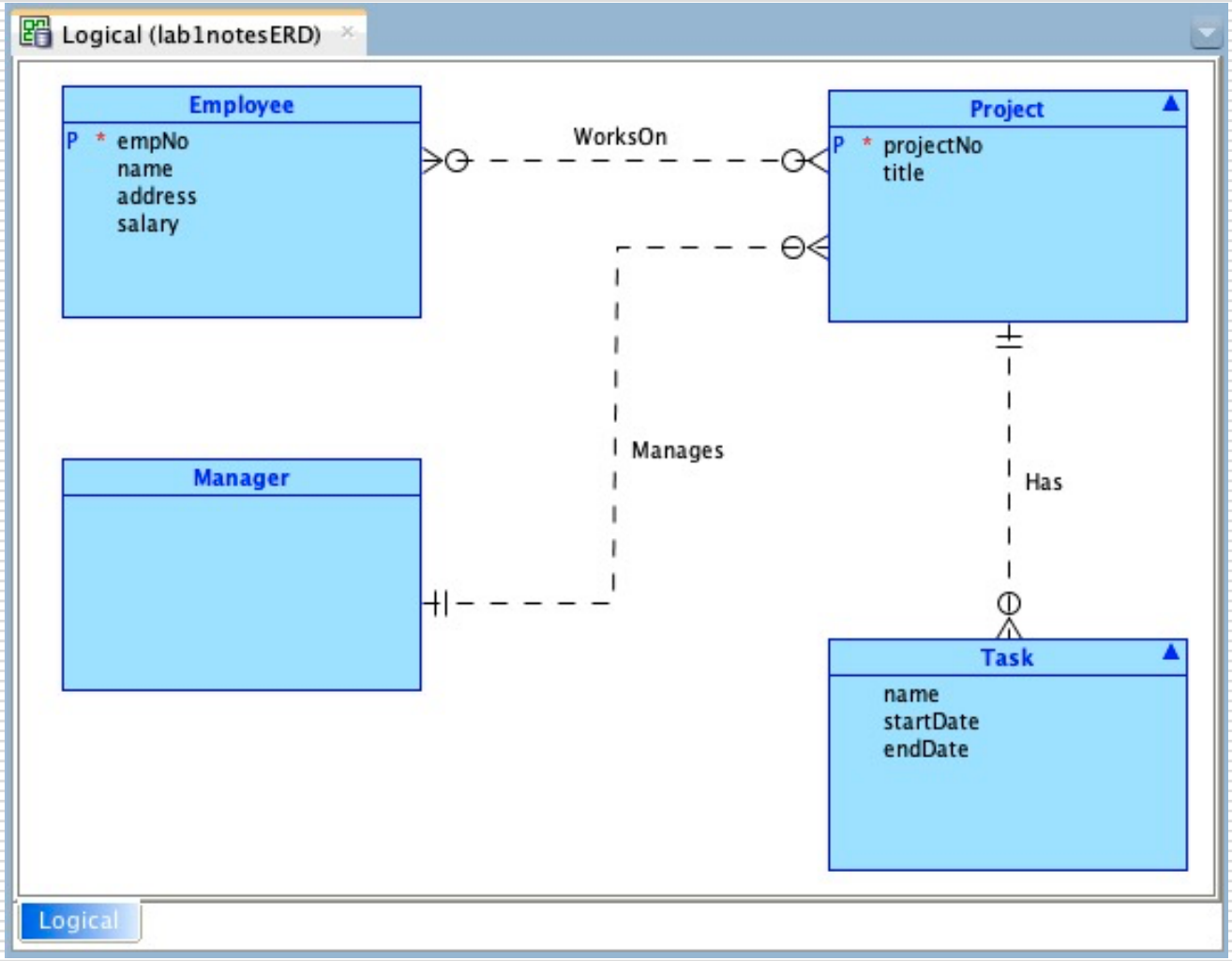
Add Entity Attributes (1)

- Open the Properties dialog for an entity (shown on the next slide) either by double clicking it or right-clicking it and selecting Properties from the popup menu and do the following.
  - Select the Attributes tab in the left column.
  - Click + to add a new attribute.
  - Enter a name for the attribute in the Name field.
  - Check the Primary UID checkbox if the attribute is a primary key.
- The attributes that have been defined for an entity can be displayed inside the entity box as shown on slide 20.

Add Entity Attributes (2)



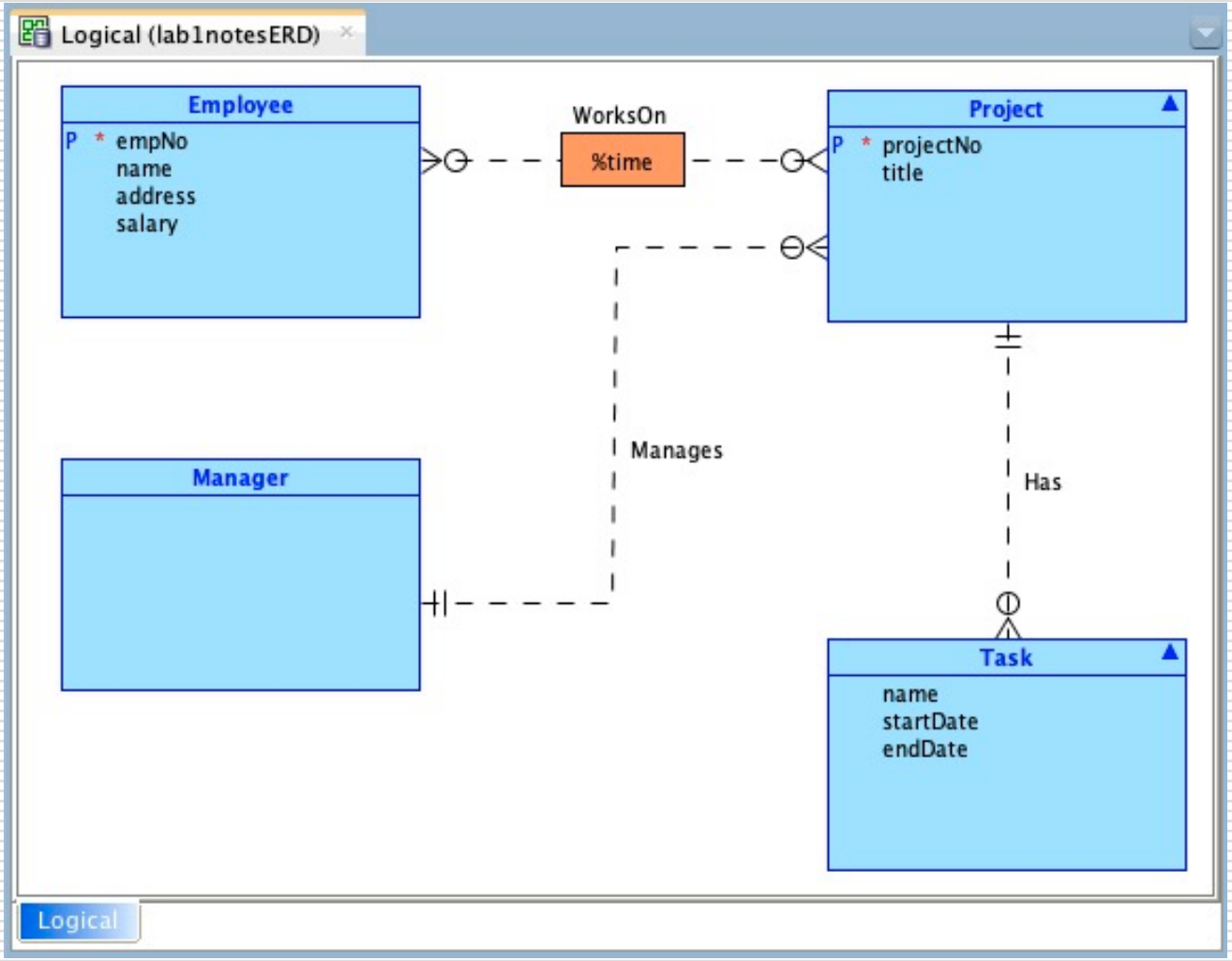
Add Entity Attributes (3)



Add Relationship Attributes (1)

- Open the Properties dialog for a relationship (see slide 14) either by double clicking it or right-clicking it and selecting Properties from the popup menu and:
  - Select the Attributes tab in the left column.
  - Click + to add a new attribute.
  - Enter a name for the attribute in the Name field.
  - Click **OK**.
  - Resize the attribute box as desired.
- The next slide shows an attribute defined for the WorksOn relationship.

Add Relationship Attributes (2)



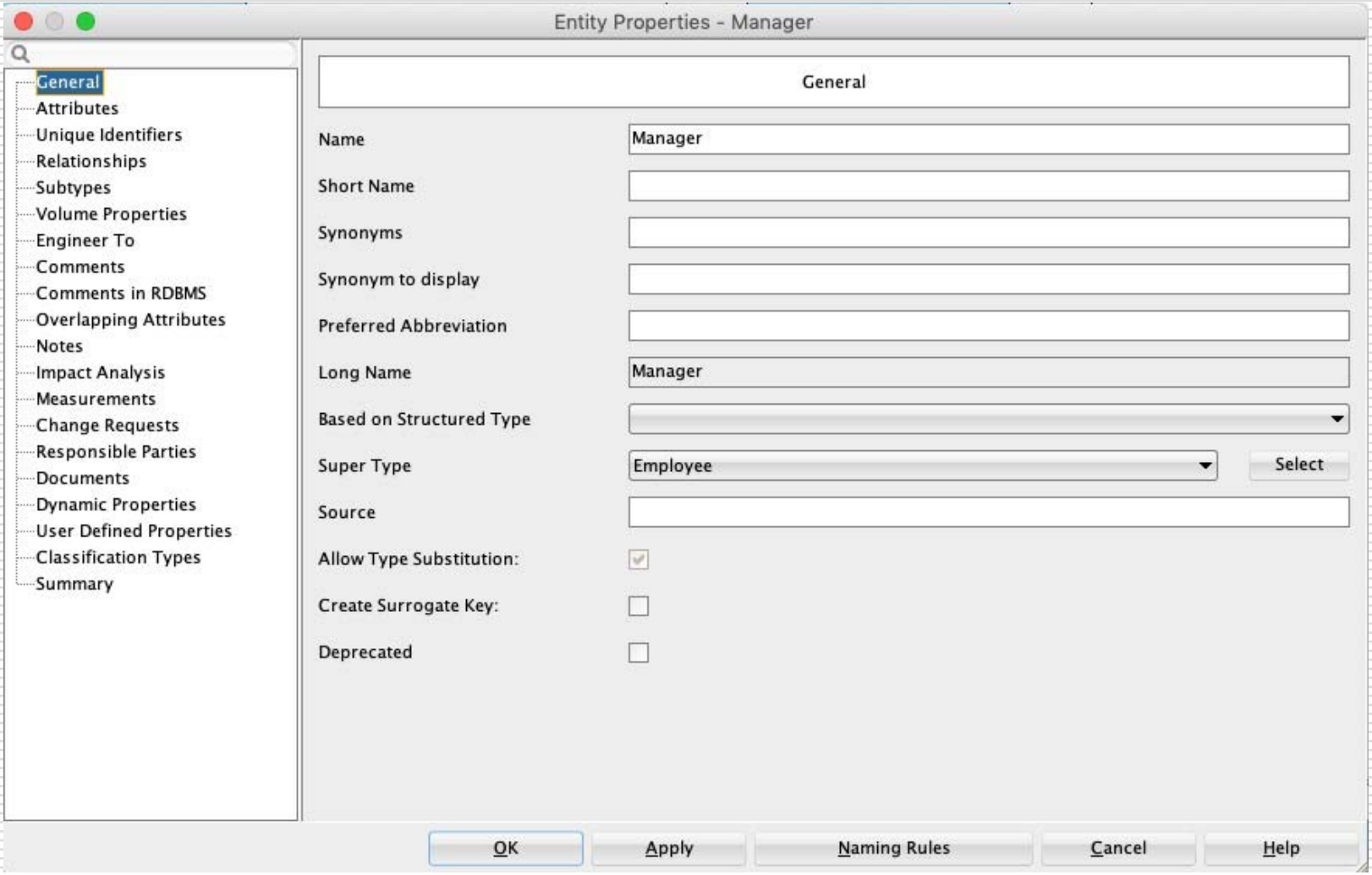
Create A Generalization Relationship (1)

- Open the Properties dialog for the subclass entity (e.g., Manager) and do the following.
  - Select the superclass in the Super Type dropdown list (e.g., Employee as shown on the next slide).
  - Click **OK**.

Note: If Box-In-Box Presentation has not been unchecked in the **Notation** setting (see slide 8), then the supertype/subtype relationship will display as shown in the figure on the right. To display it as shown in slide 25, uncheck Box-In-Box Presentation in the **Notation** setting.

- Slide 25 shows a generalization relationship example.

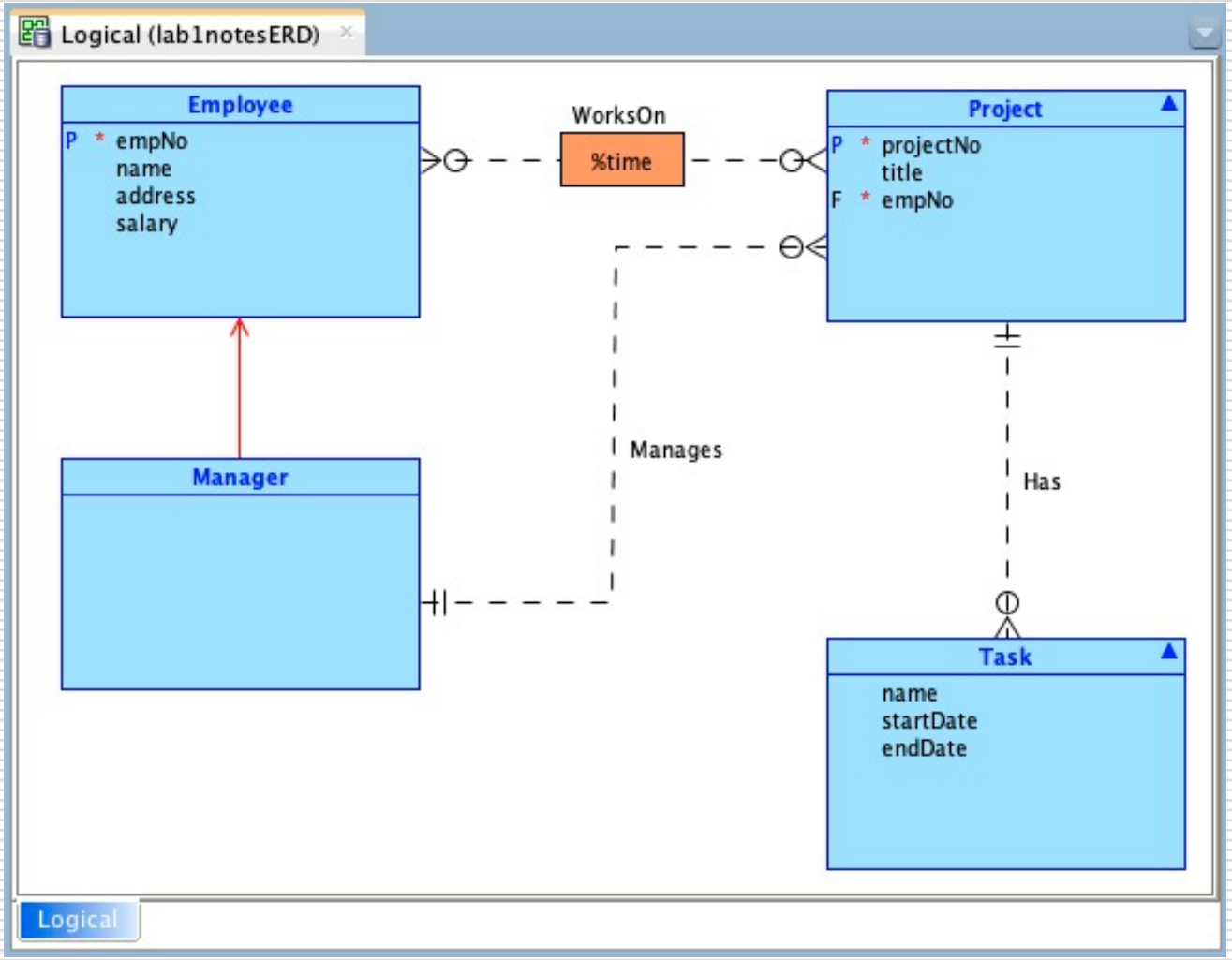
Create A Generalization Relationship (2)



Create A Generalization Relationship (3)

Reposition a generalization relationship by selecting it and dragging its endpoints to the desired positions.

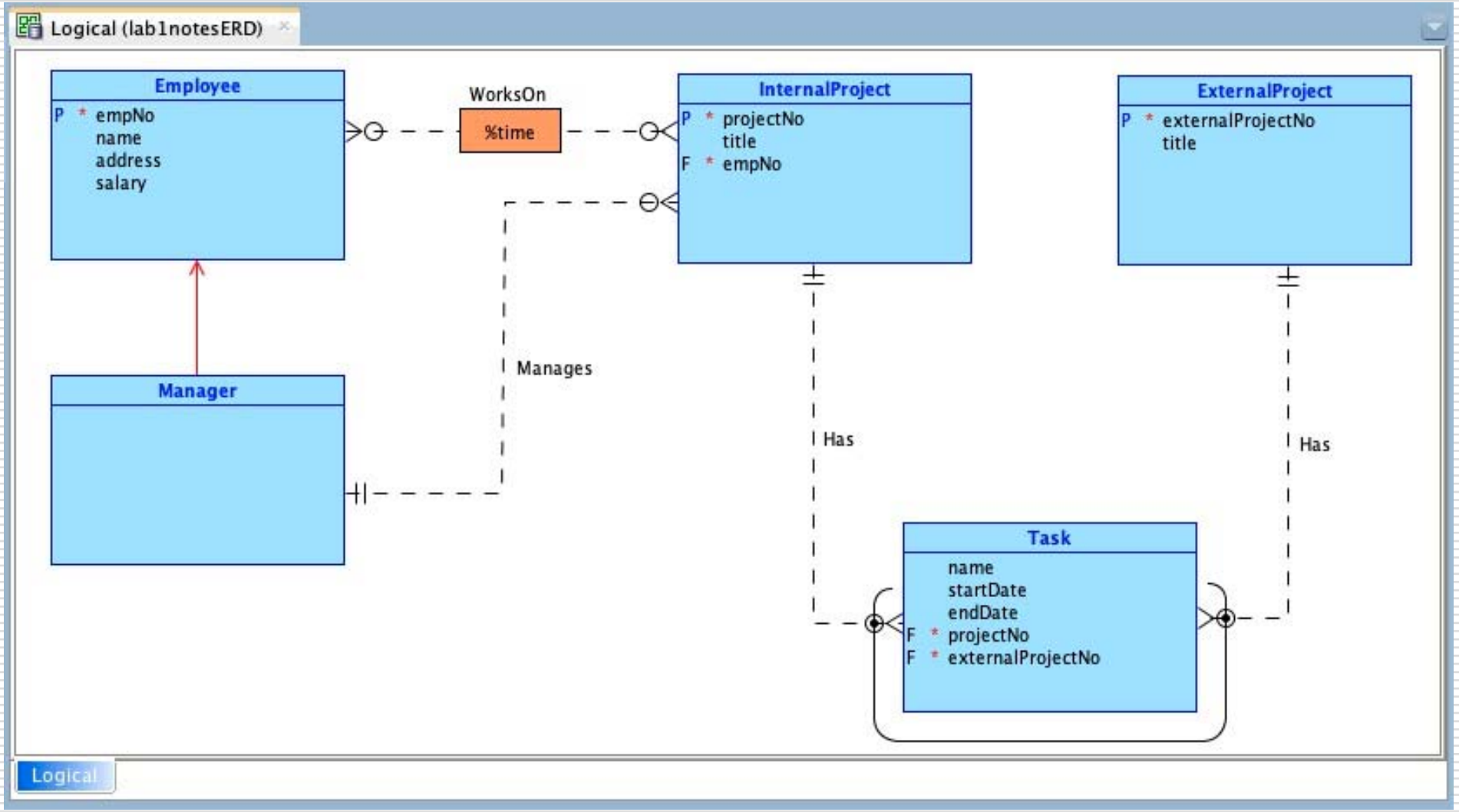
Add elbows to a generalization relationship by right-clicking on it, selecting Add Elbow from the popup menu and dragging the elbow to the desired position.



Create An XOR Constraint (Arc Relationship) (1)

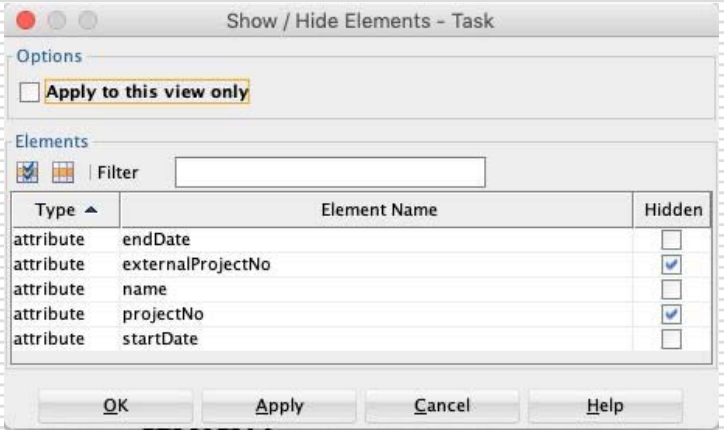
- To create an XOR constraint (Arc relationship):
  - Select the entity type that should participate in only one of the relationship types (e.g., Task).
  - Select all relationships to be included (hold down the Shift key and click each relationship).
  - Click the **New Arc** button in the toolbar.
- An example of an XOR constraint (Arc relationship) is shown on the next slide.

Create An XOR Constraint (Arc Relationship) (2)



Showing/Hiding Design Elements (1)

- To hide elements, such as foreign keys, within an entity:
  - right-click on the entity and select Show / Hide Elements from the popup menu.
  - Select the elements to hide and select **OK**.



- Slide 29 shows an example of hiding some entity elements (compare with the previous slide).
- When entity elements are hidden, a triangle ▲ appears in the upper right corner as shown on slide 29.

Showing/Hiding Design Elements (2)