

COMP 3311

Database Management Systems

Lab 1

Oracle Data Modeler

Lab Topics

- How to construct an E-R diagram using [Oracle Data Modeler](#).

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 19.4 (requires JDK 8 or 11).
(There is also a standalone version of Oracle Data Modeler.)

Oracle SQL Developer (1)

- ❑ Run the program “[sqldeveloper](#)”.

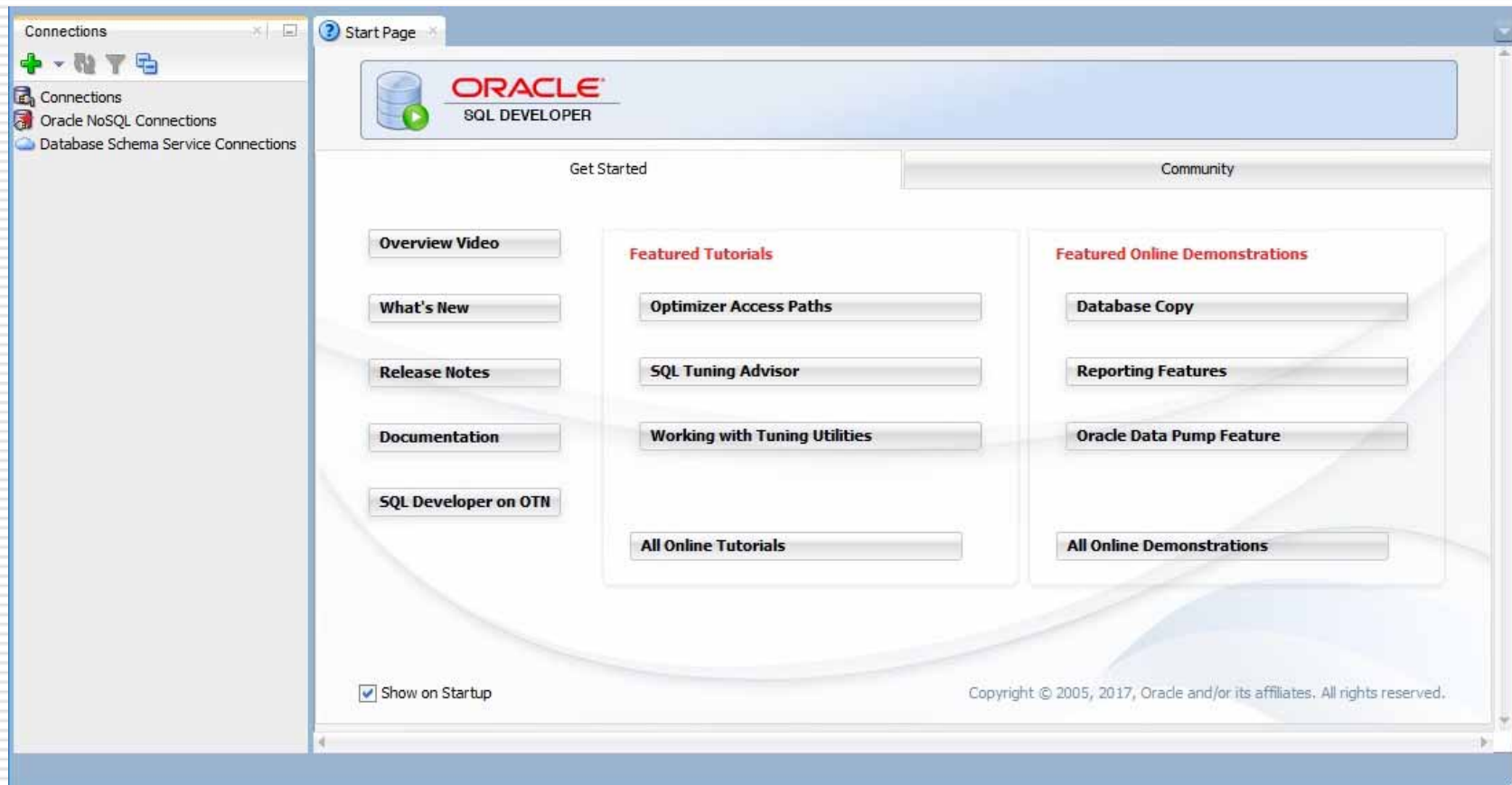
In Lab 4, search for “[sql](#)”; it should be the only app found.

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 these in the next lab.

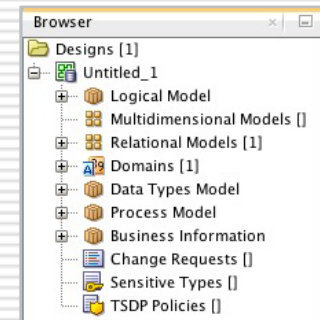


Create A Database Design

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



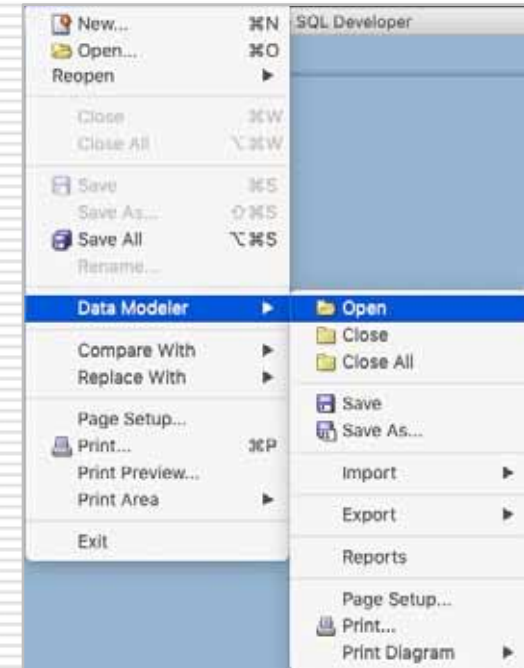
- ❑ As shown in the figure on the right, the **Browser** tab contains a default template called **Untitled_1** for creating a database design.



Open, Save, Print A Database Design

❑ To open a saved design:

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

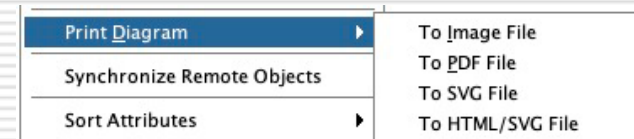


❑ To save a design:

- select **File** in the **Oracle SQL Developer** menu;
- select **Data Modeler→Save** or **Data Modeler→Save As**.

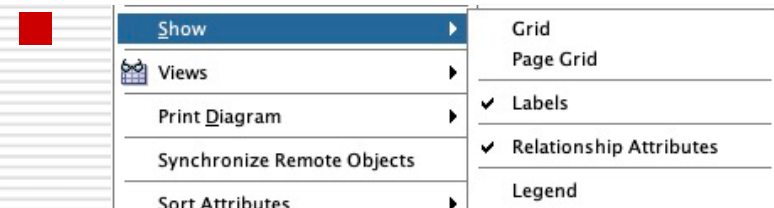
❑ To print a design:

- 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 Settings

- ❑ Right-click in the design surface of the **Logical** tab and make the following selections from the popup menu.











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.


Oracle Data Modeler Toolbar



□ The **Oracle Data Modeler** toolbar contains buttons for the following operations (among others):

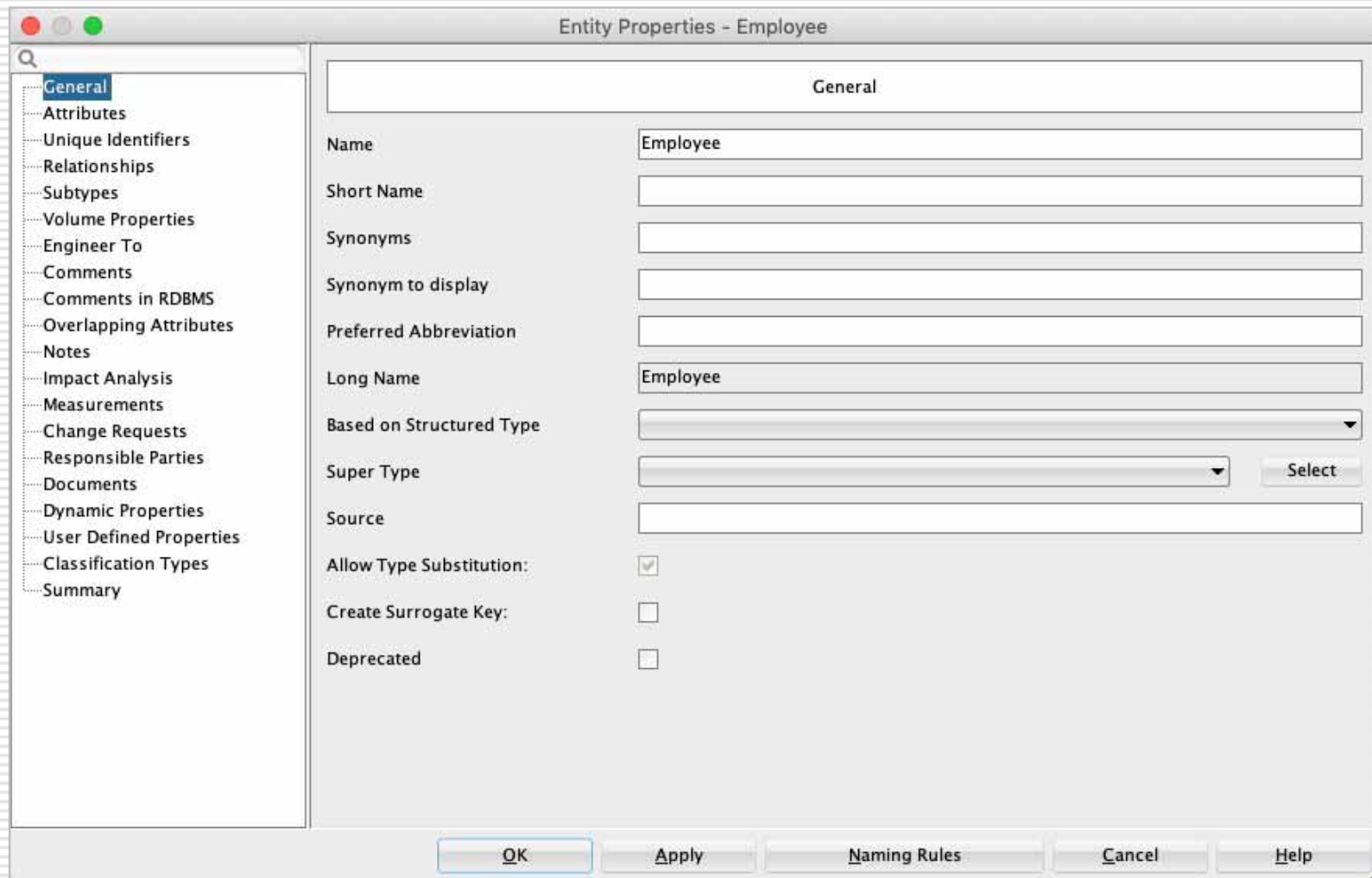
-  **Select** allows selection of diagram elements.
-  **New Entity** creates a new entity type.
-  **New N:M Relation** creates a new N:M relationship type.
-  **New 1:N Relation** creates a new 1:N relationship type.
-  **New 1:N Relation Identifying** creates a new 1:N relationship type for a weak 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, do the following.
 - Enter a name for the entity type in the **Name** field.
 - Click the **OK** button.
- ❑ An entity appears on the design surface similar to 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)



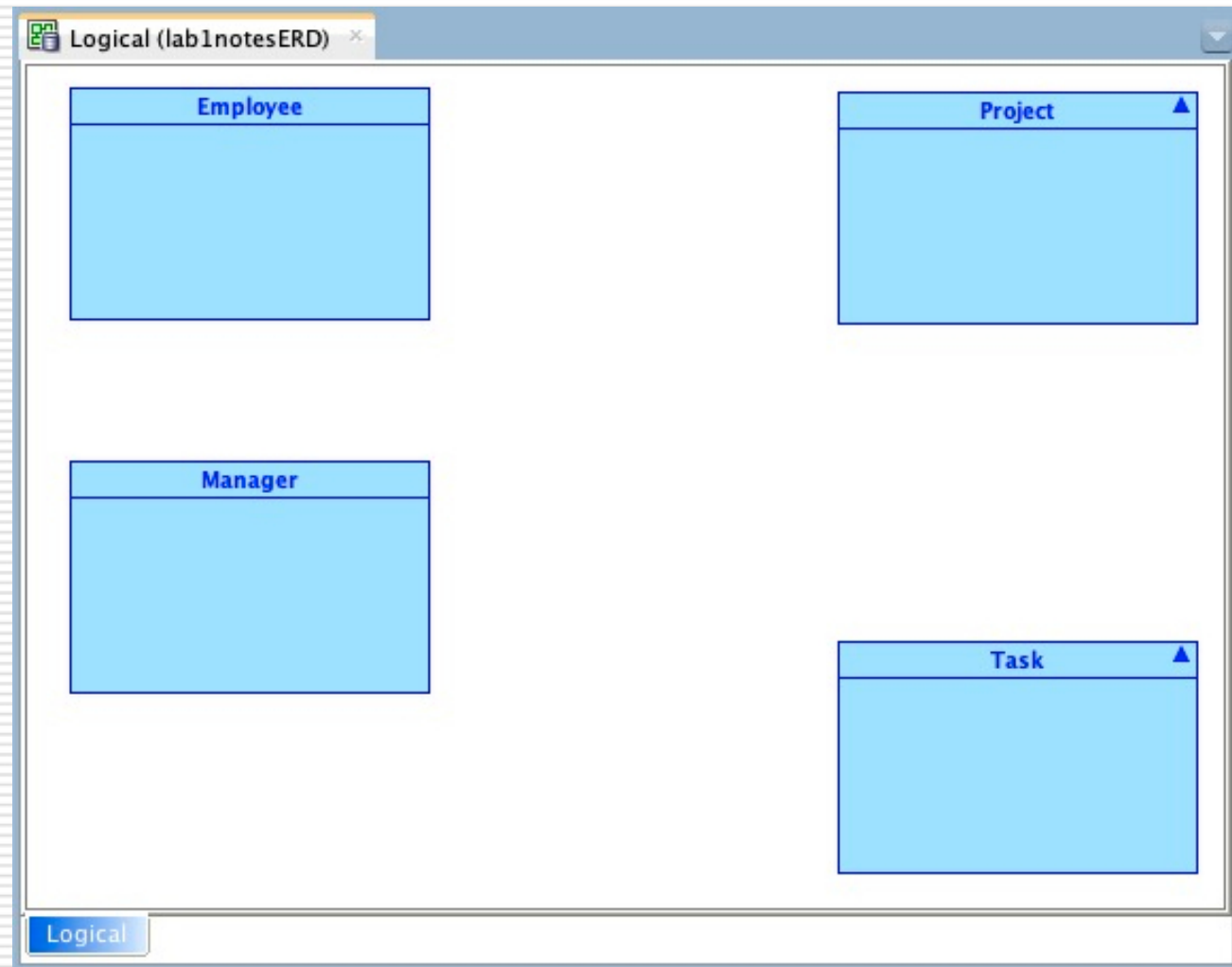
The image shows a software dialog box titled "Entity Properties - Employee". On the left is a tree view with categories like General, Attributes, Unique Identifiers, Relationships, Subtypes, Volume Properties, Engineer To, Comments, Comments in RDBMS, Overlapping Attributes, Notes, Impact Analysis, Measurements, Change Requests, Responsible Parties, Documents, Dynamic Properties, User Defined Properties, Classification Types, and Summary. The "General" category is selected. The main area of the dialog is divided into two panes, with the "General" pane active. It contains several input fields: "Name" (filled with "Employee"), "Short Name", "Synonyms", "Synonym to display", "Preferred Abbreviation", "Long Name" (filled with "Employee"), "Based on Structured Type" (a dropdown menu), "Super Type" (a dropdown menu with a "Select" button next to it), and "Source". At the bottom of the main area are three checkboxes: "Allow Type Substitution:" (checked), "Create Surrogate Key:" (unchecked), and "Deprecated" (unchecked). At the very bottom of the dialog are five buttons: "OK", "Apply", "Naming Rules", "Cancel", and "Help".

General	
Name	Employee
Short Name	
Synonyms	
Synonym to display	
Preferred Abbreviation	
Long Name	Employee
Based on Structured Type	
Super Type	
Source	
Allow Type Substitution:	<input checked="" type="checkbox"/>
Create Surrogate Key:	<input type="checkbox"/>
Deprecated	<input type="checkbox"/>

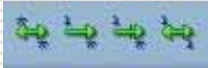
Create An Entity Type (3)

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.



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 do the following.
 - 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 similar to 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)

Relation Properties - WorksOn

General

Name: WorksOn

Use surrogate keys: ☐

Source Cardinality

Source: Employee

Source key:

Name on Source:

Source Entity Synonym: Employee

Source to Target Cardinality: 1 to *

Source Optional: ☒

Transferable: ☒

Target Cardinality

Target: Project

Target key:

Name on Target:

Target Entity Synonym: Project

Target to Source Cardinality: * to 1

Target Optional: ☒

Transferable: ☒

Dominant Role: None

Identifying: ☐ In Arc: ☐

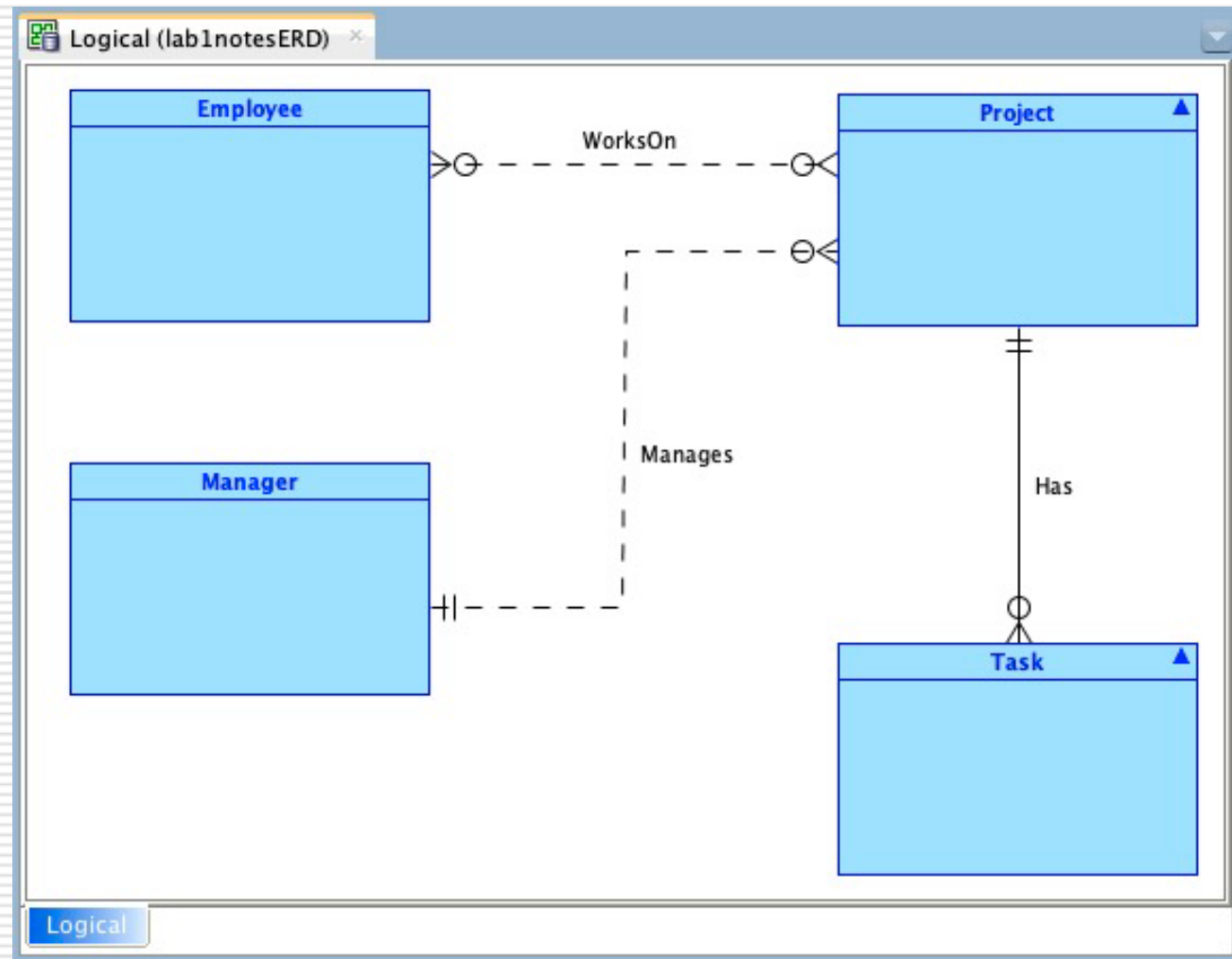
Delete Rule: NO ACTION

OK Apply Cancel Help

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)

Entity Properties - Employee

Attributes

Details Overview UDP

Attributes:

	Name	Data type
1	empNo	Unknown
2	name	Unknown
3	address	Unknown
4	salary	Unknown

Attribute Properties

Name: empNo

Data Type: ☒ Domain ☐ Logical ☐ Distinct
☐ Structured ☐ Collection

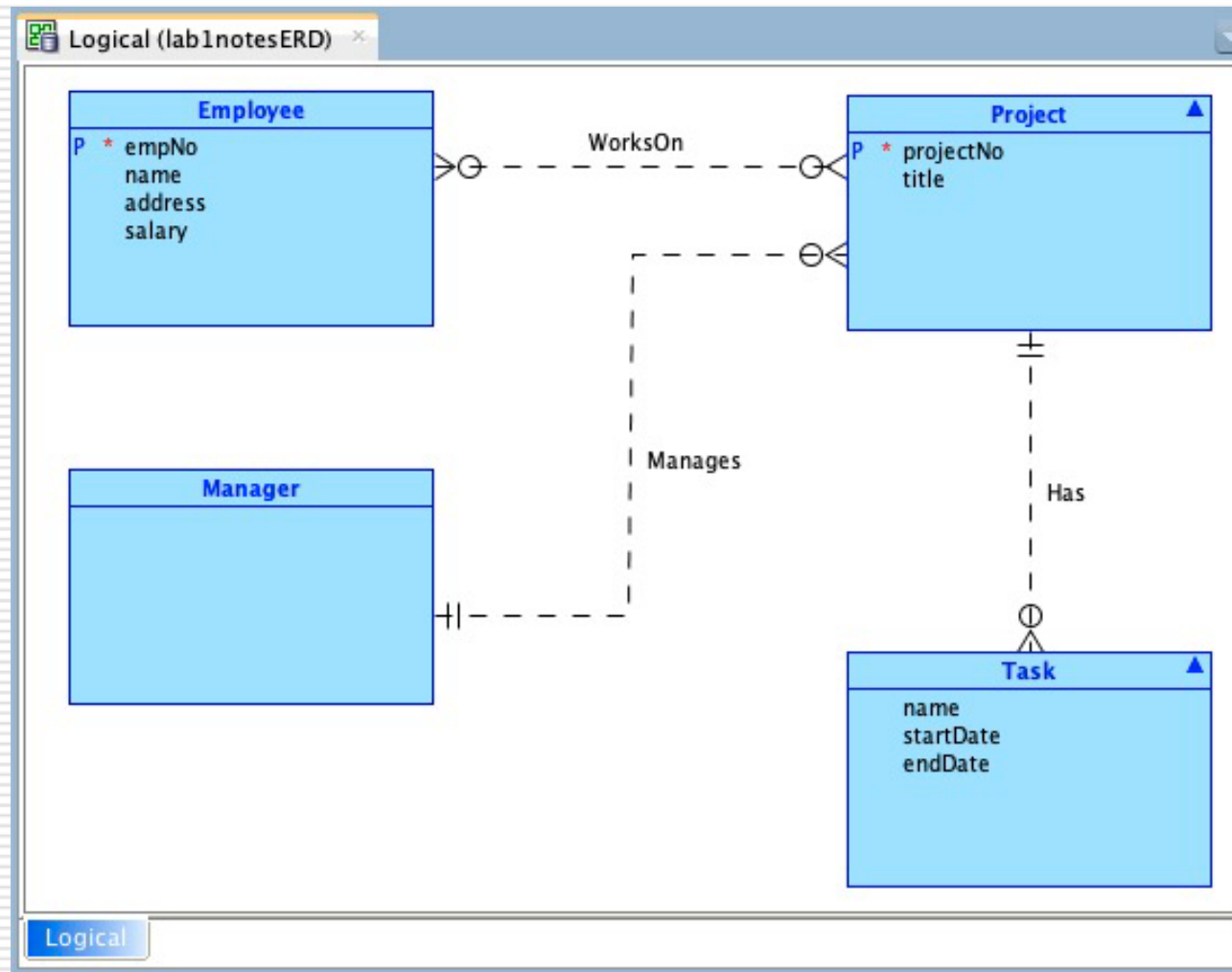
Source Type: Unknown Preferred ☐

☒ Primary UID ☐ Relation UID ☒ Mandatory ☐ Deprecated

Comments in RDBMS Comments Notes

OK Apply Naming Rules Cancel Help

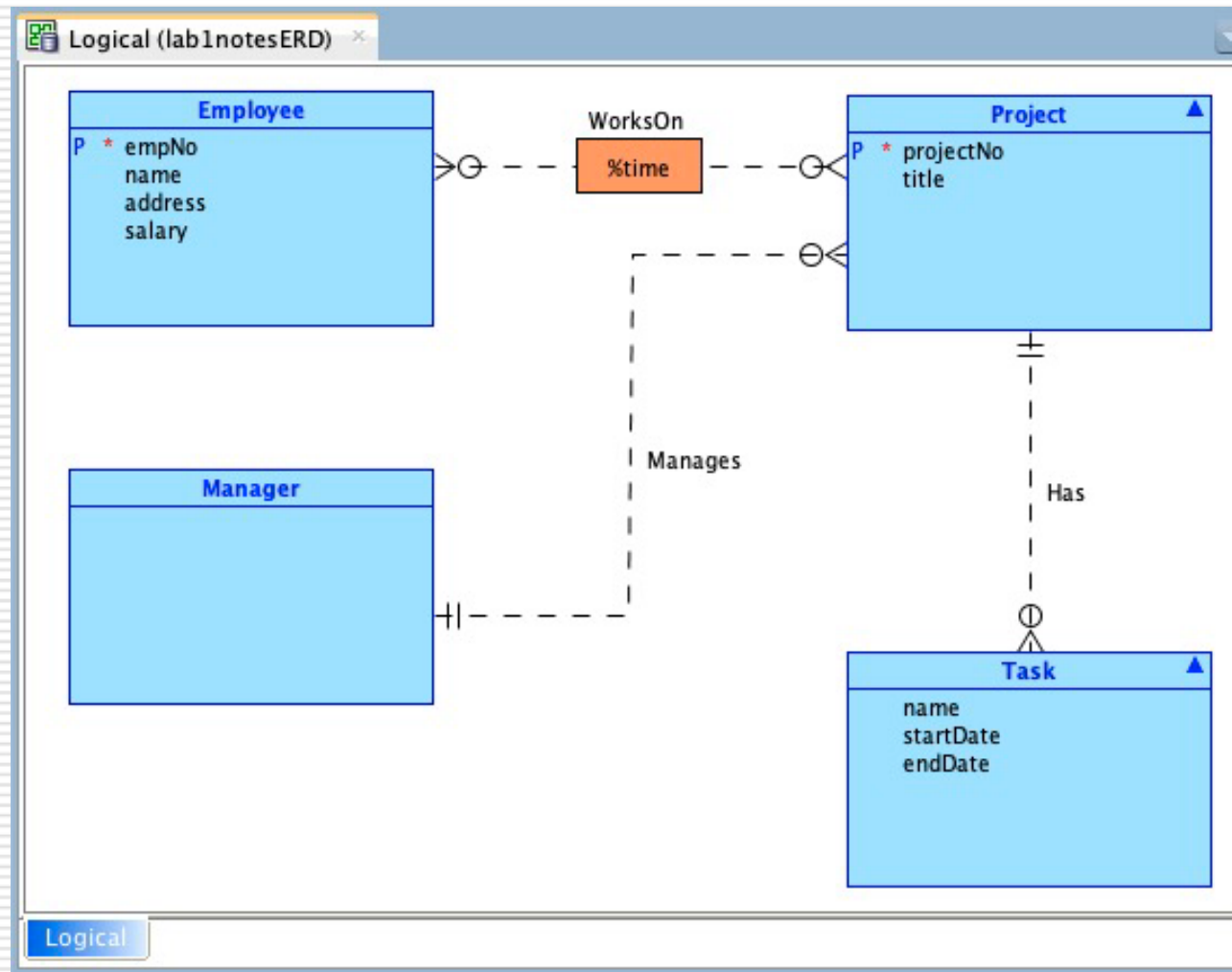
Add Entity Attributes (3)



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 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.
 - Click **OK**.
 - Resize the attribute box as desired.
- ❑ The next slide shows an attribute defined for the **WorksOn** relationship.

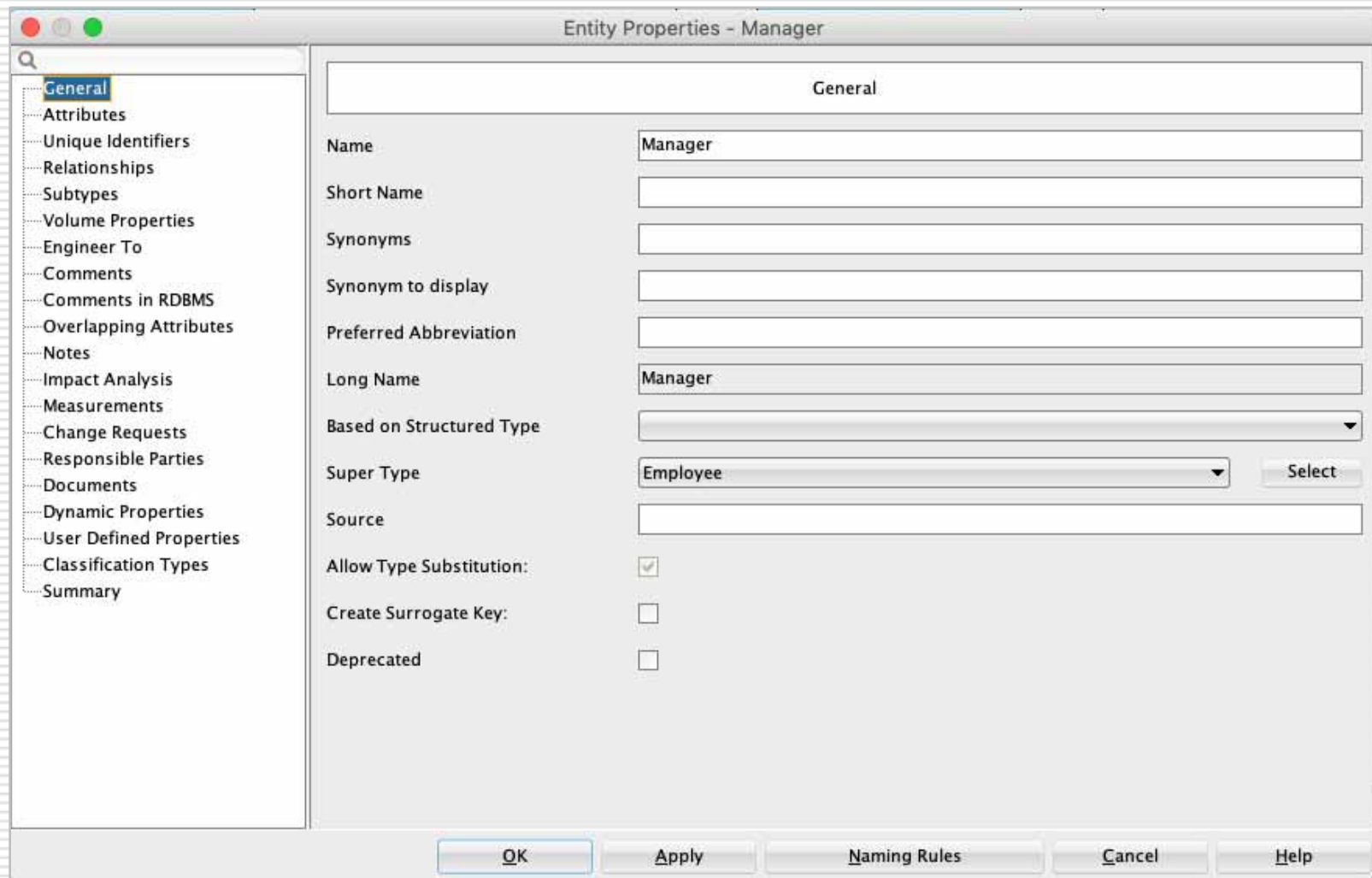
Add Relationship Attributes (2)



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**.
- ❑ An example of a generalization relationship is shown on slide 25.

Create A Generalization Relationship (2)



The image shows a software dialog box titled "Entity Properties - Manager". On the left is a tree view with a search icon at the top. The "General" item is selected and highlighted. The main area of the dialog is titled "General" and contains several fields and checkboxes. The "Name" field is filled with "Manager". The "Long Name" field is also filled with "Manager". The "Super Type" dropdown menu is set to "Employee", with a "Select" button next to it. The "Allow Type Substitution:" checkbox is checked. The "Create Surrogate Key:" and "Deprecated" checkboxes are unchecked. At the bottom of the dialog are five buttons: "OK", "Apply", "Naming Rules", "Cancel", and "Help".

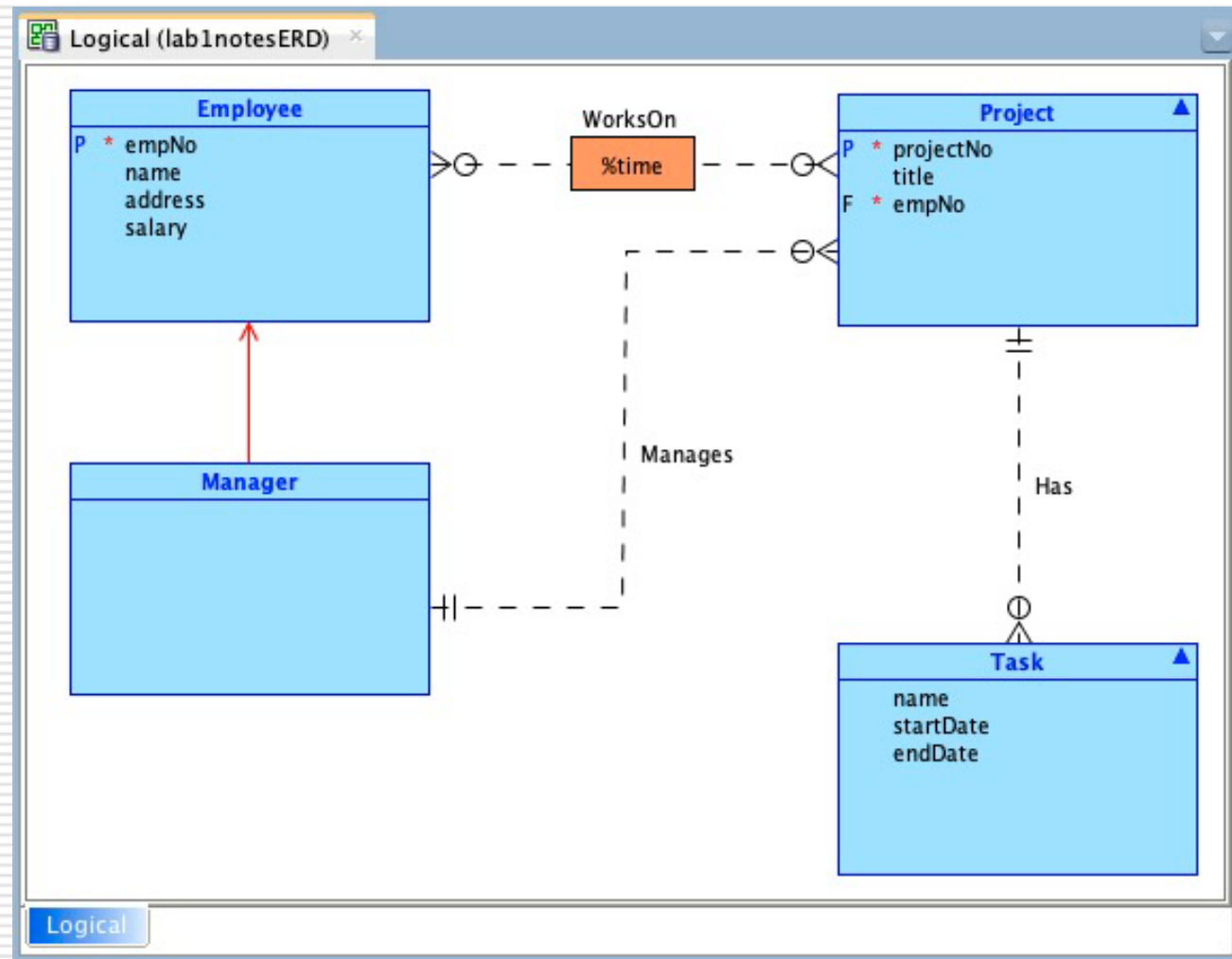
General	
Name	Manager
Short Name	
Synonyms	
Synonym to display	
Preferred Abbreviation	
Long Name	Manager
Based on Structured Type	
Super Type	Employee Select
Source	
Allow Type Substitution:	<input checked="" type="checkbox"/>
Create Surrogate Key:	<input type="checkbox"/>
Deprecated	<input type="checkbox"/>

Buttons: OK, Apply, Naming Rules, Cancel, Help

Create A Generalization Relationship (3)

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

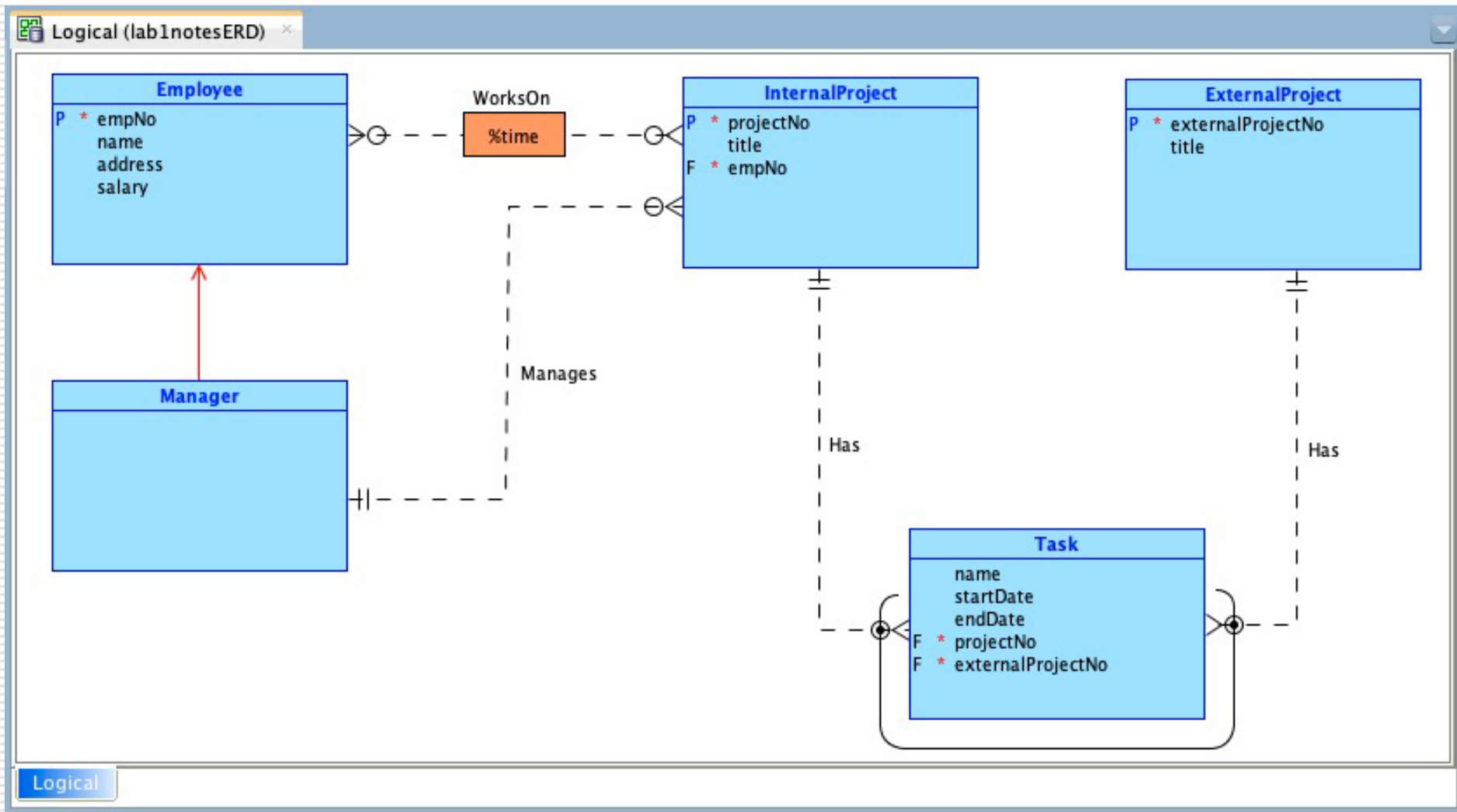
Add elbows to a generalization relationship by right-clicking on it, selecting **Add Elbow** from the popup menu and dragging the elbow to the desired position.



Create An XOR Constraint (Arc Relationship) (1)

- ❑ To create an XOR constraint (Arc relationship) do the following:
 - Select the entity type that should participate in only one of the relationship types (e.g., Task).
 - Select all relationship lines to be included (hold down the Shift key and click each line).
 - 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)

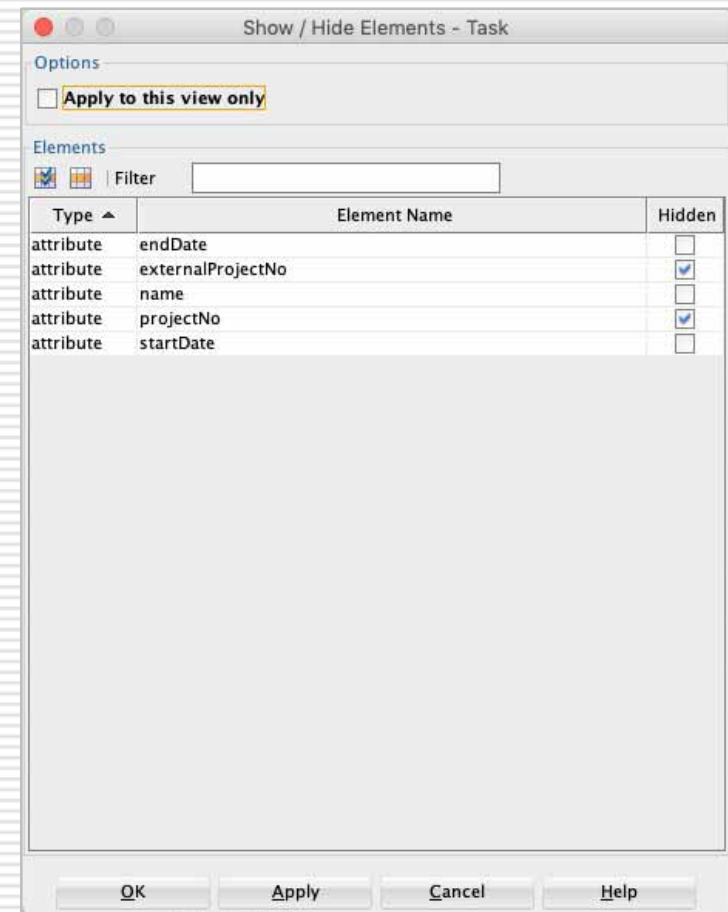


Showing/Hiding Design Elements (1)

❑ 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.
- Click **OK**.

❑ The next slide shows an example of hiding some elements of entities (compare with the previous slide).



Showing/Hiding Design Elements (2)

