

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)

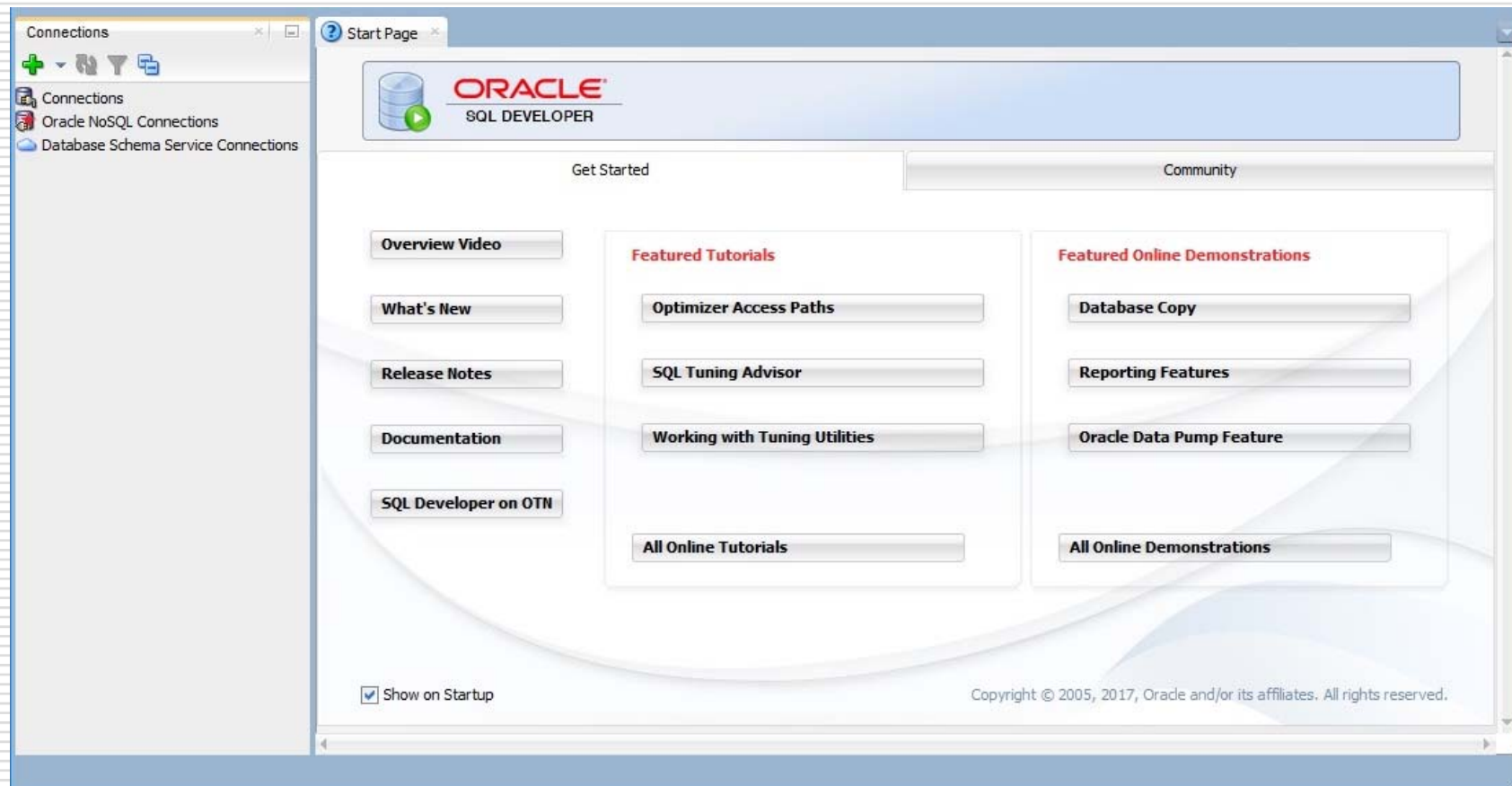
- Run the program “[sqldeveloper](#)”.

Double click the app.

SQL Developer opens in the [Start Page](#) as shown on the next slide.

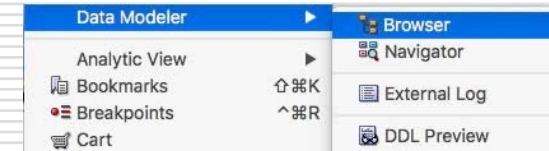
Oracle SQL Developer (2)

- ❑ Close the [Connections](#) and the [Start Page](#) tabs; you will use the [Connections](#) tab in the next lab.

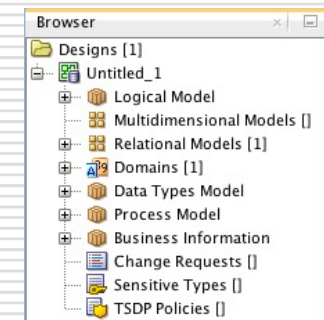


Create A Database Design

- ❑ 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 **Untitled_1** for creating a database design.

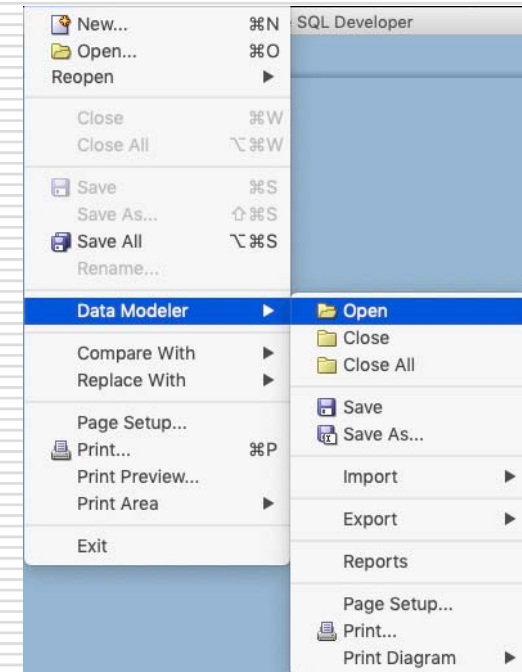


- ❑ This template will be renamed when you save your design as explained on the next slide.

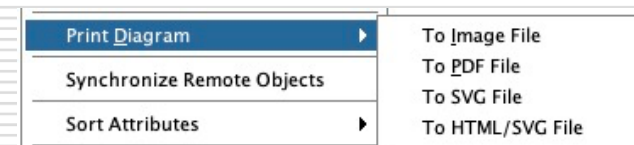
Save, Open, Print A Database Design

- ❑ 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.



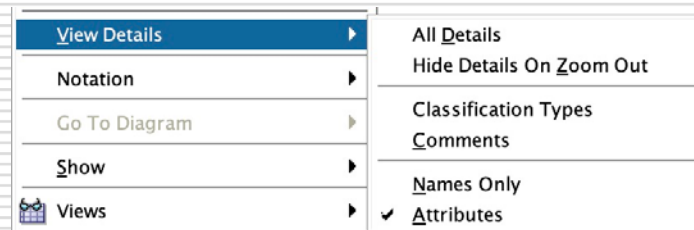
- ❑ To print a design:
 - right-click in the design surface;
 - select **Print Diagram** from the popup menu.
 - select one of the options shown in the figure.



Oracle Data Modeler Design Settings

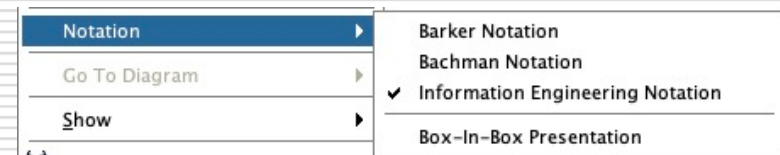
- ❑ Right-click in the design surface of the **Logical** tab and make the following selections from the popup menu.

- **View Details**: check only **Attributes**

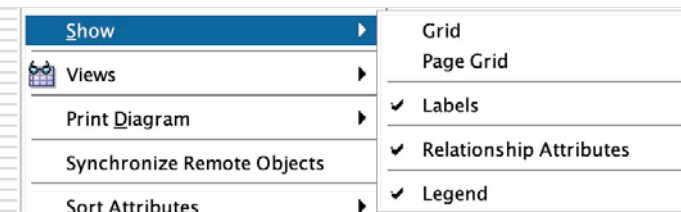


Note
If options other than **Attributes** is selected in **View Details**, **Oracle Data Modeler** will show many additional details about entities that are not relevant for the purpose of constructing only an E-R diagram.

- **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)

Entity Properties - Employee

General

Name: Employee

Short Name:

Synonyms:

Synonym to display:

Preferred Abbreviation:

Long Name: Employee

Based on Structured Type:

Super Type:

Source:

Allow Type Substitution: ☒

Create Surrogate Key: ☐

Deprecated: ☐

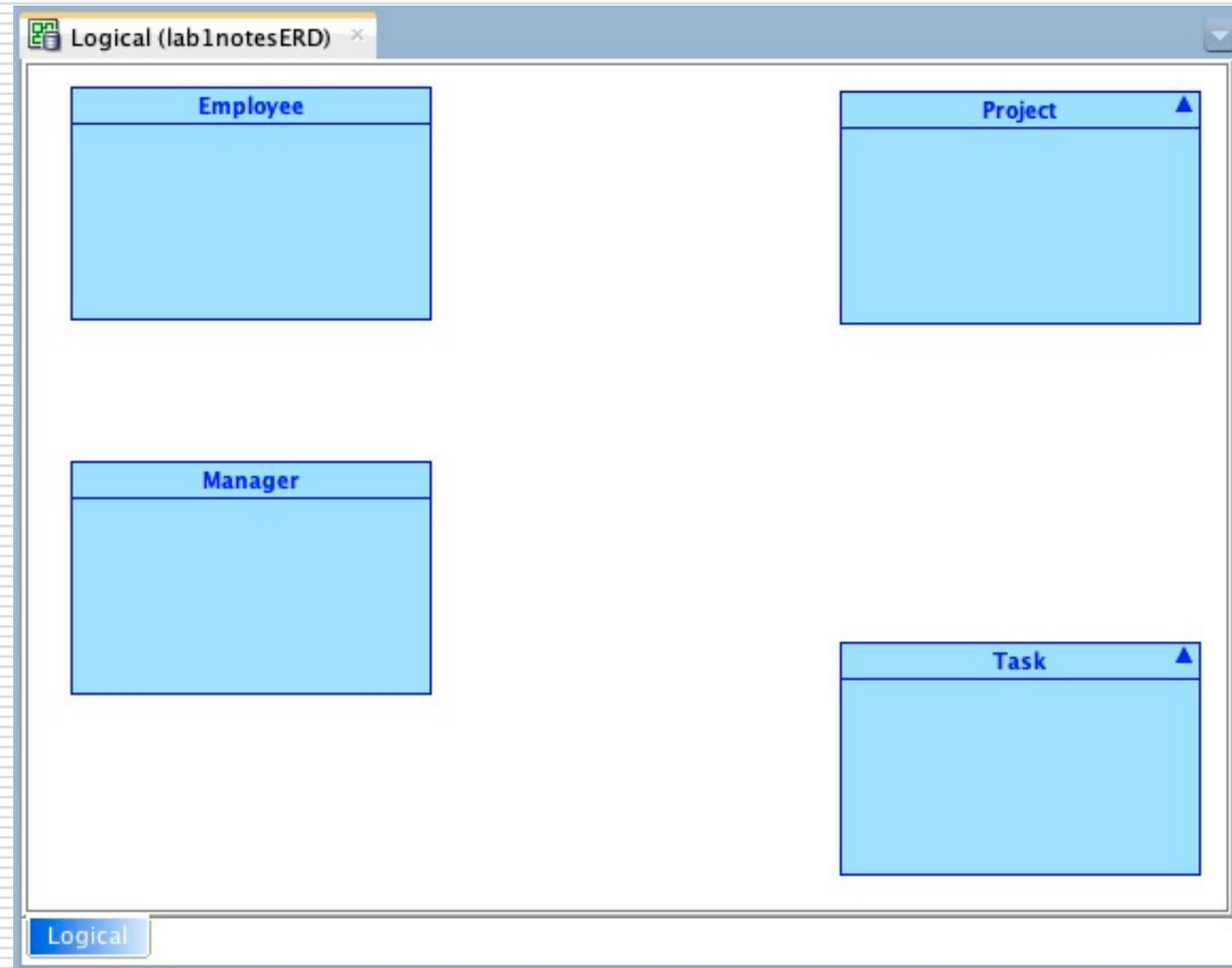
OK Apply Naming Rules Cancel Help

Create An Entity Type (3)

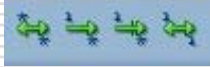
Reposition an entity type by selecting it and dragging it to the desired position.

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)

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: $\leftarrow *$

Source Optional: ☒

Transferable: ☒

Target Cardinality

Target: Project

Target key:

Name on Target:

Target Entity Synonym: Project

Target to Source Cardinality: $\rightarrow *$

Target Optional: ☒

Transferable: ☒

Dominant Role: None

Identifying: ☐ In Arc: ☐

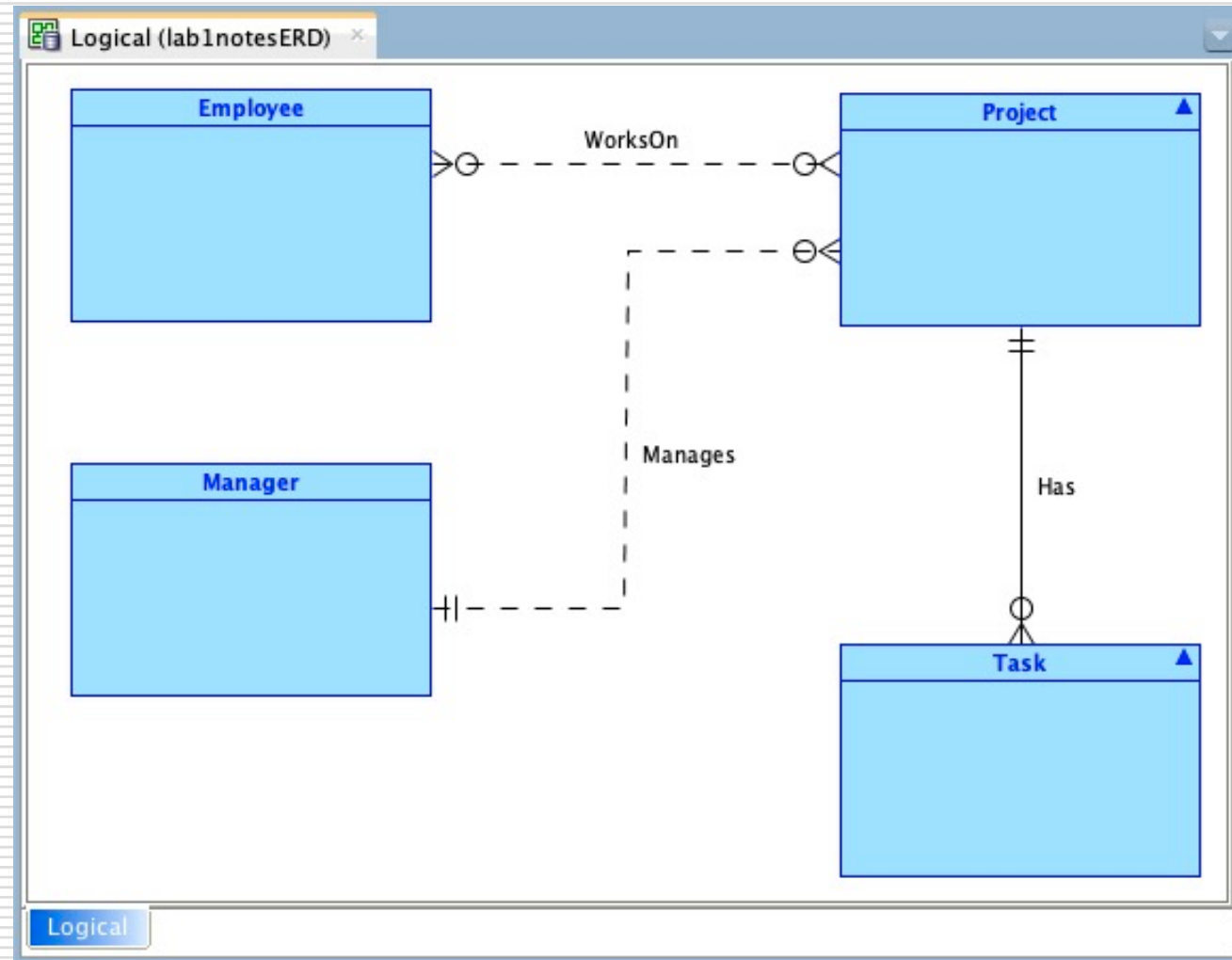
Delete Rule: NO ACTION

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)

The screenshot shows the 'Entity Properties - Employee' dialog box with the 'Attributes' tab selected. The left sidebar contains a tree view with 'Attributes' highlighted. The main area is divided into two panes: 'Attributes:' and 'Attribute Properties'.

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

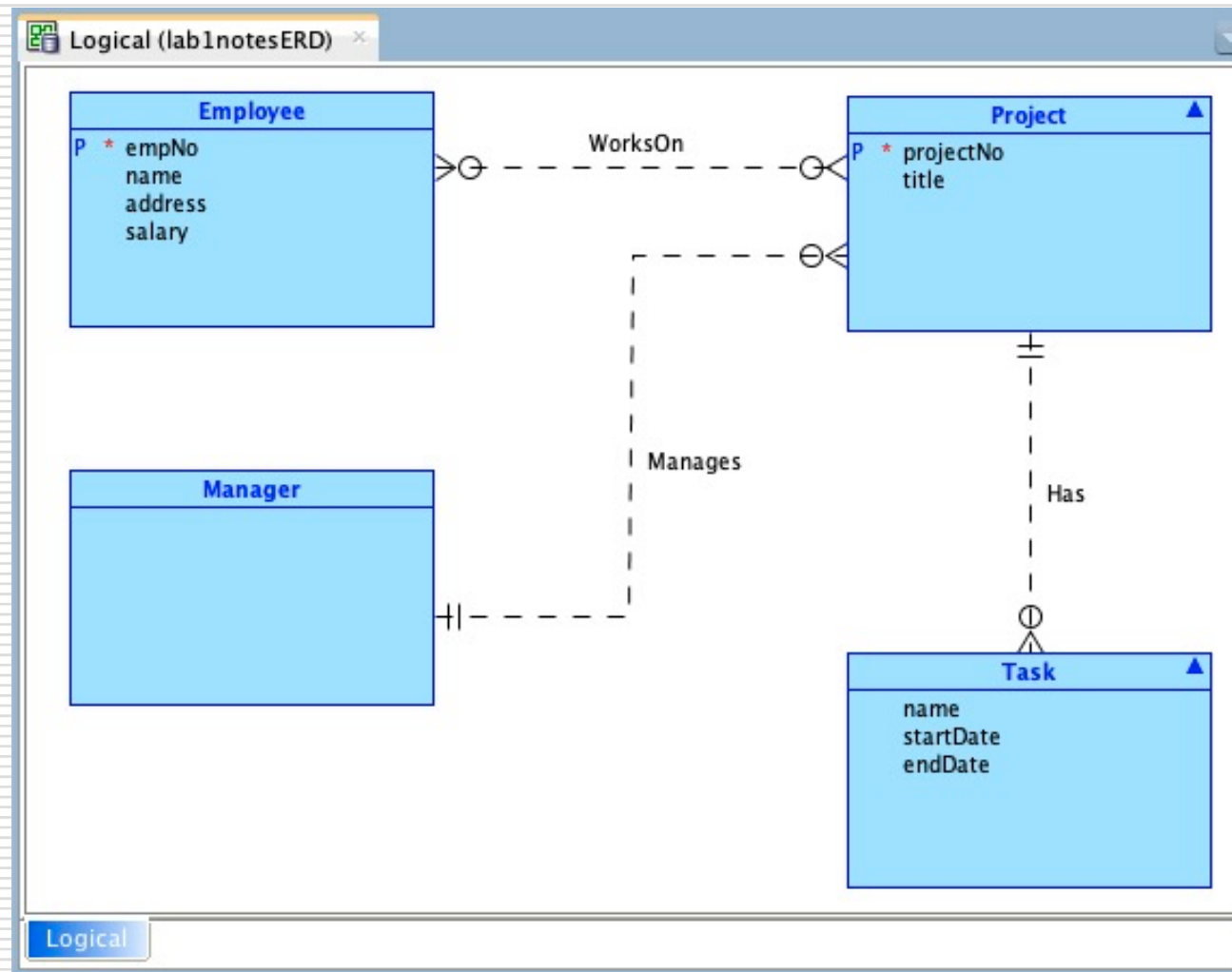
Source Type: Unknown Preferred ☐

☒ Primary UID ☐ Relation UID ☒ Mandatory ☐ Deprecated

Comments in RDBMS: Comments Notes

Buttons at the bottom: OK, Apply, Naming Rules, Cancel, Help

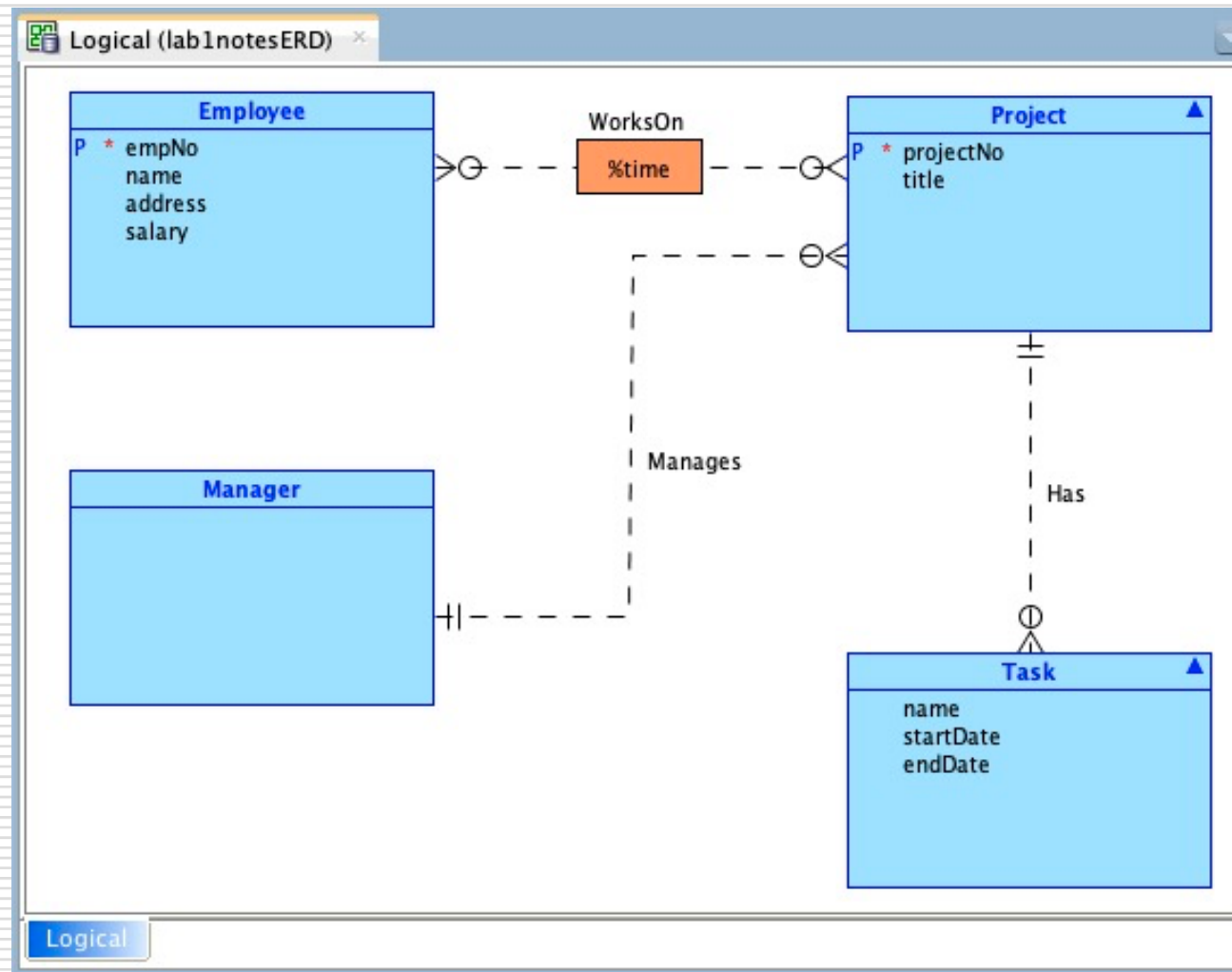
Add Entity Attributes (3)



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:
 - 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)

The screenshot shows a software interface for defining entity properties. The title bar reads "Entity Properties - Manager". On the left is a sidebar with a search icon and a tree view containing the following items: General (selected), 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 main area is titled "General" and contains the following fields and controls:

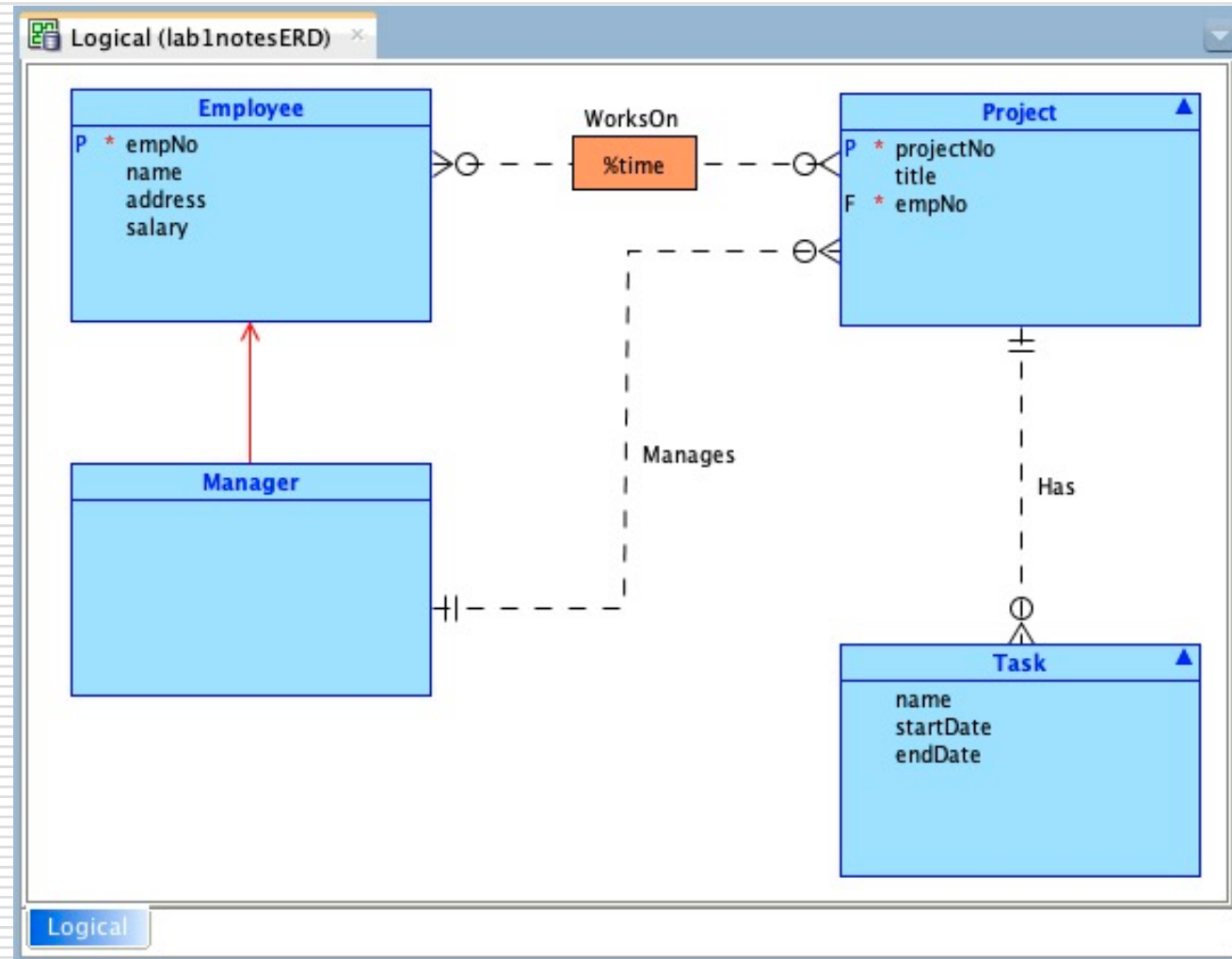
- Name: Manager
- Short Name: (empty)
- Synonyms: (empty)
- Synonym to display: (empty)
- Preferred Abbreviation: (empty)
- Long Name: Manager
- Based on Structured Type: (empty dropdown)
- Super Type: Employee (dropdown menu) with a "Select" button to its right.
- Source: (empty)
- Allow Type Substitution: ☒
- Create Surrogate Key: ☐
- Deprecated: ☐

At the bottom of the dialog are five buttons: OK, Apply, Naming Rules, Cancel, and Help.

Create A Generalization Relationship (3)

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

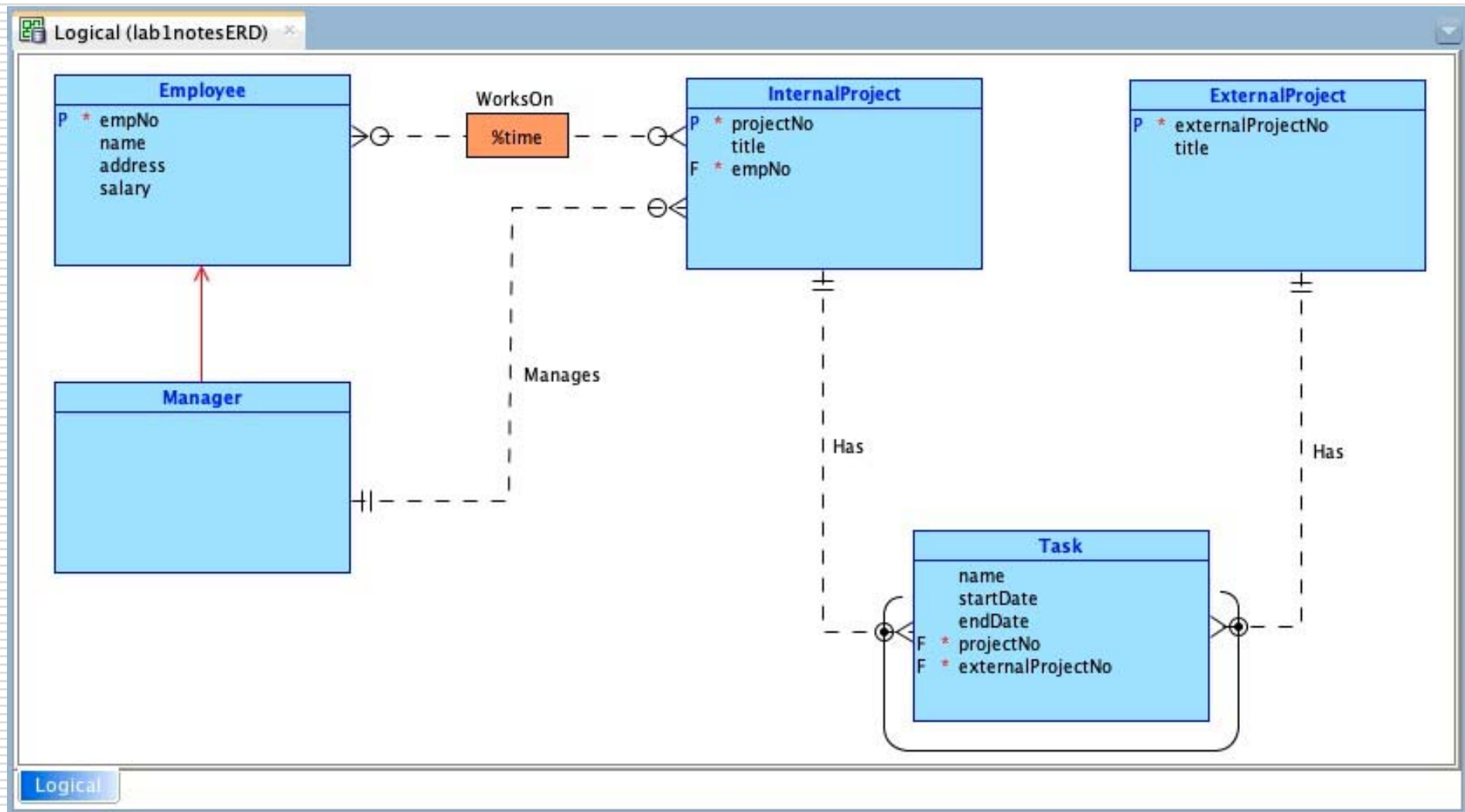
Add elbows to a generalization relationship by right-clicking on it, selecting **Add Elbow** from the popup menu and dragging the elbow to the desired position.



Create An XOR Constraint (Arc Relationship) (1)

- ❑ To create an XOR constraint (Arc relationship):
 - 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.

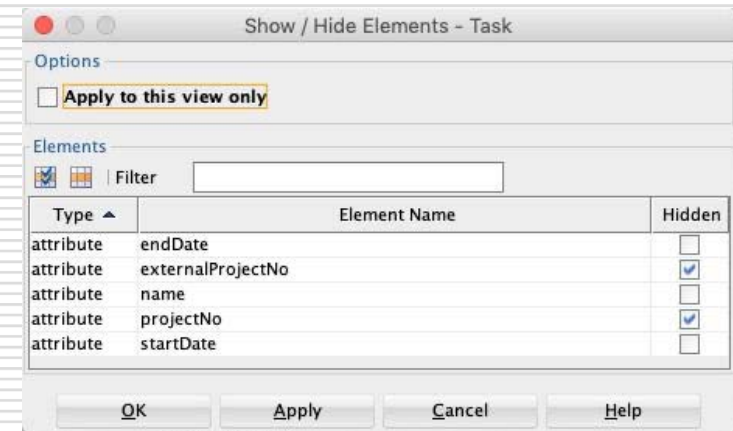
Create An XOR Constraint (Arc Relationship) (2)



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)

