Entity Relationship Diagrams
(Section 15.1)

Peter Revesz

CSCE 413/813
Computer Science and Engineering
University of Nebraska – Lincoln
Entity Relationship Diagram

**Entity Set** - set of persons, objects, or concepts that form a major focus of the database. In the entity relationship diagram, entity sets are represented by rectangles.

**Relationship** - some interaction or other connection between two entity sets or among more entity sets. In the entity relationship diagram, relationships are represented by diamonds and line connections to all the entity sets involved in the relationship.

**Attributes** - describe specific features or characteristics of the entities or the relationships. In the entity relationship diagram, attributes are represented by ovals.
Relationship Types

A binary relationship between two entity sets $A$ and $B$ is:

**One-to-one** - if each entity in $A$ participates in the relationship with at most one entity in $B$ and vice versa. One-to-one relationships are represented by a pair of arrows. Both arrows run from the relationship to the entity sets.

**One-to-many** - if each entity in $A$ may participate in the relationship with several entities in $B$, but each entity in $B$ participates in the relationship with at most one entity in $A$. A one-to-many relationship between $A$ and $B$ is represented by an arrow from the relationship $R$ to $A$.

**Many-to-many** - if each entity in $A$ may participate in the relationship with several entities in $B$, and vice versa. Many-to-many relationships are represented by a pair of plain lines.
Insurance Company Database

What needs to be represented?

Persons

Disasters

Hit

Name

Type
Insurance Company Database

What components are these in the diagram?

Persons – Entity Set
Disasters – Entity Set
Hit – Relationship between Persons and Disasters

What type of relationship?
Many-to-many

Name – Attribute of Persons
Type – Attribute of Disasters
Insurance Company Database

Draw the Entity Relationship Diagram.

Person

Name

Hit

Disaster

Type
Exercise: Draw the Entity Relationship Diagram for a Gallery Database

What needs to be represented?
Exercise: Draw the Entity Relationship Diagram for a Gallery Database

What needs to be represented?

Displays
Gallery
ID
Name
Owner
Painters
Paintings
Paints
Phone
PNUM
Price
Title
Exercise: Draw the Entity Relationship Diagram for a Gallery Database

What components are these in the diagram?

- **Displays** – Relationship between Painting and Gallery
- **Gallery** – Entity Set
- **ID** – Attribute of Painter
- **Name** – Attribute of Painter
- **Owner** – Attribute of Gallery
- **Painters** – Entity Set
- **Painting** – Entity Set
- **Paints** – Relationship between Painting and Painter
- **Phone** – Attribute of Painter
- **PNUM** – Attribute of Gallery
- **Price** – Attribute of Painting
- **Title** – Attribute of Painting
Entity Relationship Diagram for Gallery Database
An instance of the Gallery Database

Translating an Entity Relationship Diagram to a Relation Scheme: Each entity is a table. Each many-to-many relationship is a table that contains the primary keys of its associated entities. One-to-many and one-to-one relationships do not need a separate table. They can be implemented by adding the primary key of one entity to another entity. Here Painter ID is added to Painting, and Painting PNUM is added to Gallery to implement many-to-one relationships.
"An Instance of the Gallery Database Created in MySQL"

Exercise: Find the name of the painter who painted the most expensive painting.

```
MariaDB [revesz]> select * from painter;
+-------------+---------+---------+
<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>PHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>123</td>
<td>Ross</td>
<td>888-4567</td>
</tr>
<tr>
<td>126</td>
<td>Pollock</td>
<td>345-1122</td>
</tr>
<tr>
<td>234</td>
<td>Picasso</td>
<td>456-3345</td>
</tr>
<tr>
<td>335</td>
<td>O'Keefe</td>
<td>567-8999</td>
</tr>
<tr>
<td>456</td>
<td>Warhol</td>
<td>777-7777</td>
</tr>
</tbody>
</table>
+-------------+---------+---------+
5 rows in set (0.00 sec)

MariaDB [revesz]> select * from gallery;
+--------+---------+
<table>
<thead>
<tr>
<th>PNUM</th>
<th>OWNER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345</td>
<td>Johnson</td>
</tr>
<tr>
<td>6666</td>
<td>Johnson</td>
</tr>
<tr>
<td>4536</td>
<td>McCloud</td>
</tr>
<tr>
<td>7878</td>
<td>McCloud</td>
</tr>
<tr>
<td>6789</td>
<td>Palmer</td>
</tr>
<tr>
<td>7896</td>
<td>Palmer</td>
</tr>
<tr>
<td>9889</td>
<td>Palmer</td>
</tr>
</tbody>
</table>
+--------+---------+
7 rows in set (0.00 sec)

MariaDB [revesz]> select * from painting
-> ;
+--------+---------+--------+--------+
<table>
<thead>
<tr>
<th>PNUM</th>
<th>TITLE</th>
<th>PRICE</th>
<th>ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345</td>
<td>Wild Waters</td>
<td>245.00</td>
<td>126</td>
</tr>
<tr>
<td>4536</td>
<td>Sea Storm</td>
<td>8359.00</td>
<td>335</td>
</tr>
<tr>
<td>6666</td>
<td>Wild Waters</td>
<td>6799.00</td>
<td>234</td>
</tr>
<tr>
<td>7878</td>
<td>High Tide</td>
<td>98000.00</td>
<td>456</td>
</tr>
<tr>
<td>6789</td>
<td>Paradise</td>
<td>590000.00</td>
<td>234</td>
</tr>
<tr>
<td>7896</td>
<td>Faded Rose</td>
<td>145.00</td>
<td>123</td>
</tr>
<tr>
<td>9889</td>
<td>Sunset</td>
<td>975000.00</td>
<td>234</td>
</tr>
</tbody>
</table>
+--------+---------+--------+--------+
7 rows in set (0.00 sec)
```
Drawing an Entity Relationship Diagram using www.draw.io