

## CSC430/530 – Database Management Systems

### Assignment #2 – EER to Relational Model Mapping

In this assignment, you are to map provided ER and EER diagrams into Relational Model schemas following steps described in “Lesson 5.1 - EER to Relational Model Mapping”.

- a) Consider following ER diagram for a database that can be used to keep track of transport ships and their locations for maritime authorities. Note: assume port names to be unique across all states/countries and seas/oceans/lakes. Map this diagram into a relational schema and specify all the primary & foreign keys.

**Describe each step of the mapping process.** For example:

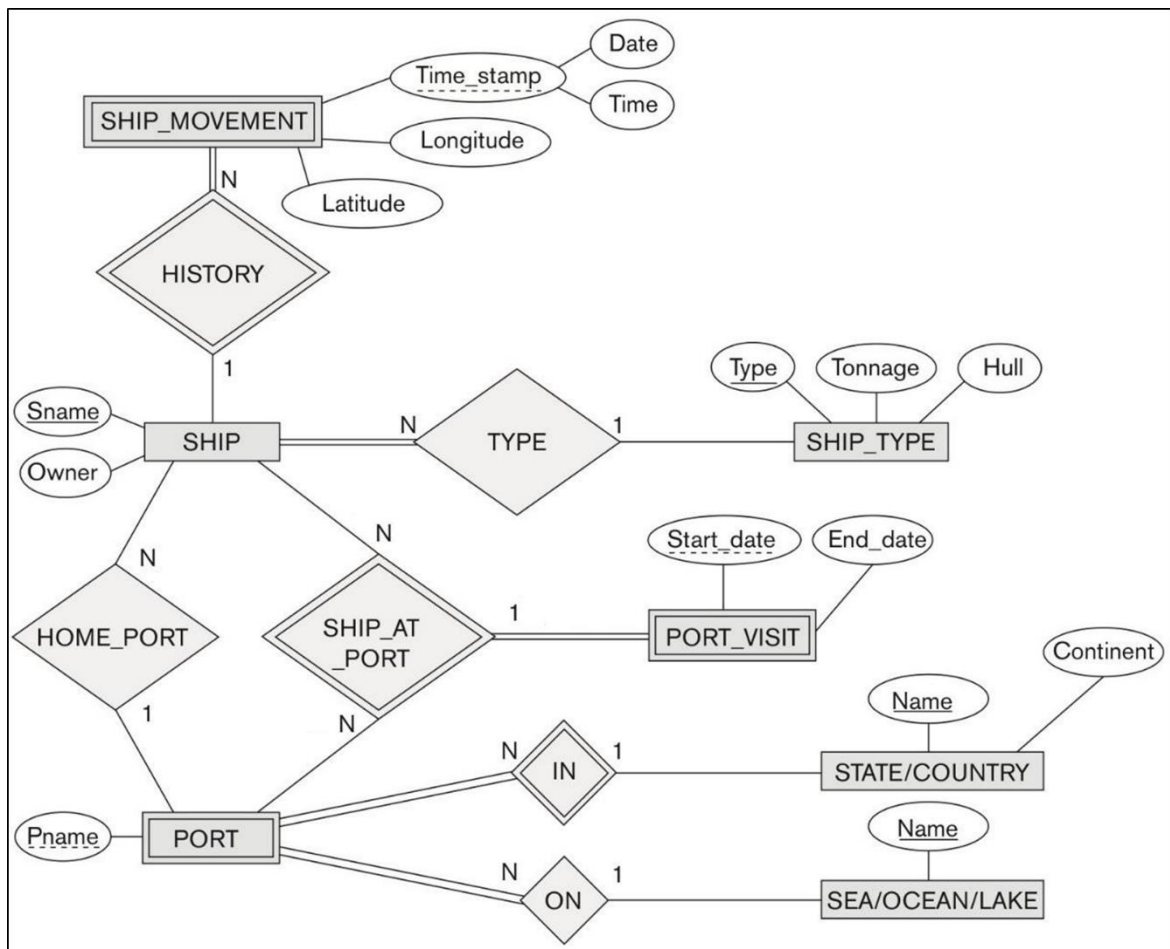
*Step 1 - mapping regular entities: SHIP, SHIP\_TYPE, STATE/COUNTRY, and SEA/OCEAN/LAKE.*

- Regular entity SHIP mapped as SHIP relation. All simple attributes are included. Attribute “Sname” is chosen as a primary key.
- Regular entity SHIP\_TYPE mapped as SHIP\_TYPE relation. All simple attributes are included. Attribute “Type” is chosen as a primary key ...

...

*Step 4 - mapping binary 1:N relationships: TYPE, ON, and HOME\_PORT.*

- 1:N relationship TYPE is mapped as a foreign key attribute “Type” in SHIP relation (“N” side) that corresponds to “Type” primary key attribute in SHIP\_TYPE relation (“1” side) ...



**Step 1 - mapping regular entities: SHIP, SHIP\_TYPE, STATE/COUNTRY, SEA/OCEAN/LAKE.**

- Regular entity SHIP mapped as SHIP relation. All simple attributes are included. Attribute "Sname" is chosen as a primary key.
- Regular entity SHIP\_TYPE mapped as SHIP\_TYPE relation. All simple attributes are included. Attribute "Type" is chosen as a primary key.
- Regular entity STATE/COUNTRY mapped as STATE/COUNTRY relation. Attribute "Name" is chosen as a primary key.
- Regular entity SEA/OCEAN/LAKE mapped as SEA/OCEAN/LAKE relation. All simple attributes are included. Attribute "Name" is chosen as a primary key.

**Step 2 - mapping weak entities: SHIP\_MOVEMENT, PORT\_VISIT, PORT**

- Weak entity SHIP\_MOVEMENT mapped as SHIP\_MOVEMENT relation. All simple attributes are included. Attribute "Sname" is chosen as a foreign key attribute that corresponds to "Sname" primary key attribute in SHIP relation. Attributes "Date", "Time", and "Sname" are chosen as primary key attributes in SHIP\_MOVEMENT relation.
- Weak entity PORT\_VISIT mapped as PORT\_VISIT relation. All simple attributes are included. Attribute "Pname" is chosen as a foreign key attribute that corresponds to "Pname" primary key attribute in PORT relation. Attribute "Sname" is chosen as a foreign key attribute that corresponds to "Sname" primary key attribute in SHIP relation. Attributes "Start\_date", "Pname", and "Sname" are chosen as primary key attributes in PORT\_VISIT relation.
- Weak entity PORT mapped as PORT relation. Attribute "SC\_Name" is chosen as a foreign key attribute that corresponds to "Name" primary key attribute in STATE/COUNTRY relation. Attributes "Pname" and "SC\_Name" are chosen as primary key attribute in PORT relation.

**Step 3 - mapping binary 1:1 relationships:**

- N/A

**Step 4 - mapping binary 1:N relationships: TYPE, ON, HOME\_PORT.**

- 1:N relationship TYPE is mapped as a foreign key attribute "SType" in SHIP relation ("N" side) that corresponds to "Type" primary key attribute in SHIP\_TYPE relation ("1" side).
- 1:N relationship ON is mapped as a foreign key attribute "SOL\_Name" in PORT relation ("N side) that corresponds to "Name" primary key attribute in SEA/OCEAN/LAKE relation ("1" side).
- 1:N relationship HOME\_PORT is mapped as a foreign key attribute "Pname" in SHIP relation ("N" side) that corresponds to "Pname" primary key attribute in PORT relation ("1" side).

**Step 5 - mapping binary M:N relationships: SHIP\_AT\_PORT.**

- N/A

**Step 6 - mapping multivalued attributes**

- N/A

**Step 7 - mapping n-ary relationships:**

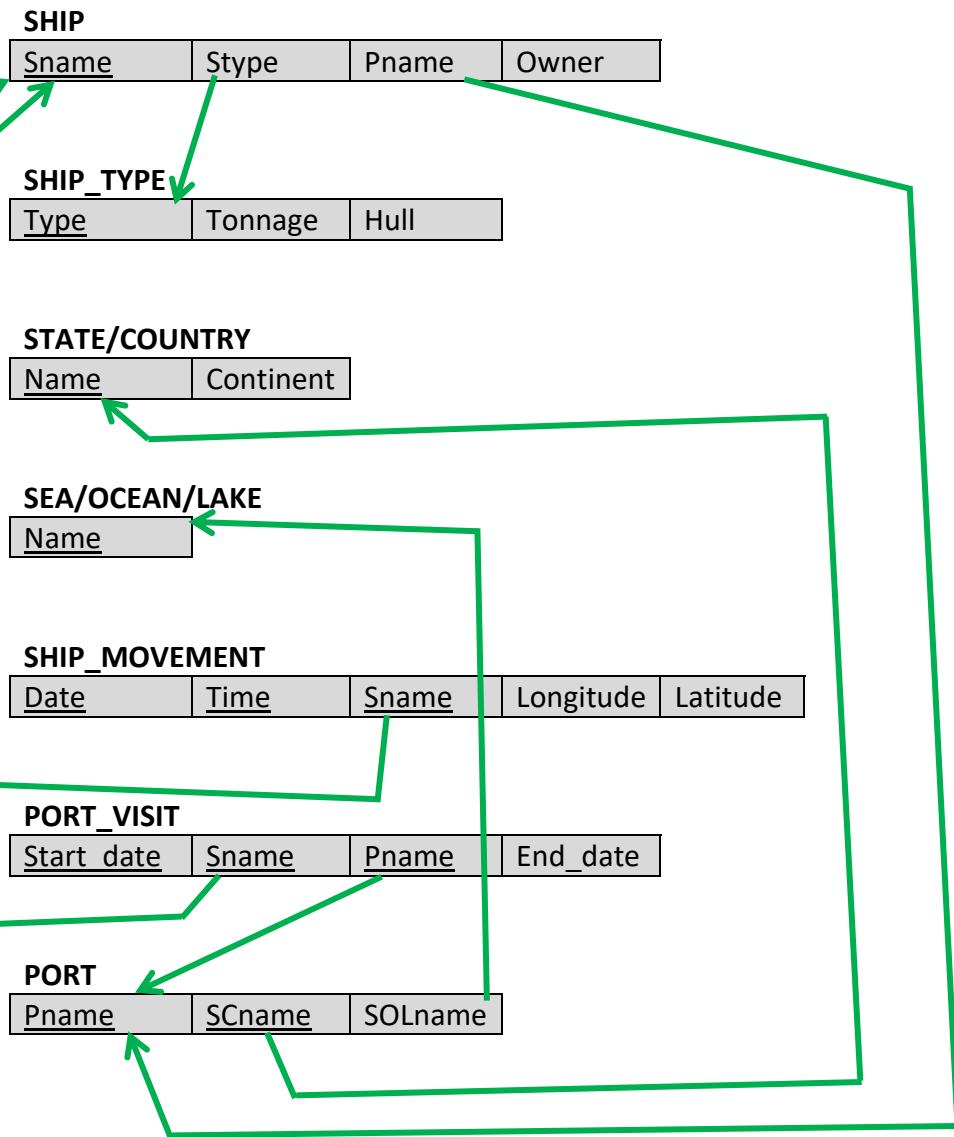
- N/A

**Step 8 - mapping specializations and generalizations:**

- N/A

**Step 9 - mapping unions:**

- N/A



- b) Consider following EER diagram for a car dealer database. Map this diagram into a relational schema and specify all the primary & foreign keys. For the VEHICLE to CAR/TRUCK/SUV specialization, pick one of the options discussed in class (8A, 8B, 8C, 8D). Justify your choice.

**Describe each step of the mapping process.** For example:

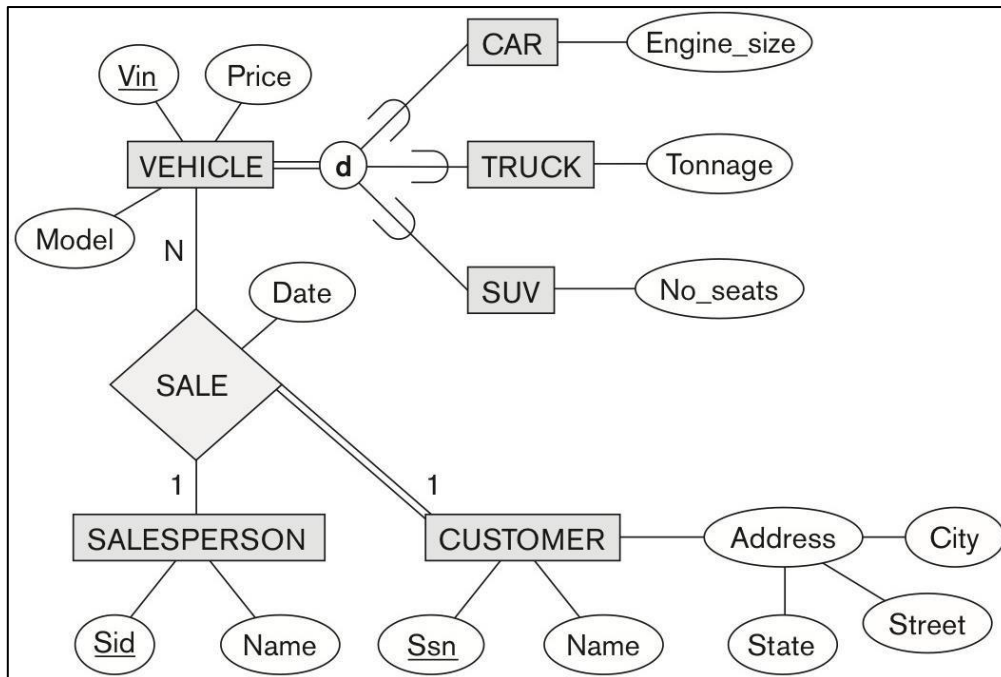
*Step 1 - mapping regular entities: VEHICLE, SALESPERSON, CUSTOMER.*

- Regular entity type VEHICLE is mapped as a VEHICLE relation. All simple attributes are included.  
Attribute "Vin" is chosen as a primary key ...

...

*Step 7 – mapping n-ary relationships: SALE ...*

*Step 8 – mapping specializations and generalizations: CAR, TRUCK, SUV ...*



**Step 1 - mapping regular entities: VEHICLE, SALESPERSON, CUSTOMER.**

- Regular entity type VEHICLE is mapped as a VEHICLE relation. All simple attributes are included. Attribute "Vin" is chosen as a primary key.
- Regular entity type SALESPERSON is mapped as SALESPERSON relation. All simple attributes are included. Attribute "Sid" is chosen as a primary key.
- Regular entity type CUSTOMER is mapped as a CUSTOMER relation. All simple and composite attributes are included. Attribute "Ssn" is chosen as a primary key.

**Step 2 - mapping weak entities:**

- N/A

**Step 3 - mapping binary 1:1 relationships:**

- N/A

**Step 4 - mapping binary 1:N relationships:**

- N/A

**Step 5 - mapping binary M:N relationships:**

- N/A

**Step 6 - mapping multivalued attributes:**

- N/A

**Step 7 - mapping n-ary relationships: SALE**

- N-ary relationship SALE is mapped as a SALE relation. Simple attribute "Date" is included. Attribute "Vin" is chosen as a foreign key attribute that corresponds to "Vin" in VEHICLE relation ("N" side). Attribute "Sid" is chosen as a foreign key attribute that corresponds to "Sid" primary key attribute in SALESPERSON relation ("1" side). Attribute "Csn" is chosen as a foreign key attribute that corresponds to "Ssn" primary key attribute in CUSTOMER relation ("1" side). Attributes "Vin", "Sid", and "Csn" are chosen as primary key attribute in SALE relation.

**Step 8A - mapping specializations and generalizations: CAR, TRUCK, SUV**

- Due to being total and disjoint specializations and for database simplicity, CAR, TRUCK, and SUV subclasses of generalized VEHICLE will each represent a new relation using Option 8A. This prevents us from having redundant relations and needing more foreign keys when implementing a SALE relation because it already has a VEHICLE relation.
- Subclass CAR contains all simple attributes. "Vin" is chosen as a primary and foreign key.
- Subclass TRUCK contains all simple attributes. "Vin" is chosen as a primary and foreign key.
- Subclass SUV contains all simple attributes. "Vin" is chosen as a primary and foreign key.

**Step 9 - mapping unions:**

- N/A

**SALESPERSON**

<u>Sid</u>	Name
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**CUSTOMER**

<u>Ssn</u>	Name	State	Street	City
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**SALE**

<u>Vin</u>	<u>Sid</u>	<u>Cssn</u>	Date
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**VEHICLE**

<u>Vin</u>	Price	Model
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**CAR**

<u>Vin</u>	Engine_size
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**TRUCK**

<u>Vin</u>	Tonnage
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**SUV**

<u>Vin</u>	No_seats
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