

Database Management Systems

Lecture



Relational Model





- **Insert**

- Add a tuple, representing an entity or an instance, into a relation
- In other words, add a row to a table
- `INSERT ('E_345', 'James', 'Street 2', 'D_21') INTO EMPLOYEE`



Operations on relations

■ Insert

- Add a tuple, representing an entity or an instance, into a relation
- In other words, add a row to a table
- INSERT ('E_345', 'James', 'Street 2', 'D_21') INTO EMPLOYEE

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21
E_345	James	Street 2	D_21



Operations on relations

■ Insert

- A tuple is only inserted into a relation if it does not violate any of the constraints discussed earlier...
 - INSERT ('D_238', 'James', 'Street 2', 'D_21') INTO EMPLOYEE
 - Not allowed!
 - Violates domain constraint! (Assume Emp No. should follow the format E_999)

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Productio n	San Francisco



Operations on relations

■ Insert

- A tuple is only inserted into a relation if it does not violate any of the constraints discussed earlier...
 - INSERT (NULL, 'James', 'Street 2', 'D_21') INTO EMPLOYEE
 - Not allowed!
 - Violates entity integrity constraint! Emp No. cannot be NULL

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Insert

- A tuple is only inserted into a relation if it does not violate any of the constraints discussed earlier...
 - INSERT ('E_238', 'James', 'Street 2', 'D_21') INTO EMPLOYEE
 - Not allowed!
 - Violates key constraint! E-238 already exists in the Emp No. attribute

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Insert

- A tuple is only inserted into a relation if it does not violate any of the constraints discussed earlier...
 - INSERT ('E_245', 'James', 'Street 2', 'D_26') INTO EMPLOYEE
 - Not allowed!
 - Violates referential integrity constraint! D_26 does not exist in the referenced (parent) table

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Productio n	San Francisco



- **Delete**

- Deletes one or more tuples from a relation
 - DELETE EMPLOYEE tuple with Emp_No = E_124

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21
E_345	James	Street 2	D_21



- **Delete**

- Deletes one or more tuples from a relation
 - DELETE EMPLOYEE tuple with Emp_No = E_124

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_345	James	Street 2	D_21



- **Delete**

- Deletes one or more tuples from a relation
 - DELETE EMPLOYEE tuple with Dep_No = 'NULL'

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_345	James	Street 2	D_21



- **Delete**

- Deletes one or more tuples from a relation
 - DELETE EMPLOYEE tuple with Dep_No = 'NULL'

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_345	James	Street 2	D_21



- **Delete**

- Deletes one or more tuples from a relation
 - DELETE EMPLOYEE tuple where Name starts with 'J'

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_345	James	Street 2	D_21



- **Delete**
 - Deletes one or more tuples from a relation
 - DELETE EMPLOYEE tuple where Name starts with 'J'

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
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■ Delete

- Do any constraints apply when deleting tuples?
- Yes!
- But which ones?
- Only referential integrity constraint!
- We cannot delete a tuple from a parent (referenced) relation if its primary key exists as foreign key in a tuple of dependent (referencing) table



Operations on relations

- **Delete**
 - DELETE DEPT tuple with Name = 'Sales'

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Delete

- DELETE DEPT tuple with Name = 'Sales'
 - Not allowed!
 - If we delete the tuple, its primary key D_21 exists as foreign key in an EMPLOYEE tuple
 - Violation of referential integrity constraint!

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Delete

- How to handle such violations?
- Multiple options exist:
 1. Reject the DELETE operation!

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

- **Delete**
 - How to handle such violations?
 - Multiple options exist:
 1. Reject the DELETE operation!

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Delete

- How to handle such violations?
- Multiple options exist:
 1. Reject the DELETE operation!
 2. Set the foreign key as 'NULL' in the affected tuples of dependent table

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Delete

- How to handle such violations?
- Multiple options exist:
 1. Reject the DELETE operation!
 2. Set the foreign key as 'NULL' in the affected tuples of dependent table

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	NULL

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Delete

- How to handle such violations?
- Multiple options exist:
 1. Reject the DELETE operation!
 2. Set the foreign key as 'NULL' in the affected tuples of dependent table
 - We cannot do this if the foreign key is part of the primary key...

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	NULL

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco



Operations on relations

■ Delete

- How to handle such violations?
- Multiple options exist:
 1. Reject the DELETE operation!
 2. Set the foreign key as 'NULL' in the affected tuples of dependent table
 3. Set the foreign key to some default value in the affected tuples of dependent table (default value is specified using DDL)

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_20

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	San Diego



Operations on relations

- **Update (or Modify)**
 - Change one or more attributes in one or more tuples
 - UPDATE Dep No in EMPLOYEE to D_21 for Emp No E_124

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_20

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	San Diego



Operations on relations

- **Update (or Modify)**
 - Change one or more attributes in one or more tuples
 - UPDATE Dep No in EMPLOYEE to D_21 for Emp No E_124

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	San Diego



Operations on relations

- **Update (or Modify)**
 - Change one or more attributes in one or more tuples
 - UPDATE Location in DEPT to 'New York' for Dep No D_20

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	San Diego



Operations on relations

- **Update (or Modify)**
 - Change one or more attributes in one or more tuples
 - UPDATE Location in DEPT to 'New York' for Dep No D_20

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	New York



Operations on relations

- **Update (or Modify)**
 - Do any constraints apply to Update operation?
 - Yes!

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	New York



Operations on relations

- **Update (or Modify)**
 - Do any constraints apply to Update operation?
 - Yes!
 - UPDATE Emp No in EMPLOYEE for EMP No E_124 to E_123
 - Not allowed!
 - Violates key constraint – E_123 already exists!

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	New York



Operations on relations

- **Update (or Modify)**

- Do any constraints apply to Update operation?
- Yes!
 - UPDATE Dep No in EMPLOYEE for EMP No E_124 to D_24
 - Not allowed!
 - Violates referential integrity constraint – D_24 does not exist!

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	New York



Operations on relations

- **Update (or Modify)**

- Do any constraints apply to Update operation?
- Yes!
 - UPDATE Dep No in DEPT for Dep No D_21 to D_24
 - Not allowed!
 - Violates referential integrity constraint – D_21 already exists as foreign key in EMPLOYEE tuples!

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	New York



Operations on relations

- **Update (or Modify)**

- Do any constraints apply to Update operation?
- Yes!
 - Generally speaking, if the modify operation does not involve any primary key or foreign key, it is accepted.
 - The domain constraints (data type, format, etc.) must be met in any case

EMPLOYEE

<u>Emp No</u>	Name	Address	Dep No
E_123	John	Street 1	D_23
E_238	Charles	Street 3	NULL
E_124	David	Street 2	D_21

DEPT

<u>Dep No</u>	Name	Location
D_21	Sales	Los Angeles
D_23	Production	San Francisco
D_20	HQ	New York



Thanks a lot

