

Database Management System – 16 (Update Operations and Violation of Integrity Constraints)

Ajay James
Asst. Prof in CSE
Government Engineering College Thrissur

Outline

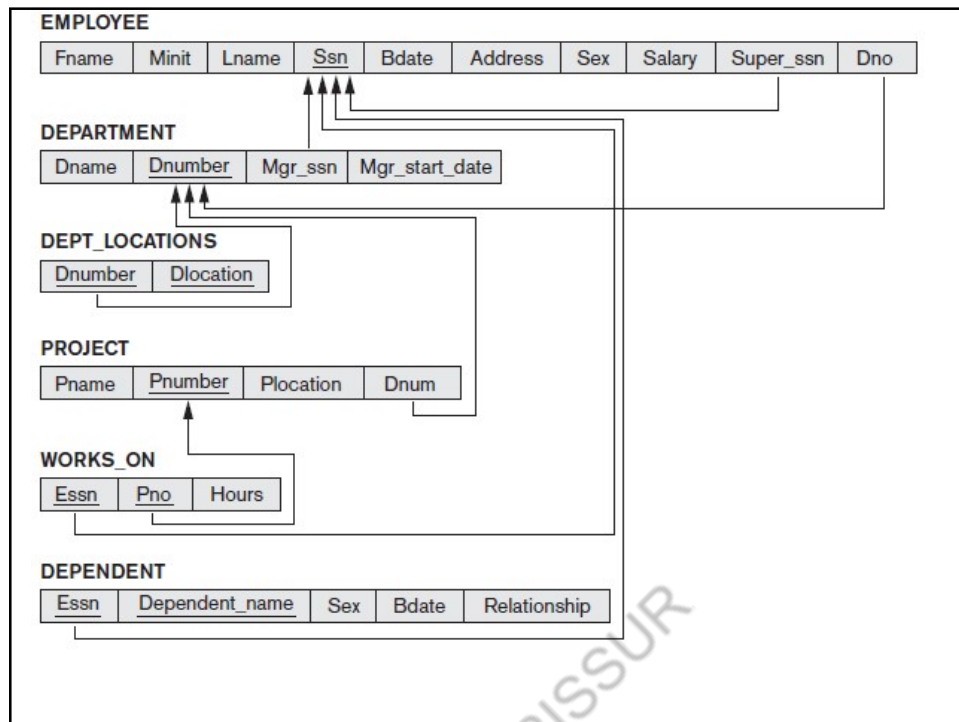
- Update operations
- Insert
- Delete
- Modify

Update Operations on Relations

- INSERT a tuple
- DELETE a tuple
- MODIFY a tuple
- Integrity constraints should not be violated by the update operations
- Several update operations may have to be grouped together
- Updates may *propagate* to cause other updates automatically

Update Operations on Relations

- In case of integrity violation, several actions can be taken:
 - Cancel the operation that causes the violation (REJECT option)
 - Perform the operation but inform the user of the violation
 - Trigger additional updates so the violation is corrected (CASCADE option, SET NULL option)
 - Execute a user-specified error-correction routine



| EMPLOYEE | | | | | | | | | |
|----------|-------|---------|------------|------------|--------------------------|-----|--------|-----------|-----|
| Fname | Minit | Lname | <u>Ssn</u> | Bdate | Address | Sex | Salary | Super_ssn | Dno |
| John | B | Smith | 123456789 | 1965-01-09 | 731 Fondren, Houston, TX | M | 30000 | 333445555 | 5 |
| Franklin | T | Wong | 333445555 | 1955-12-08 | 638 Voss, Houston, TX | M | 40000 | 888665555 | 5 |
| Alicia | J | Zelaya | 999887777 | 1968-01-19 | 3321 Castle, Spring, TX | F | 25000 | 987654321 | 4 |
| Jennifer | S | Wallace | 987654321 | 1941-06-20 | 291 Berry, Bellaire, TX | F | 43000 | 888665555 | 4 |
| Ramesh | K | Narayan | 666884444 | 1962-09-15 | 975 Fire Oak, Humble, TX | M | 38000 | 333445555 | 5 |
| Joyce | A | English | 453453453 | 1972-07-31 | 5631 Rice, Houston, TX | F | 25000 | 333445555 | 5 |
| Ahmad | V | Jabbar | 987987987 | 1969-03-29 | 980 Dallas, Houston, TX | M | 25000 | 987654321 | 4 |
| James | E | Borg | 888665555 | 1937-11-10 | 450 Stone, Houston, TX | M | 55000 | NULL | 1 |

| DEPARTMENT | | | |
|----------------|----------------|-----------|----------------|
| Dname | <u>Dnumber</u> | Mgr_ssn | Mgr_start_date |
| Research | 5 | 333445555 | 1988-05-22 |
| Administration | 4 | 987654321 | 1995-01-01 |
| Headquarters | 1 | 888665555 | 1981-06-19 |

| DEPT_LOCATIONS | |
|----------------|------------------|
| <u>Dnumber</u> | <u>Dlocation</u> |
| 1 | Houston |
| 4 | Stafford |
| 5 | Bellaire |
| 5 | Sugarland |
| 5 | Houston |

| WORKS_ON | | |
|-------------|------------|-------|
| <u>Essn</u> | <u>Pno</u> | Hours |

| PROJECT | | | |
|---------|----------------|-----------|------|
| Pname | <u>Pnumber</u> | Plocation | Dnum |

| WORKS_ON | | | PROJECT | | | |
|-------------|------------|-------|-----------------|----------------|-----------|------|
| <u>Essn</u> | <u>Pno</u> | Hours | <u>Pname</u> | <u>Pnumber</u> | Plocation | Dnum |
| 123456789 | 1 | 32.5 | ProductX | 1 | Bellaire | 5 |
| 123456789 | 2 | 7.5 | ProductY | 2 | Sugarland | 5 |
| 666884444 | 3 | 40.0 | ProductZ | 3 | Houston | 5 |
| 453453453 | 1 | 20.0 | Computerization | 10 | Stafford | 4 |
| 453453453 | 2 | 20.0 | Reorganization | 20 | Houston | 1 |
| 333445555 | 2 | 10.0 | Newbenefits | 30 | Stafford | 4 |
| 333445555 | 3 | 10.0 | | | | |
| 333445555 | 10 | 10.0 | | | | |
| 333445555 | 20 | 10.0 | | | | |
| 999887777 | 30 | 30.0 | | | | |
| 999887777 | 10 | 10.0 | | | | |
| 987987987 | 10 | 35.0 | | | | |
| 987987987 | 30 | 5.0 | | | | |
| 987654321 | 30 | 20.0 | | | | |
| 987654321 | 20 | 15.0 | | | | |
| 888665555 | 20 | NULL | | | | |

| DEPENDENT | | | | |
|-------------|-----------------------|-----|------------|--------------|
| <u>Essn</u> | <u>Dependent_name</u> | Sex | Bdate | Relationship |
| 333445555 | Alice | F | 1986-04-05 | Daughter |
| 333445555 | Theodore | M | 1983-10-25 | Son |
| 333445555 | Joy | F | 1958-05-03 | Spouse |
| 987654321 | Abner | M | 1942-02-28 | Spouse |
| 123456789 | Michael | M | 1988-01-04 | Son |
| 123456789 | Alice | F | 1988-12-30 | Daughter |
| 123456789 | Elizabeth | F | 1967-05-05 | Spouse |

Insertion Examples

- Insert <'Cecilia', 'F', 'Kolonsky', NULL, '1960-04-05', '6357 Windy Lane, Katy, TX', F, 28000, NULL, 4> into EMPLOYEE.
 - Result: This insertion violates the entity integrity constraint (NULL for the primary key Ssn), so it is rejected.
- Insert <'Alicia', 'J', 'Zelaya', '999887777', '1960-04-05', '6357 Windy Lane, Katy, TX', F, 28000, '987654321', 4> into EMPLOYEE.
 - Result: This insertion violates the key constraint because another tuple with the same Ssn value already exists in the EMPLOYEE relation, and so it is rejected.

Insertion Examples

- Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6357 Windswept, Katy, TX', F, 28000, '987654321', 7> into EMPLOYEE.
 - Result: This insertion violates the referential integrity constraint specified on Dno in EMPLOYEE because no corresponding referenced tuple exists in DEPARTMENT with Dnumber = 7.
- Insert <'Cecilia', 'F', 'Kolonsky', '677678989', '1960-04-05', '6357 Windy Lane, Katy, TX', F, 28000, NULL, 4> into EMPLOYEE.
 - Result: This insertion satisfies all constraints, so it is acceptable.

| EMPLOYEE | | | | | | | | | |
|----------|-------|---------|-----------|------------|--------------------------|-----|--------|-----------|-----|
| Fname | Minit | Lname | Ssn | Bdate | Address | Sex | Salary | Super_ssn | Dno |
| John | B | Smith | 123456789 | 1965-01-09 | 731 Fondren, Houston, TX | M | 30000 | 333445555 | 5 |
| Franklin | T | Wong | 333445555 | 1955-12-08 | 638 Voss, Houston, TX | M | 40000 | 888665555 | 5 |
| Alicia | J | Zelaya | 999887777 | 1968-01-19 | 3321 Castle, Spring, TX | F | 25000 | 987654321 | 4 |
| Jennifer | S | Wallace | 987654321 | 1941-06-20 | 291 Berry, Bellaire, TX | F | 43000 | 888665555 | 4 |
| Ramesh | K | Narayan | 666884444 | 1962-09-15 | 975 Fire Oak, Humble, TX | M | 38000 | 333445555 | 5 |
| Joyce | A | English | 453453453 | 1972-07-31 | 5631 Rice, Houston, TX | F | 25000 | 333445555 | 5 |
| Ahmad | V | Jabbar | 987987987 | 1969-03-29 | 980 Dallas, Houston, TX | M | 25000 | 987654321 | 4 |
| James | E | Borg | 888665555 | 1937-11-10 | 450 Stone, Houston, TX | M | 55000 | NULL | 1 |

| DEPARTMENT | | | |
|----------------|---------|-----------|----------------|
| Dname | Dnumber | Mgr_ssn | Mgr_start_date |
| Research | 5 | 333445555 | 1988-05-22 |
| Administration | 4 | 987654321 | 1995-01-01 |
| Headquarters | 1 | 888665555 | 1981-06-19 |

| DEPT_LOCATIONS | |
|----------------|-----------|
| Dnumber | Dlocation |
| 1 | Houston |
| 4 | Stafford |
| 5 | Bellaire |
| 5 | Sugarland |
| 5 | Houston |

WORKS ON

PROJECT

| WORKS_ON | | | PROJECT | | | |
|-----------|-----|-------|-----------------|---------|-----------|------|
| Essn | Pno | Hours | Pname | Pnumber | Plocation | Dnum |
| 123456789 | 1 | 32.5 | ProductX | 1 | Bellaire | 5 |
| 123456789 | 2 | 7.5 | ProductY | 2 | Sugarland | 5 |
| 666884444 | 3 | 40.0 | ProductZ | 3 | Houston | 5 |
| 453453453 | 1 | 20.0 | Computerization | 10 | Stafford | 4 |
| 453453453 | 2 | 20.0 | Reorganization | 20 | Houston | 1 |
| 333445555 | 2 | 10.0 | Newbenefits | 30 | Stafford | 4 |
| 333445555 | 3 | 10.0 | | | | |
| 333445555 | 10 | 10.0 | | | | |
| 333445555 | 20 | 10.0 | | | | |
| 999887777 | 30 | 30.0 | | | | |
| 999887777 | 10 | 10.0 | | | | |
| 987987987 | 10 | 35.0 | | | | |
| 987987987 | 30 | 5.0 | | | | |
| 987654321 | 30 | 20.0 | | | | |
| 987654321 | 20 | 15.0 | | | | |
| 888665555 | 20 | NULL | | | | |

| DEPENDENT | | | | |
|-----------|----------------|-----|------------|--------------|
| Essn | Dependent_name | Sex | Bdate | Relationship |
| 333445555 | Alice | F | 1986-04-05 | Daughter |
| 333445555 | Theodore | M | 1983-10-25 | Son |
| 333445555 | Joy | F | 1958-05-03 | Spouse |
| 987654321 | Abner | M | 1942-02-28 | Spouse |
| 123456789 | Michael | M | 1988-01-04 | Son |
| 123456789 | Alice | F | 1988-12-30 | Daughter |
| 123456789 | Elizabeth | F | 1967-05-05 | Spouse |

Deletion examples

- Delete the WORKS_ON tuple with Essn = '999887777' and Pno = 10.
 - Result: This deletion is acceptable and deletes exactly one tuple.
- Delete the EMPLOYEE tuple with Ssn = '999887777'.
 - Result: This deletion is not acceptable, because there are tuples in WORKS_ON that refer to this tuple. Hence, if the tuple in EMPLOYEE is deleted, referential integrity violations will result.
- Delete the EMPLOYEE tuple with Ssn = '333445555'.
 - Result: This deletion will result in even worse referential integrity violations, because the tuple involved is referenced by tuples from the EMPLOYEE, DEPARTMENT, WORKS_ON, and DEPENDENT relations.

Update (Modify) Operation

- Update the salary of the EMPLOYEE tuple with Ssn = '999887777' to 28000.
 - Result: Acceptable.
- Update the Dno of the EMPLOYEE tuple with Ssn = '999887777' to 1.
 - Result: Acceptable.
- Update the Dno of the EMPLOYEE tuple with Ssn = '999887777' to 7.
 - Result: Unacceptable, because it violates referential integrity.
- Update the Ssn of the EMPLOYEE tuple with Ssn = '999887777' to '987654321'.
 - Result: Unacceptable, because it violates primary key constraint

Exercise – 2

- Discuss all integrity constraints violated by each operation, if any, and the different ways of enforcing these constraints.
1. Insert <'Robert', 'F', 'Scott', '943775543', '1972-06-21', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1> into EMPLOYEE.
 2. Insert <'ProductA', 4, 'Bellaire', 2> into PROJECT.
 3. Insert <'Production', 4, '943775543', '2007-10-01'> into DEPARTMENT.
 4. Insert <'677678989', NULL, '40.0'> into WORKS_ON.
 5. Insert <'453453453', 'John', 'M', '1990-12-12', 'spouse'> into DEPENDENT.
 6. Delete the WORKS_ON tuples with Essn = '333445555'.
 7. Delete the EMPLOYEE tuple with Ssn = '987654321'.
 8. Delete the PROJECT tuple with Pname = 'ProductX'.
 9. Modify the Mgr_ssn and Mgr_start_date of the DEPARTMENT tuple with Dnumber = 5 to '123456789' and '2007-10-01', respectively.
 10. Modify the Super_ssn attribute of the EMPLOYEE tuple with Ssn = '999887777' to '943775543'.
 11. Modify the Hours attribute of the WORKS_ON tuple with Essn = '999887777' and Pno = 10 to '5.0'.

Reference

- Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education 6th edition and 7th edition

Thank you