Databases and Interfaces

Reference: Fundamental Of Database Systems

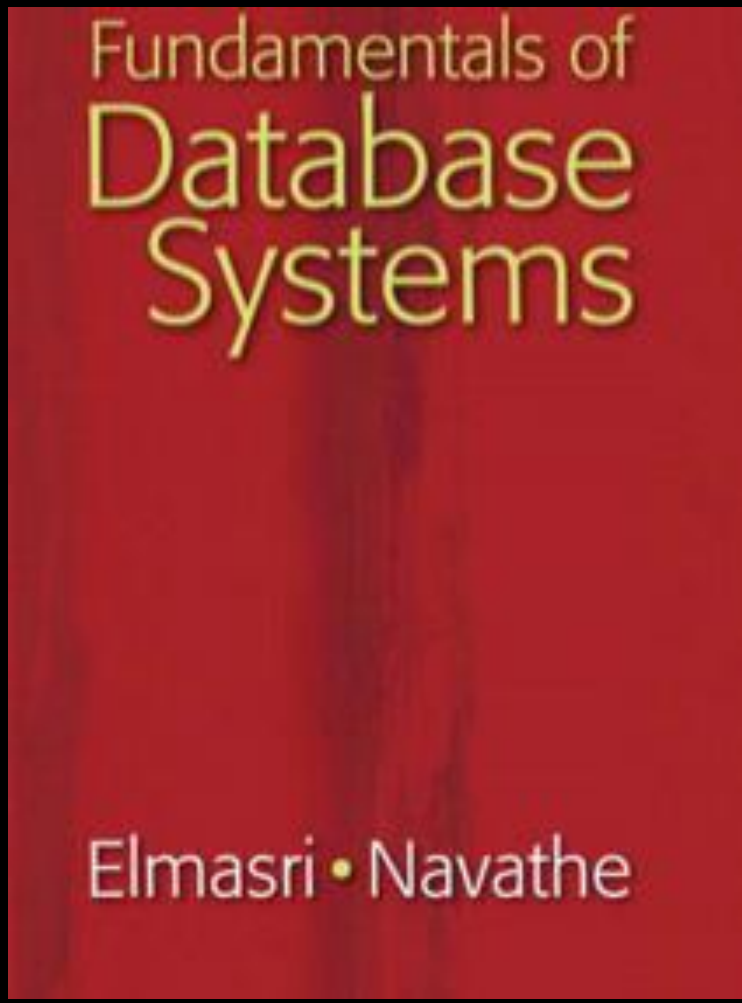
Author: Ramez Elmasri and Shamkant B. Navathe

By: Prof. Dr. Eng. Sherif Kassem Fathy

Reference:

"*Fundamental Of Database Systems*",

By: Ramez Elmasri and Shamkant B. Navathe



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Chapter : Data Modeling Using The Entity-Relationship Model

Lecture 6

By: Prof. Dr. Eng. Sherif Kassem Fathy

Objectives:

- High Level Conceptual Models and Database
- ER Model Concepts
- Data Model System Specification and entity in the system
- Defining the key and relationship types
- Design an Entity Relationship(ER) diagram

Contents:

1. Data Model System Specification
2. Identify entity in the system
3. Define entity type
4. Weak entity type
5. Identify key
6. Relationship types
7. Entity relationship diagram

Entity Types, Entity Sets, Attributes, and Keys (Identify the Entity Required) :

- ***Entity:*** is the thing in the real world with an independent existence
- An entity may be an object with a physical existence:
  - Person, Car, House, Employee
- Or an entity may be an object with a conceptual existence:
  - Company, Job, Course

Attribute:

- ***Attribute:*** Each entity has particular properties called attributes that describes it
- An employee entity may be described by the employee's:
  - Name, age, address, salary, Job

An Example Database Application (Company Data Model System Specification):

- The company is organized into departments
- Each department has a name, a number, and an employee who manages the department
- We keep track of the start date of managing the department by the manager
- Department may have several locations
- A department controls a number of projects
- Each project has a name, a number, and a single location
- System needs employee's name, social security number, address, salary, sex, and birth date

- An employee is assigned to one department
- Employee may work on several projects which are not necessarily controlled by the same department
- We keep track of the number of hours that an employee works on each project
- We need to know the direct supervisor of each employee
- We want to know the dependent of each employee for insurance purposes
- Insurance needs dependent's name, sex, birth date, and relationship to the employee

1. Database Name:

2. Entity Type:

Four types of entities are required:

3. Define Entity Types:

- DEPARTMENT
  -
  -
- PROJECT
  -
- EMPLOYEE
  -
  -
- DEPENDENT
  -

4. Weak Entity Types:

- Entity type may not have any key by its own
- Entity values in the entity may be identical
- This is called weak entity type
- Entities belonging to a weak entity type are identified by being related to specific entities from another entity type in combination with some of their attribute values
- Example:

5. Identify Key :

Entity	Key
DEPARTMENT	
PROJECT	
EMPLOYEE	
DEPENDENT	

6. Identify Relationships Types :

Relationship	Type	From	To

7. Entity-Relationship (ER) Diagrams:

- The Fig. shows the COMPANY ER schema (Data Model)

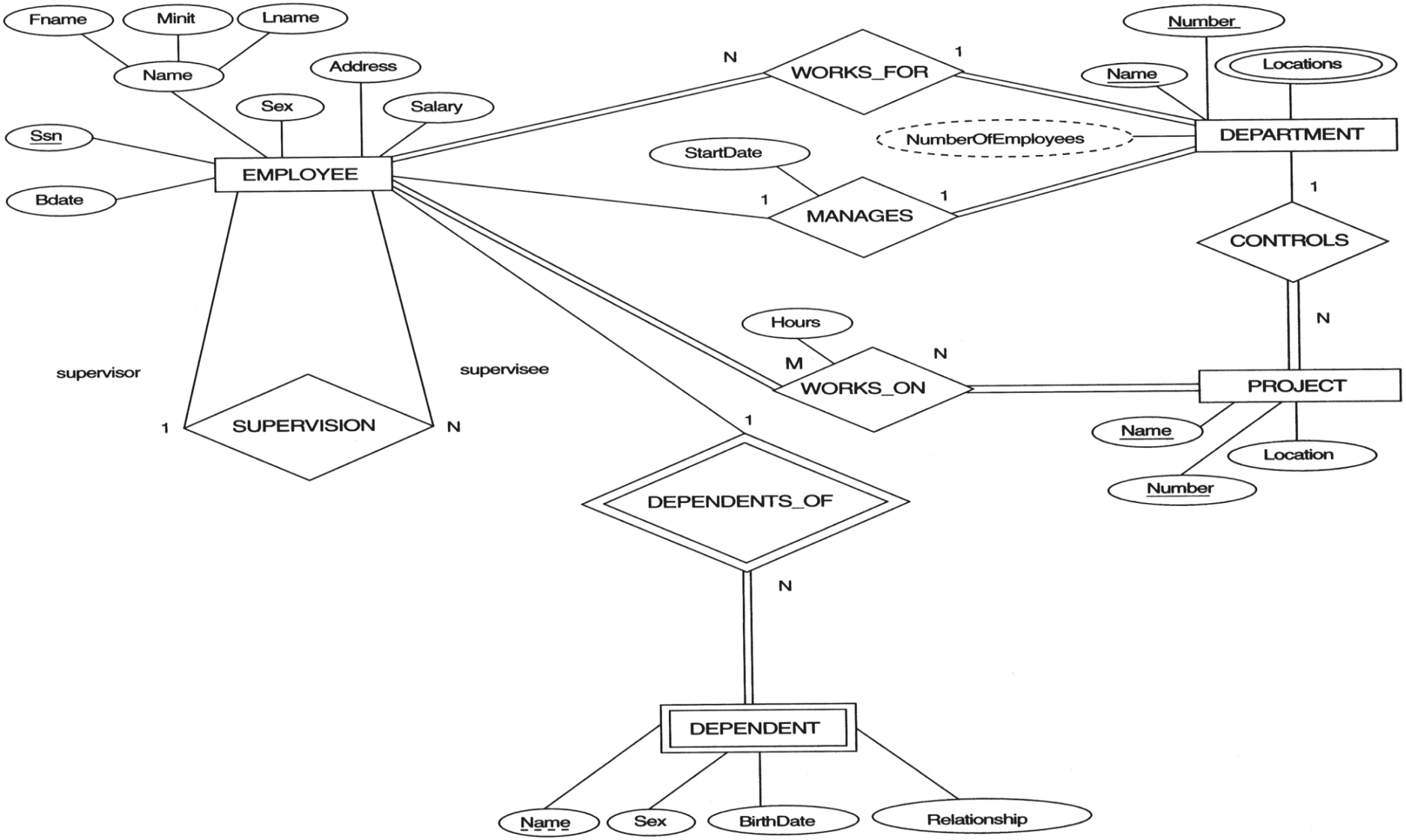
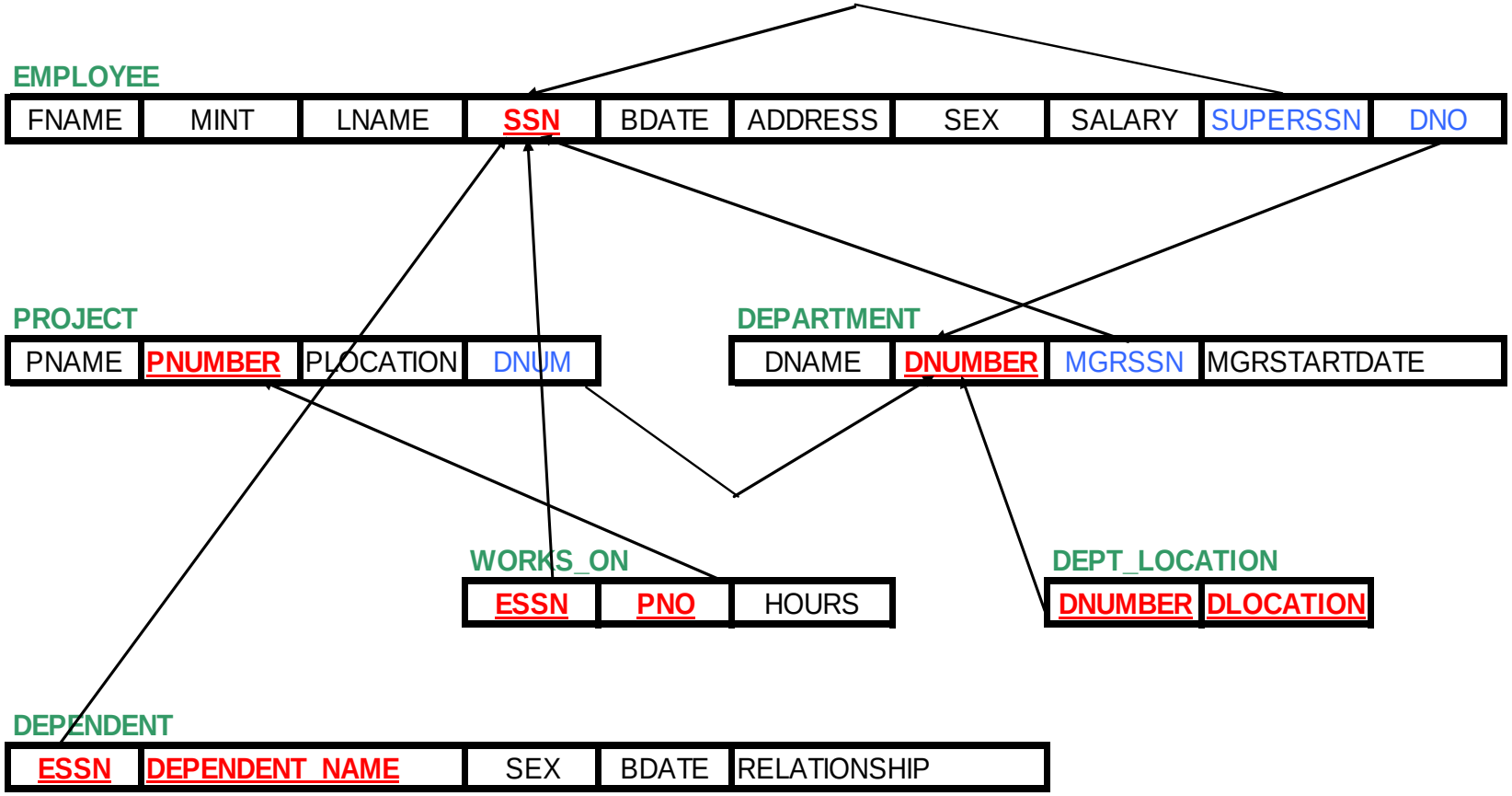


FIGURE 3.2 *An ER schema diagram for the COMPANY database.*

8.The COMPANY relational Schema:

- The Fig. shows the COMPANY relational schema



Referential Integrity Constraints On The COMPANY System

The COMPANY Tables:

EMPLOYEE	FNAME	MINIT	LNAME	SSN	BDATE	ADDRESS	SEX	SALARY	SUPERSSN	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	1968-07-19	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

DEPT_LOCATIONS	DNUMBER	DLOCATION
	1	Houston
	4	Stafford
	5	Bellaire
	5	Sugarland
	5	Houston

DEPARTMENT	DNAME	DNUMBER	MGRSSN	MGRSTARTDATE
	Research	5	333445555	1988-05-22
	Administration	4	987654321	1995-01-01
	Headquarters	1	888665555	1981-06-19

WORKS_ON	ESSN	PNO	HOURS
	123456789	1	32.5
	123456789	2	7.5
	666884444	3	40.0
	453453453	1	20.0
	453453453	2	20.0
	333445555	2	10.0
	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

PROJECT	PNAME	PNUMBER	PLOCATION	DNUM
	ProductX	1	Bellaire	5
	ProductY	2	Sugarland	5
	ProductZ	3	Houston	5
	Computerization	10	Stafford	4
	Reorganization	20	Houston	1
	Newbenefits	30	Stafford	4

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

9. SQL Statement to Define The COMPANY Database:

```
CREATE TABLE EMPLOYEE (
        FNAME       VARCHAR(15)  NOT  NULL,
        MINT        CHAR(1),
        LNAME       VARCHAR(15) NOT  NULL,
        SSN         CHAR(9),
        BDATE       CHAR(9),
        ADDRESS     VARCHAR(30),
        SEX         CHAR(1),
        SALARY      INTEGER,
        SUPERSSN    CHAR(9),
        DNO         INTEGER);
```

```
CREATE TABLE DEPARTMENT (
        DNAME                   VARCHAR(15)  NOT  NULL,
        DNUMBER                  INTEGER NOT  NULL,
        MGRSSN                  CHAR(9),
        MGRSTARTDATE    CHAR(9));

CREATE TABLE DEPT_LOCATION (
            DNUMBER              INTEGER NOT  NULL,
            DLOCATION           CHAR(9) NOT  NULL);
```

```
CREATE TABLE PROJECT (
        PNAME                VARCHAR(15)  NOT  NULL,
        PNUMBER               INTEGER NOT  NULL,
        PLOCATION            VARCHAR(15),
        DNUM                  INTEGER NOT  NULL);

CREATE TABLE WORKS_ON (
        ESSN                 CHAR(9)  NOT  NULL,
        PNO                  INTEGER NOT  NULL,
        HOURS                DECIMAL(3,1)   NOT  NULL);
```

```
CREATE TABLE DEPENDENT (
   ESSN                    CHAR(9)  NOT  NULL,
   DEPENDENT_NAME VARCHAR(15)  NOT   NULL,
   SEX                     CHAR(1),
    BDATE                   CHAR(9),
    RELATIONSHIP        VARCHAR(8) );
```

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Thank You