IT 775
Database Technology

Relational Database (RD) Modeling

Introduction

INTRODUCTION

- **Relational database model -** logical database model that represents a database as a collection of related tables
- **Relational schema -** visual depiction of the relational database model
- Most contemporary commercial DBMS software packages, are **relational DBMS (RDBMS)** software packages

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Terminology

TABLE 3.1 Synonyms Used in the Relational Database Model

Relation	=	Relational Table	=	Table
Column	=	Attribute	=	Field
Row	=	Tuple	=	Record

INTRODUCTION

- **Relation -** table in a relational database
  - A table containing rows and columns
  - The main construct in the relational database model
  - Every relation is a table, not every table is a relation

INTRODUCTION

- **Relation -** table in a relational database
  - In order for a table to be a relation the following conditions must hold:
    - *Each column must have a name (within one table, each column name must be unique)*
    - *Within one table, each row must be unique*
    - *Within each row, each value in each column must be single valued (multiple values of the content represented by the column are not allowed in any rows of the table)*
    - *All values in each column must be from the same (predefined) domain*
    - *Order of columns is irrelevant*
    - *Order of rows is irrelevant*

INTRODUCTION

Example of relational and non-relational tables

Relational Table (Relation)

EmpID	EmpName	EmpGender	EmpPhone	EmpBdate
0001	Joe	M	x234	1/11/1985
0002	Sue	F	x345	2/7/1983
0003	Amy	F	x456	4/4/1990
0004	Pat	F	x567	3/8/1971
0005	Mike	M	x678	5/5/1965

Not a Relational Table

EmpID	EmpInfo	EmpInfo	EmpPhone	EmpBdate
0001	Joe	M	x234	1/11/1985
0002	Sue	F	x345	2/7/1983
0001	Joe	M	x234	1/11/1985
0004	Pat	F	x567, x789	3/8/1971
0005	Mike	M	x678	a long time ago

INTRODUCTION

Example of a relation with rows and columns appearing in a different order

A Relation

EmpID	EmpName	EmpGender	EmpPhone	EmpBdate
0001	Joe	M	x234	1/11/1985
0002	Sue	F	x345	2/7/1983
0003	Amy	F	x456	4/4/1990
0004	Pat	F	x567	3/8/1971
0005	Mike	M	x678	5/5/1965

Exact Same Relation (order of rows and columns is irrelevant)

EmpName	EmpID	EmpGender	EmpBdate	EmpPhone
Joe	0001	M	1/11/1985	x234
Amy	0003	F	4/4/1990	x456
Sue	0002	F	2/7/1983	x345
Pat	0004	F	3/8/1971	x567
Mike	0005	M	5/5/1965	x678

INTRODUCTION

- **Relational database -** collection of related relations within which each relation has a unique name

PRIMARY KEY

- **Primary key -** column (or a set of columns) whose value is unique for each row
  - Each relation must have a primary key
  - The name of the primary key column is underlined in order to distinguish it from the other columns in the relation

PRIMARY KEY

Relation with the primary key underlined

EMPLOYEE

EmpID	EmpName	EmpGender	EmpPhone	EmpBdate
0001	Joe	M	x234	1/11/1985
0002	Sue	F	x345	2/7/1983
0003	Amy	F	x456	8/4/1990
0004	Pat	F	x567	3/8/1971
0005	Mike	M	x678	5/5/1965
0010	Mike	M	x666	8/1/1974
0007	Barbara	F	x777	4/5/1980
0011	Ivan	M	x777	3/4/1981
0009	Amy	F	x777	1/11/1985

MAPPING ER DIAGRAMS INTO RELATIONAL SCHEMAS

- Once an ER diagram is constructed, it is subsequently mapped into a relational schema (collection of relations)

ER AND RELATIONAL MODELING

- Process of requirements collection should be accompanied by the ER modeling and then followed by mapping the ER model into a subsequent relational schema
- Some practitioners prefer to create relational schemas straight from the requirements
  - In such cases, the ER modeling phase is simply omitted

ER AND RELATIONAL MODELING

- Create relational schemas straight from the requirements is not advisable for following reasons
  - ER modeling is more suited for visualization of the requirements
  - Certain concepts can be visualized graphically only in ER diagrams
  - Every attribute is mentioned only once in the ER diagram
  - An ER model is a better communication and documentation device