1
Introduction

Database Management Systems - Lab

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Outline

- Introduction
- DBMS
- SQL
- DDL & DML
- Charset
- Data Types

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- **Introduction**
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Introduction

- If you create an application without storage, and store data in variables, then you stop the running of application, what will be happen of stored data?

- Answer: all data will be removed, because the variables are removed from memory (RAM)

- What the solution?

Introduction

- We need a permanent storage for storing data forever.
- The first permanent storage is files
- File is permanent storage contains data as texts, and exist in file system of Operating System, and can you access it using Explorer [like Windows Explorer].

Introduction

- Using Files, the permanent storage as:
  - **Storage**: files
  - **Environment**: File System on OS
  - **Method** [to deal with files in apps]: Functions [Input Stream & Output Stream]

Introduction

- However, disadvantages of file system
  - Less secure
  - Slow
  - Complex to deal and use
  - A lot of formats (txt, dat, pdf, doxc, csv, etc.)
  - Data is stored as textual paragraphs, not structured

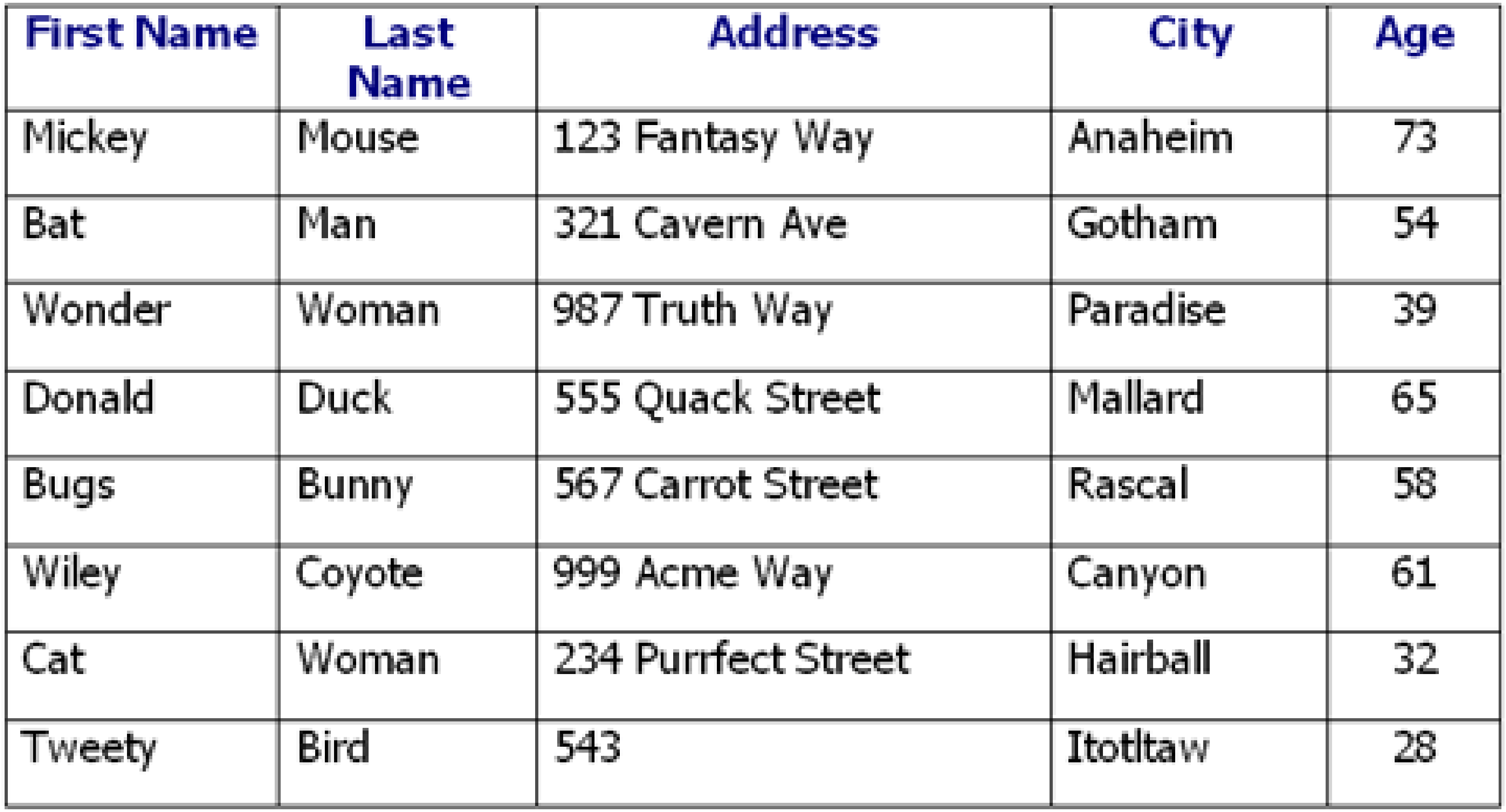
- So, we need another permanent storage
- What is ??

Introduction

- Database is collection of tables,
- Table is group of rows and columns that store data as structured and organized format

- Advantages of file system
  - Easy to Use
  - Fast
  - Secure
  - Structured

Introduction



First Name	Last Name	Address	City	Age
Mickey	Mouse	123 Fantasy Way	Anaheim	73
Bat	Man	321 Cavern Ave	Gotham	54
Wonder	Woman	987 Truth Way	Paradise	39
Donald	Duck	555 Quack Street	Mallard	65
Bugs	Bunny	567 Carrot Street	Rascal	58
Wiley	Coyote	999 Acme Way	Canyon	61
Cat	Woman	234 Purrfect Street	Hairball	32
Tweety	Bird	543	Itotltaw	28

Introduction

- Row is called
  - Record
  - Instance
  - Entity

- Column is called
  - Feature
  - Field
  - Attribute

Introduction

- Using Database, the permanent storage as:
  - **Storage**: structured tables
  - **Environment**: Database Management System (Special Program)
  - **Method** [to deal with it in apps]: SQL

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DBMS

- In files, we can create and manage the files using Word, PowerPoint, Notepad, etc.

- In Database, we need a special program to manage databases, is called Database Management System (DBMS).

- A database management system (DBMS) is a software package designed to define, manipulate, retrieve and manage data in a database. A DBMS generally manipulates the data itself, the data format, field names, record structure and file structure. It also defines rules to validate and manipulate this data.

DBMS

- There are many DBMS software packages, like
  - Oracle
  - MySQL
  - SQL Server
  - MariaDB

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SQL

- How I can deal with files program?
- E.g. Word, I can open Microsoft Office Word, then write a text, then save it as .doxc file.

- However, how I can deal with DBMS?
- Using a language, not GUI.
- Using Structural Query Language (SQL)

SQL

- SQL is set of keywords which used to make a transaction on database or table, like create table, remove table, add new row, add new column, etc.

- Example: *CREATE TABLE students;*

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DDL & DML

- When you deal with DBMS, you can
  - Create new database
  - Change name of old database
  - Create new table in old database
  - Remove table from database
  - Add new row into table
  - Remove row from table
- So, you deal with 3 levels
  - Database
  - Table (Columns in Table level; not Row level)
  - Row

DDL & DML

- Database is a container of tables
- Table is a container of rows
- Row is atomic unit

- So, you can say there are two levels: containers and rows
  - SQL type to deal with container level is called DDL (Data Definition Language)
  - SQL type to deal with row level is called DML (Data Manipulation Language)

DDL & DML

- DDL like
  - Create database
  - Alter database
  - Drop database
  - Truncate database
  - Create table
  - Alter table
  - Drop table
  - Truncate table

DDL & DML

- DML like
  - Insert row
  - Update row
  - Delete row
  - Select row/s

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Charset

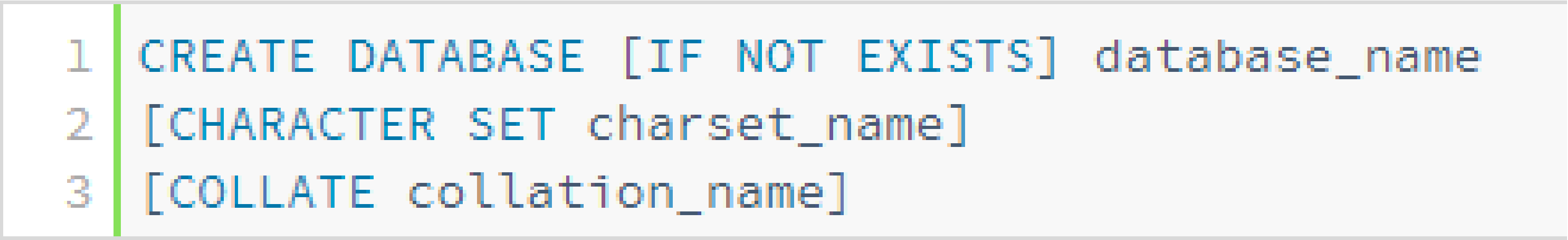
- Charset is encoding standard of alphanumeric characters, that could be used on computer and network.

- For example, ‘A’ is some charsets maybe as another symbol in other charsets.

Charset

- What best charset in DBMS?
  - UTF8 (for Arabic and English)
  - UTF8MB4 (for Arabic and English + emojis and smiles)

Charset



```
CREATE DATABASE [IF NOT EXISTS] database_name
[CHARACTER SET charset_name]
[COLLATE collation_name]
```

- Example:

CREATE DATABASE aqsa CHARACTER SET utf8 COLLATE utf8mb4;

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Data Types

- Numbers

Type	Details	Limit Length
int	Integer number	11
bigint	Integer number	20
double	Floating-point number	
float	Floating-point number	
numeric	Number	
real	Floating-point number	

Data Types

- String

Type	Details
char	fixed length Reserve whole space
varchar	variable length Reserve as needed
text	Better for long text Can save ‘\n’

Data Types

- Date and Time

Type	Details
date	YYYY-MM-DD
time	hh:mm:ss
datetime	YYYY-MM-DD hh:mm:ss
timestamp	YYYY-MM-DD hh:mm:ss Timezone

Data Types

- Binary

Type	Details
binary	0 or 1
boolean	true or false