http://www.accessrepairnrecovery.com/blog/wp-content/uploads/2017/04/boxbarimage5.jpg

Database in Everyday Life

by Assoc. Prof. Dr. Churee Techawut

adapted into English by Dr. Prakarn Unachak

ภาควิชาวิทยาการคอมพิวเตอร์
COMPUTER SCIENCE DEPARTMENT, CMU
คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่

204100 IT AND MODERN LIFE

1. *What is a Database?*
2. *Database Management System*
3. *Database in Everyday Life*
4. *Types of Database in Everyday Life*
5. *Benefits of Database*
6. *Database Tables*
7. *Tables' Relationships in Database*
8. *Tables' Relationships in Student Database*

1. What is a Database?

1. What is a Database?

- *A database is an organized collection of data. In this course, we will focus on database in electronics form (stored on computers)*
- *Data are recorded facts. Data in one database are assumed to be related in some way.*
- *Data recorded on the database can searched and edited, you can*
  - *Insert new data into the database.*
  - *Delete existing data you no longer want in the database.*
  - *Update data to match current facts.*

2. Database Management System

2. Database Management System

- *A database management system (DBMS) is a program that allow users to create and maintain databases.*
- *A good DBMS should allow users to conveniently do the followings:*
  - *Data definition*
  - *Data creation and storage*
  - *Data management*
  - *Data sharing*

2. Database Management System

- ***Data definition*** *is the act of defining data types, structures, and other formatting/limitations of data to be stored in the database. These details are part of what be called* ***metadata*** *(data about data)*

- ***Data creation and storage*** *are the processes of writing down data into the storage medium (hard drives, for example), which are under controlled by the DBMS*

2. Database Management System

- ***Data management*** *is the process of interacting with data in the data base, such as:*
  - *Asking the database a question (**query**) to the database, and getting an appropriate response.*
  - *Keeping the data up-to-date.*
  - *Creating reports about the data.*
- ***Data sharing*** *is the act of allowing multiple user and/or programs to (appropriately) access the data in the database at the same time.*

3. Database in Everyday Life

Some Examples

3. Database in Everyday Life

- ***Checking E-mail***

Outlook Web App

new mail

search mail and people

all unread to me flagged

Favorites
Inbox 457
Sent Items
Drafts [84]

CHUREE TECHAWUT
Inbox 457
Drafts [84]
Sent Items
Deleted Items 338
chiangmai.ac.th
Junk Email
Notes [11]
PhD Students
Sent
Training Student
Aukrit
Ilbenz
Panisara 1
Pgack
Pong z 1
Ponpaeng 1

INBOX CONVERSATIONS BY DATE

Waraporn Insom 12:02p
ขอเชิญเข้าร่วมสัมมนาเชิงปฏิบัติการเรื่อง "วิทยาการข้
[cid:ii_j3cizra50_15c5ce26523d5af2]--

csstaff@cs.science.cmu.ac.th 10:49a
test send mail
No preview is available.

Ratsameetip Wita; Wassana Naiyap 10:29a
204100 : Slide Master/Template
ขออนุญาตปรับตัว Template นิดหน่อยนะคะ เวอร์ชั่นที่แนบ...

Inbox

MONDAY

Matinee Kiewkanya Mon 12:43p
template 100 ค่ะ
ตามไฟล์แนบนะคะ ลองดูว่า ok แล้วหรือว่าจะปรับแก้อะไรบ้า...

SUNDAY

Piyavach K Sun 8:35p
หัวข้อ PhD Thesis
ได้ครับอาจารย์ _____ From: C...

LAST WEEK

CHUREE TECHAWUT Wed 5/24
สรุปแบ่งงานปรับเนื้อหากระบวนวิชา 204100
เรียน อาจารย์ทุกท่าน สรุปประชุมวันที่ 24/5/60 มี 2 เรื่องดัง...

NATANUN KANJANAKUHA; Papan Wed 5/24
คืนหนังสือ Textbook
เรียนอาจารย์ชุรีครับ ที่ผมไม่มีหนังสือค้างอยู่ครับ ขอบคุณครั...

Mail Calendar People Tasks

ขอเชิญเข้าร่วมสัมมนาเชิงปฏิบัติการเรื่อง "วิทยาการข้อมูลและการประยุกต์ในการวิจัย" (W
Science and Its Application for Research)

Subject

REPLY

Waraporn Insom <insom.waraporn@gmail.com>
Wed 5/31/2017 12:02 PM

Sender address

show all 24 recipients

To: Kittipitch K <kittipitch@gmail.com>; JAKRAMATE BOOTKRAJANG; Jakarin Chawachat <cjakarin@gmail.com>;
CHUMPHOL BUNKHUMPORNPAT; CHUREE TECHAWUT; DUSSADEE PRASERTTITIPONG; ...

เชิญชวนคณาจารย์ เข้าร่วมอบรม

สัมมนาเชิงปฏิบัติการเรื่อง
"วิทยาการข้อมูลและการประยุกต์ในการวิจัย"
(Workshop on Data Science and Its Application for Research)

วันจันทร์ที่ 5 มิถุนายน 2560
ณ SCB 4204-5
อาคารเรียนรวมและปฏิบัติการสถิติและคณิตศาสตร์

วิทยากร : Professor Don McNeil
Department of Statistics, Macquarie University,
Sydney, Australia

กำหนดการ

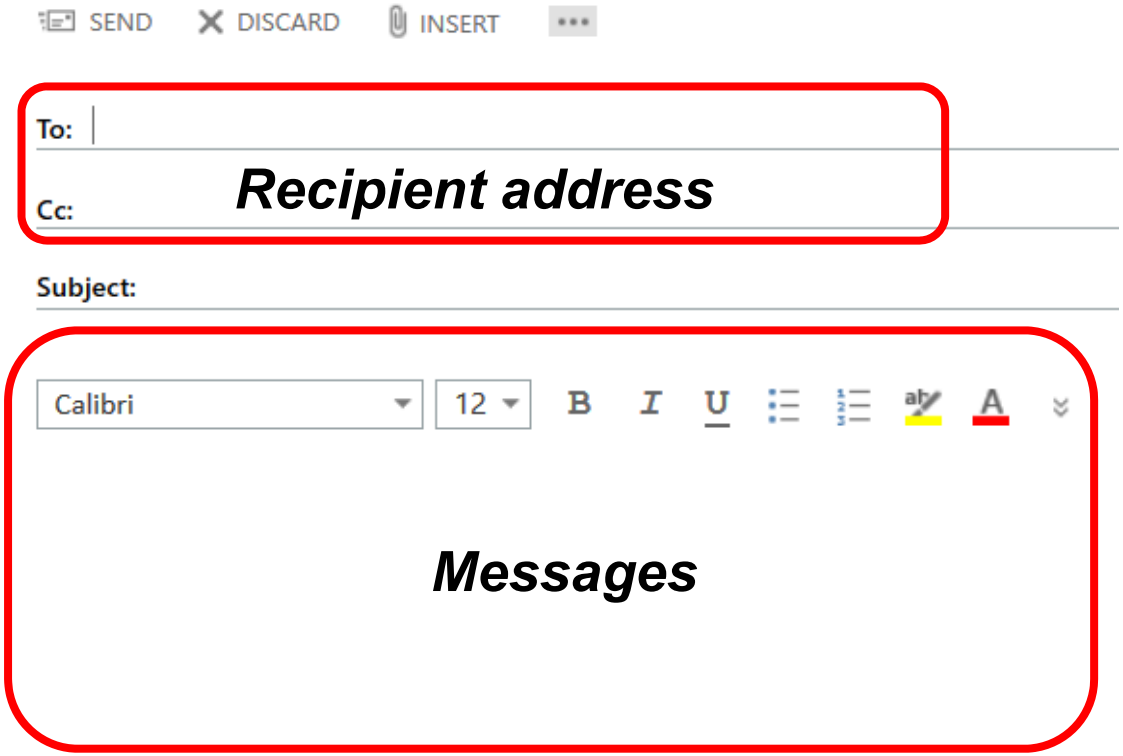
08.30-09.00 น. ลงทะเบียน
09.00-10.30 น. ช่วงที่ 1 : Introduction to Data Science
10.30-11.45 น. พักรับประทานอาหารว่างและเครื่องดื่ม
11.45-12.15 น. ช่วงที่ 2: Introduction to Data Science (ต่อ)
12.15-13.00 น. พักรับประทานอาหารกลางวัน
13.00-14.30 น. ช่วงที่ 3 : Volatility forecasting
14.30-14.45 น. พักรับประทานอาหารว่างและเครื่องดื่ม
14.45-16.30 น. ช่วงที่ 4 : Volatility forecasting (ต่อ)
หมายเหตุ : กำหนดการอาจมีการเปลี่ยนแปลงตามความเหมาะสม

ลงทะเบียนได้ที่
โต๊ะเซ็นชื่อหน้าห้องประชุม

https://basichackingskills.wordpress.com/2013/06/30/email-spoofing/

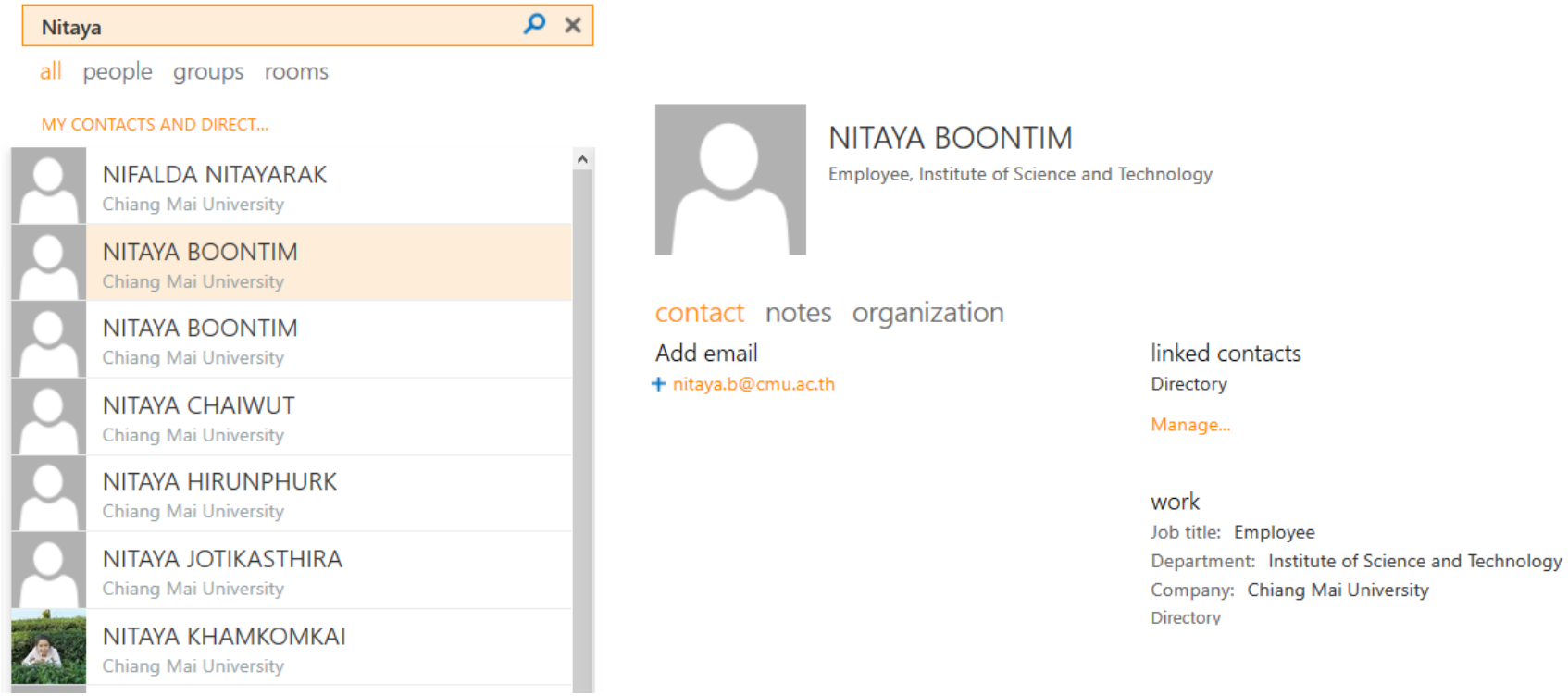
3. Database in Everyday Life

- ***Writing and Sending E-mail***



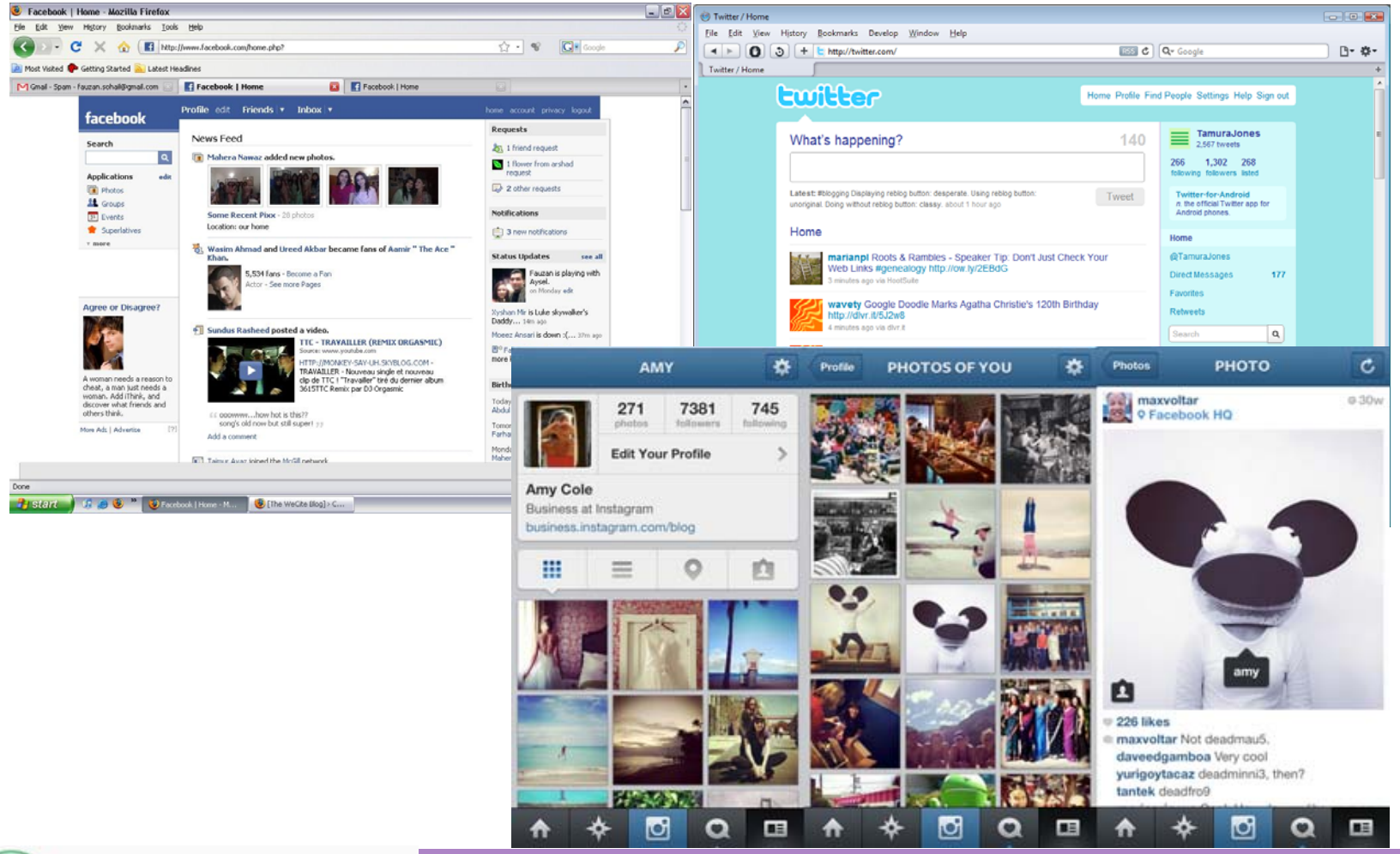
3. Database in Everyday Life

- ***Searching Email Address from Address Book***



3. Database in Everyday Life

- ***Posting and Uploading Images on Facebook/Twitter***



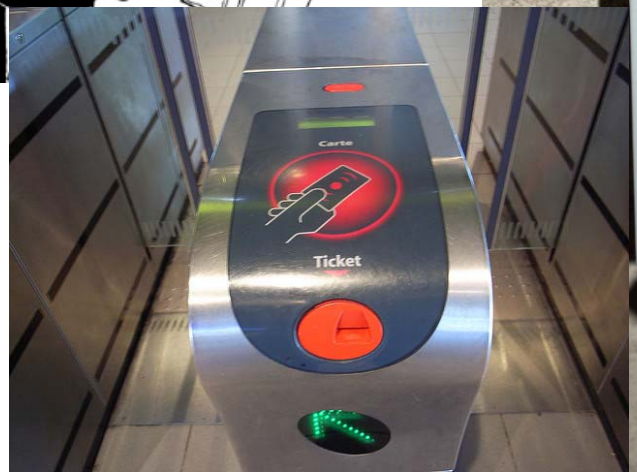
https://wecite.wordpress.com/2008/07/25/a-facelift-for-facebook/

http://seldo.com/weblog/2012/01/22/okay_twitter_its_time_you_stopped_getting_a_free_pass_you_have_fucked_up_your_interface_and

http://drakalogia.wikispaces.com/2014+PERIOD+2+INVASION+OF+PRIVACY

3. Database in Everyday Life

- ***Authenticate Yourself with Swipe Card or Fingerprints to gain Entrance into Restricted Areas***

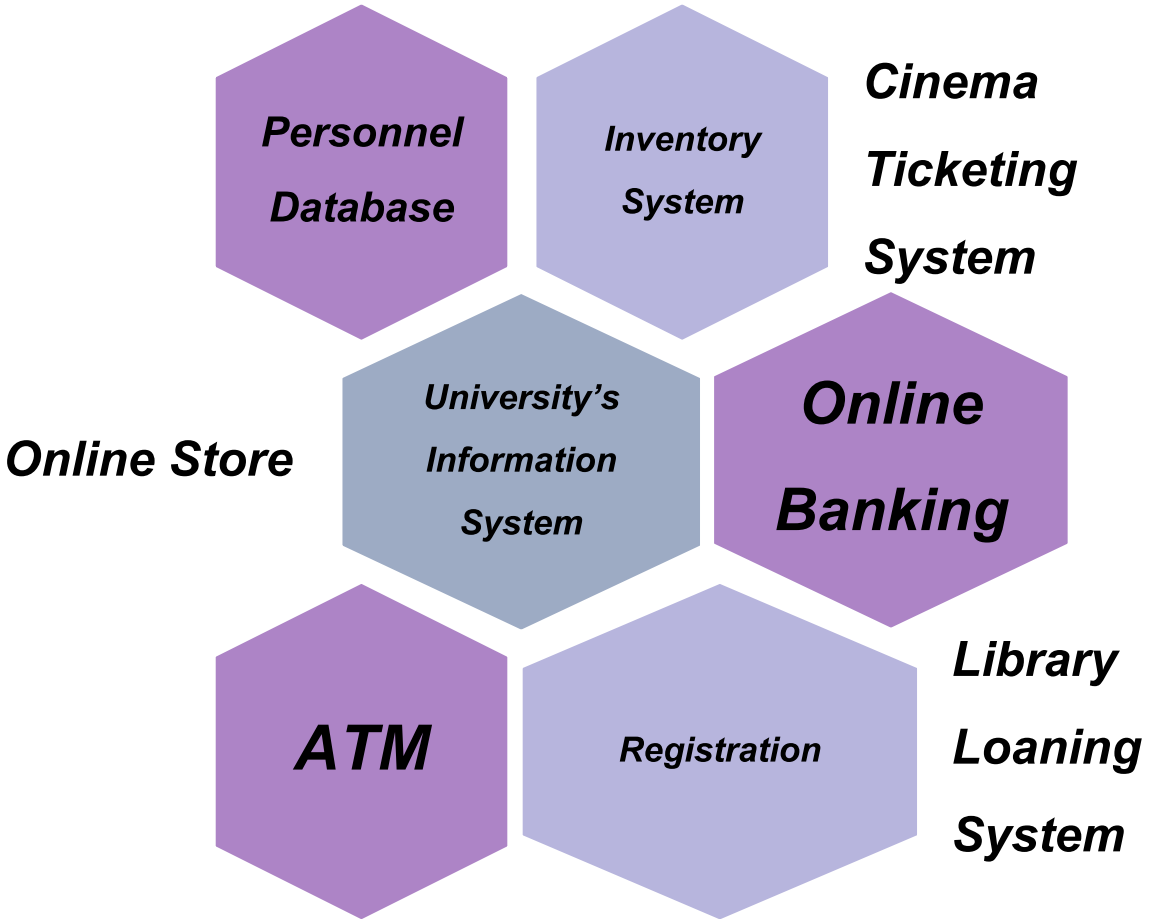


https://alexhughescartoons.co.uk/2005/05/swipe-id-card-for-entry/

https://commons.wikimedia.org/wiki/File:Fingerprint_scanner_in_Tel_Aviv.jpg

https://www.flickr.com/photos/20056291@N00/2674690243

3. Database in Everyday Life



3. Database in Everyday Life

http://www.theteachersacademy.com/blog/wp-content/uploads/2016/06/iStock_000025103113_Large.jpg

3. Database in Everyday Life

- *When a piece of data in entered into the database, it will linked, managed and copied many times.*
- *When you entered a piece of information into an online network. We may not be able to control where the data will end up and who will be using it.*
- *Example: when you enter your information to create an account for an online service, the system will remember you. This can make your subsequent uses more convenient, but your information might be used/sold by the service provider. (Do read the user's agreement)*

3. Database in Everyday Life

- *In today's digital world, almost all daily activities' data will be stored in one database or another.*
- *Hence, we should understand how database works, how data are stored, and how they are shared on online networks.*

4. Types of Database in Everyday Life

How are data stored?

4. Types of Database in Everyday Life

- A very simple database has one table, which is a collection of records
  - A record consists of multiple fields.
  - And a few is a collection of characters, or bytes.
  - Which, in turn, is a collection of bits.
- This simple database will be located as a file on a PC, and will consists of lines, or rows of text.
- A more complex database will have multiple tables, and will be run on a (or multiple) server(s) which can be accessed from around the world.

4. Types of Database in Everyday Life

- *Databases in everyday life can be of many types, such as:*
  - *Text files*
  - *Mobile databases*
  - *Desktop databases*
  - *Server databases*
  - *Cloud databases*

Text Files

- *Simplest database, for basic data moving and storage*
- *The text file can be stored on a PC or on a network*
- *A record consists of multiple fields, which as separated in a certain way*
- *The data can be read by many programs, and specialized programs or DBMS will not be necessary.*
- *Example:*
  - *CSV file*
  - *XML file*
  - *JSON file*

CSV File

- *CSV = Comma Separated Value*
- *A line is a record. The commas (,) are used to separate field. (comma-delimited data)*
  - *Other character, such as tab, can also be used*
- *Widely used for small database, can be easily understood by both human and machine.*
- *CSV is a simplest data format. Suitable for moving data between programs.*
- *Example: You can save data from a spreadsheet program (such as excel) in a CSV file. Then import the file into another program that cannot read a spreadsheet.*

CSV file

- ***Example of student's information stored in a CSV file, the fields are student id, first name, last name, birth date, and mobile phone number.***
- ***First line of the file can sometime be headers, indicating fields' names.***

description.txt | Example.csv

```
1  "Student ID", "First Name", "Last Name", "Birthdate", "MobilePhone"
2  "591023445", "Krichakorn", "Leungaraam", 15/01/2535, "0836467572"
3  "591058916", "Nawin", "Thongchareonchai", 25/04/2535, "0889777606"
4  "591555555", "Niranaam", "Raisakul", 01/04/2535, "0956781234"
```

XML file

- *Extensible Markup Language*
- *Used in data exchange on the web*
- *Both human and machine-readable, but slightly more complicated than CSV file.*
- *Sending XML file over the web is more popular and more secure than a document file or a spreadsheet because the latters are more susceptible to computer virus*
- *Can express complicated data structure as text*

XML file

Example.csv | Example.xml

```
1  <?XML version="1.0" encoding="UTF-8">
2  <student>
3  <ID>591023445</ID>
4  <FirstName>Krichakorn</FirstName>
5  <LastName>Leungaraam</LastName>
6  <Birthdate>15/01/2535</Birthdate>
7  <MobilePhone>0836467572</MobilePhone>
8  </student>
9
10 <student>
11 <ID>591058916</ID>
12 <FirstName>Nawin</FirstName>
13 <LastName>Thongchareonchai</LastName>
14 <Birthdate>25/04/2535</Birthdate>
15 <MobilePhone>0889777606</MobilePhone>
16 </student>
17
18 <student>
19 <ID>591555555</ID>
20 <FirstName>Niranaam</FirstName>
21 <LastName>Raisakul</LastName>
22 <Birthdate>01/04/2535</Birthdate>
23 <MobilePhone>0956781234</MobilePhone>
24 </student>
```

- ***Example of student data in a XML file***

Each record, field is delimited by a tag:

<ID></ID>

<FirstName></FirstName>

JSON file

- *JavaScript Object Notation*
- *Used in data exchange on the web*
- *Human and machine-readable*
- *Used by JavaScript language, which is widely used in web programming*
- *Like XML, Can express complicated data structure as text*

JSON file

Example.csv | Example.xml | Example.json

```
1  [{
2      "ID":   "591023445"
3      "FirstName":    "Krichakorn"
4      "LastName":     "Leungaraam"
5      "Birthdate":    "15/01/2535"
6      "MobilePhone":  "0836467572"
7  }, {
8      "ID":   "591058216"
9      "FirstName":    "Navin"
10     "LastName":     "Thongchareon
11     "Birthdate":    "25/04/2535"
12     "MobilePhone":  "0889777606"
13 }, {
14     "ID":   "591555555"
15     "FirstName":    "Niranaam"
16     "LastName":     "Raisakul"
17     "Birthdate":    "01/04/2535"
18     "MobilePhone":  "0956781234"
19 }]
```

- *A record is delimited by curly bracket ({})*
- *A field is defined by a tag, such as "FirstName", "LastName"*

Text Files - Conclusions

- *Data is stored in a text file.*
- *A program need to import the file to read the data.*
- *No security measure. Anyone who has access to the text file can read the data inside.*
- *Suitable for small amount of data.*

Mobile Databases

- ***For mobile device such as smartphones, tablets, or web services.***
- ***Text files may not be sufficient for the complexities of most apps/programs.***
- ***Need structured data (linked in a certain way), with some constraints on those data.***

Mobile Databases

- ***Also, relationships between data entities need to be defined.***
  - ***For example, between a student and the advisor. If you know the student's ID, you should be able to find his/her advisor's information.***
- ***Need a DBMS to manage and provide access to the data.***

Mobile Databases

Examples of DBMSs

- SQLite
- MSSQL Server
- ORACLE
- MySQL

https://upload.wikimedia.org/wikipedia/commons/thumb/3/38/SQLite370.svg/1200px-SQLite370.svg.png

http://www.iperiusbackup.net/wp-content/uploads/2016/05/1768.sql_logo.png

https://upload.wikimedia.org/wikipedia/en/thumb/6/62/MySQL.svg/1200px-MySQL.svg.png

http://www.fujitsu.com/fts/Images/oracle-580x224_tcm21-102907.png

SQLite

- *Pronounce “See-qual-lite”*
- *Small software that manage database quickly and reliably.*
- *Free license*
- *Suitable for small applications that want efficient database management, such as mobile applications*

https://upload.wikimedia.org/wikipedia/commons/thumb/3/38/SQLite370.svg/1200px-SQLite370.svg.png

Microsoft SQL Server (Compact and Express editions)

- ***A popular software that is used in database management for mobile application to large enterprise system.***
- ***Free license available***
  - ***Compact edition for mobile applications***
  - ***Express edition for PC or web applications***
  - ***Limited database size***

http://www.iperiusbackup.net/wp-content/uploads/2016/05/1768.sql_logo.png

Oracle Databases (Express Edition)

- ***Big player in database scene***
- ***Very popular for large scale databases of business purposes.***
- ***Express edition is free to use, with limitation to database size.***
  - ***Paid version is very expensive, but with extensive support.***

MySQL

- Popular with web application
- Free license and open source
- MySQL is a cross-platform software that can work across multiple OSes, such as Windows, Linux, OS X.
- Can handle large databases (into Terabytes)

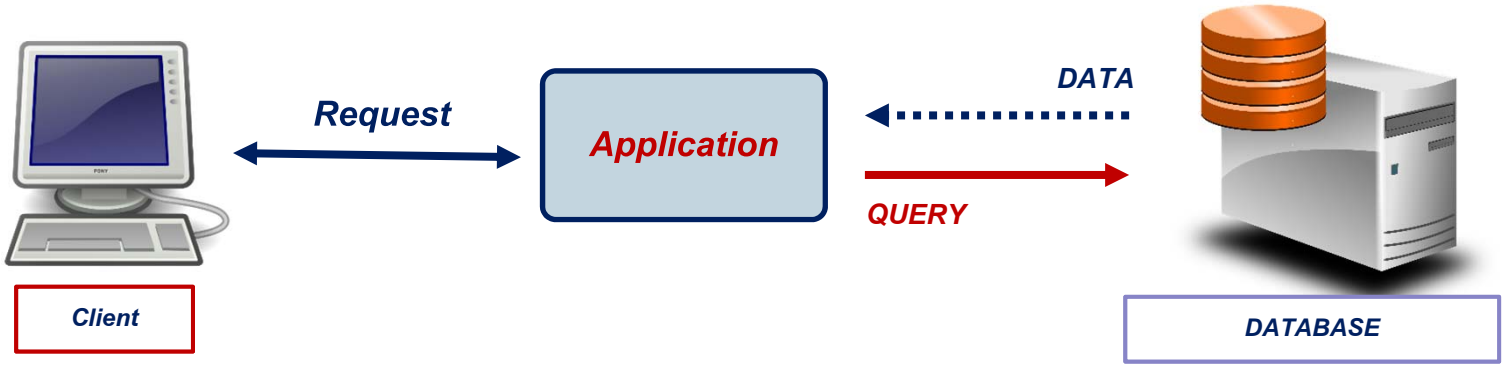
https://upload.wikimedia.org/wikipedia/en/thumb/6/62/MySQL.svg/1200px-MySQL.svg.png

Desktop Databases

- ***For a database that is not too large, used by general users with limited computer knowledge.***
- ***Can run on a PC***
- ***Previous examples such as MySQL, MS SQL Server or Oracle Database required advanced users with extensive programming and database knowledge.***
- ***DBMS such as MS Access, on the other hand, is suitable for general users in business, organizational, or personal purposes. The users can create, search, or create report using such DBMS.***

Single-tier design

- *"Everything in one place"*
- *Database, along with input forms, output reports and other user-created objects that works with the database will be stored at the same machine.*



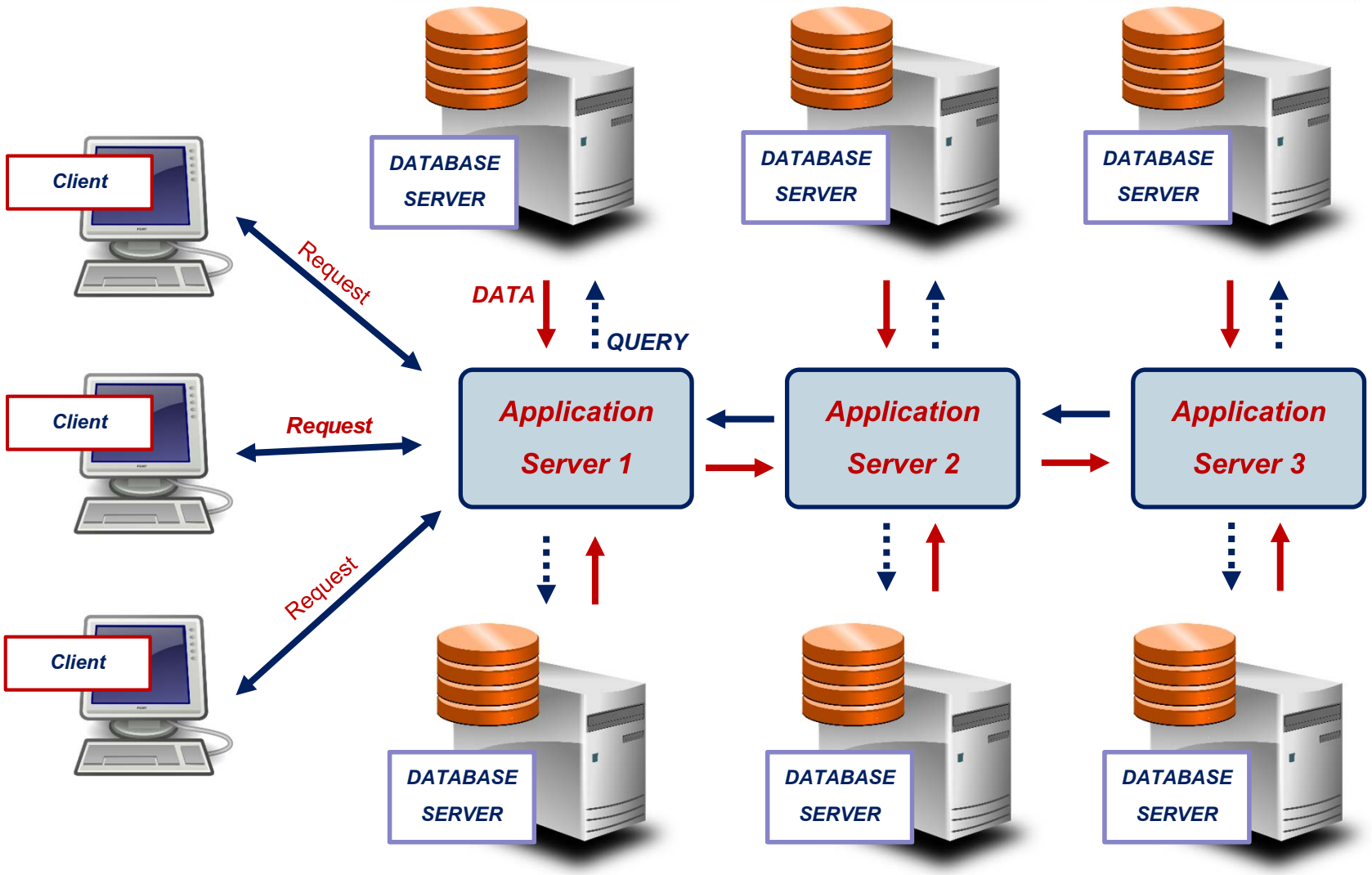
Server Databases

- *Usually for handling databases for organizational use.*
- *Multiple databases and multiple users*
- *Usually a multi-tier system, where many software, web sites over various platforms (smartphone, tablets, PC,...) can access the databases*
- *Example DBMS: MS SQL Server, ORACLE, and DB2*

Multi-tier Design

- *Forms, reports, and other subsystems are separated from the database.*
- *Forms and reports are now parts of front-end, running at the client connecting to the server*
- *The data-containing tables are part of back-end, running at the database server itself. This also include other database management activities, such as backing up and security.*
- *The separation make changing in one part, editing data in the tables, for example, much less likely to affect the other components such as the applications using the database, the input forms, or the output reports.*
- *Also allow multiple users access to the same (set of) database(s) at the same time.*

Multi-tier design



Cloud Databases

- *Cloud Computing Service is a service on the Internet or specialized network that provide various forms of services, from usage of applications running on "the cloud" (the provider's network of servers), to using their platform to run your own applications, to using storage space to store files and data.*
- *Some cloud service will provide database service (storage and management, or back-end) for front-end developer. This is sometime call being a outside (database) provider.*
- *Required Internet connection*
- *Example DBMS that can be used are MySQL and MS SQL Server*
- *You might need to pay usage fee for the cloud computing company such as Google, Amazon, Microsoft, or IBM*

5. Benefits of Database

5. Benefits of Database

There are a few benefits of using a database.

- ***Controlling data redundancy***

> ***Since data are store in "one" database, it reduces redundancy, where multiple copies of the same data are avoided (or keep in synced).***

- ***Avoid data inconsistency***

> ***Redundancy can lead to multiple copies of the same data are not updated properly. This can lead to inconsistency, supposedly the same copies of data contain different values. Reducing redundancy (and mechanism to keep copies in synced) will lead to less inconsistency.***

5. Benefits of Database

- ***Appropriate sharing of data***

  Users will have proper access right to data, as set by database administrators.

- ***Enforcement of standards***

  With centralized database, you can enforce standard such as naming, data format, access rights, and data security. Also, if the organization use the same standard throughout, data exchange can be done with ease.

5. Benefits of Database

- ***Enforcement of integrity constraints***

  DBMS can enforce integrity to records, making sure they follow certain rules, such as "there must not be any repeated student ID number". This will make sure that the data are correct, credible, and non-conflicting.

- ***Program-data independence***

  DBMS will separate application software from data. If there are changes in the data, as long as the interface between applications and DBMS remains the same, the change can be done easily.

5. Benefits of Database

- ***Reduced application development time***

> ***Since the interface between DBMS and applications remain constant, developers can focus their efforts, time and resources, to the actual working of the applications themselves.***

- ***Backup and recovery***

> ***DBMS will have mechanism to make sure that the data in the database remain correct.***

5. Benefits of Database

➢ ***Multiple user interfaces, for different types of users***

- ***DBMS can provide easy-to-use interface (or at least, a way to make one) for users without programming experience. Such users can use provided interface for searching the database with simple query language.***
- ***For more advance users, they can use high-level programming language (such as SQL) to interact with the database instead.***

6. Tables in Database

6. Tables in Database

Fields

Collections of characters or bytes. Each field will convey a certain meaning such as student ID, or first name

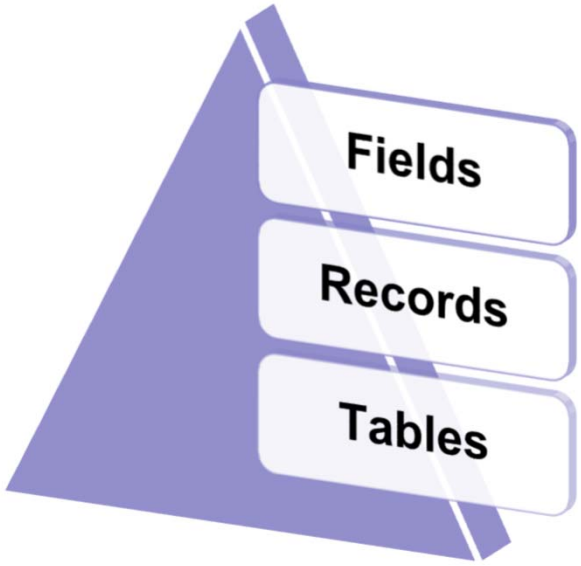
Records

Collections of related fields, representing an entity. For example, a record for a student consists of the following fields: student ID, first name, last name, faculty, GPA, etc.

6. Tables in Database

➢ Tables

Collection of more than one records. All records in a table are of the same type of data in one way or another.



6. Tables in Database

- *In every record in one table, there will be a field that is primary key. It is used to identify a record.*

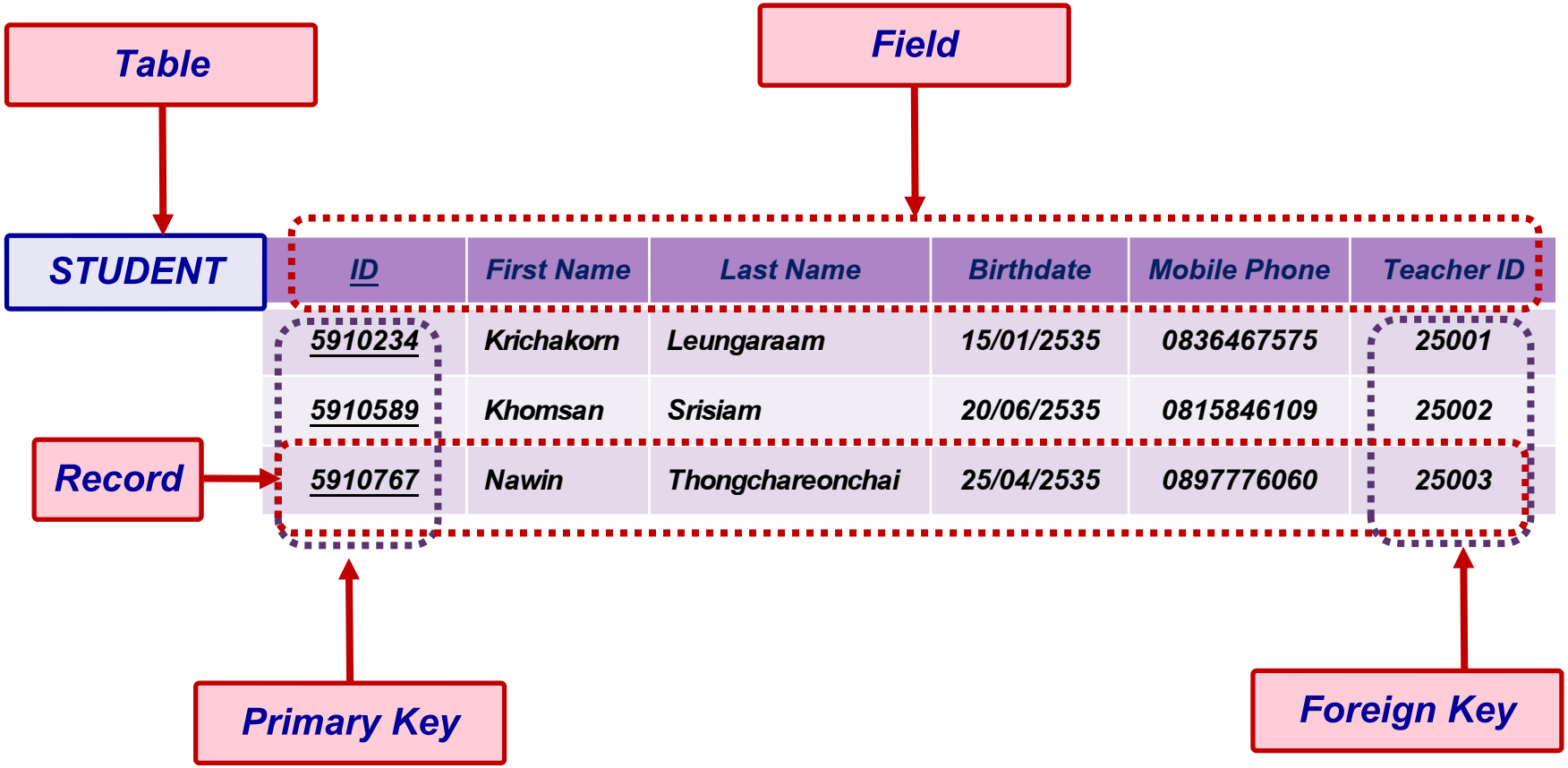
Primary key must be unique for all records in the same table

- *Sometime, a record from a table will have a field that us a foreign key.*

Foreign key will have identical values to a primary key of a record in another table. This is used to indicate records in relationship.

6. Tables in Database

➢ *Example of a table*



7. Tables' Relationships in Database

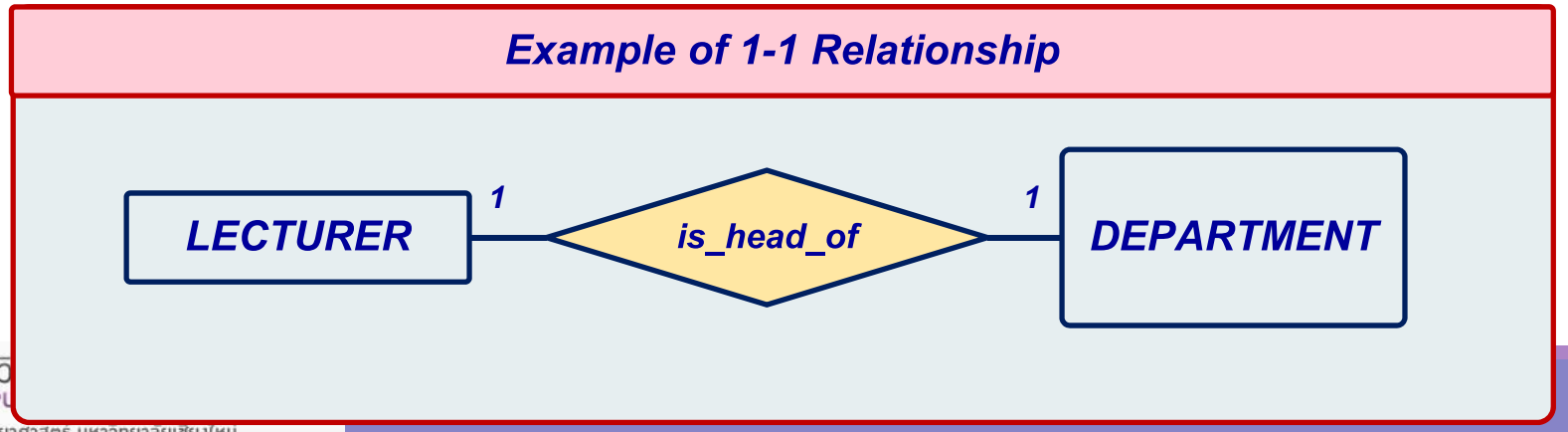
or just "Relationships"

7. Types of Relationships

There are 3 types of relationships between tables in a database.

- ***1 – 1 (One-to-one) Relationship***
  - ***A record in one table can have this relationship with up to one record in another table, and vice versa.***

"One department can have only one lecturer as a head. Also, one lecturer can be a head of only one department"



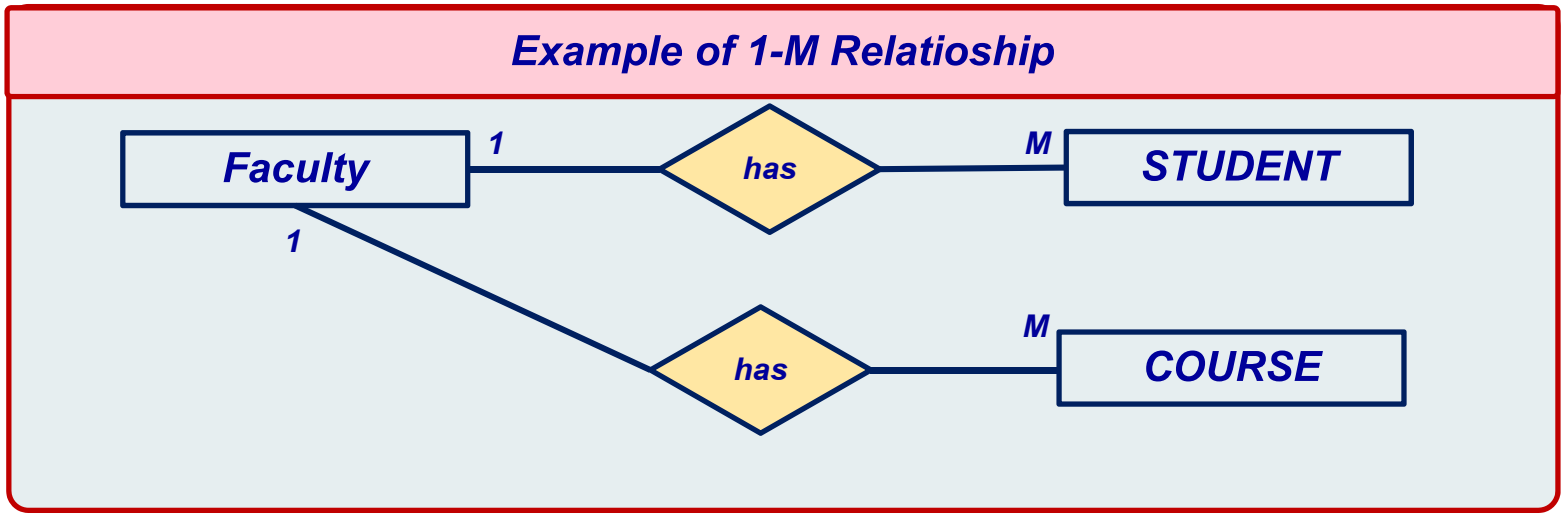
7. Types of Relationships

- *1 – M (One-to-many) Relationship*
  - *A record on the "one" side can have this relationship with more than one record on the "many" side. But the record on the "many" side can be related to only one record on the "one" side.*

7. Types of Relationships

➢ ***Example of 1-M relationship***

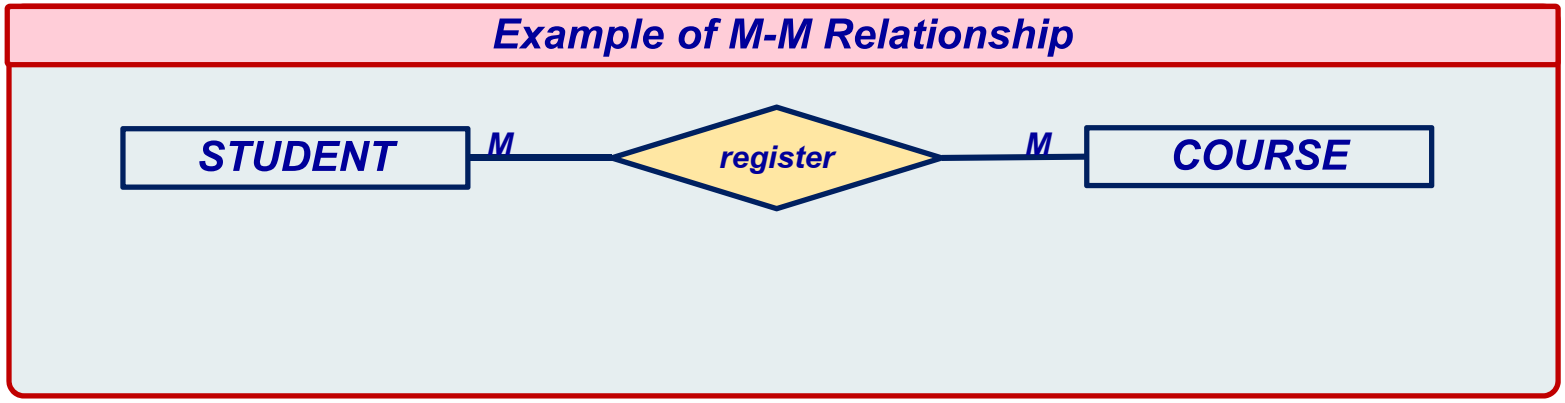
"A faculty can have many students. However, a student will only belongs to one faculty"



7. Types of Relationships

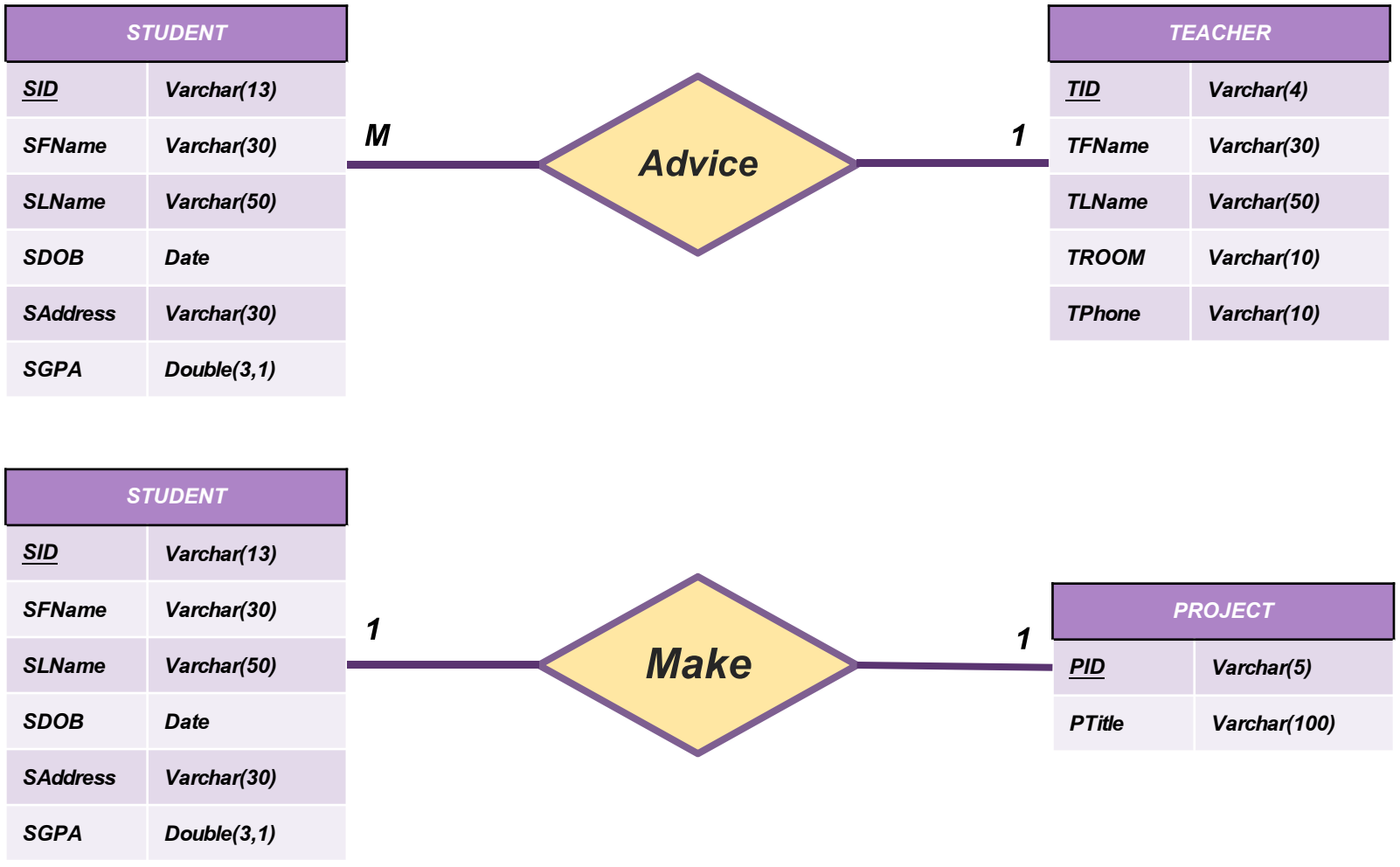
- ***M – M (Many-to-many) Relationship***
  - ***Records from either table can have relationship with more than one records in another table.***

"A student can register for many course. A course can be registered by many students."

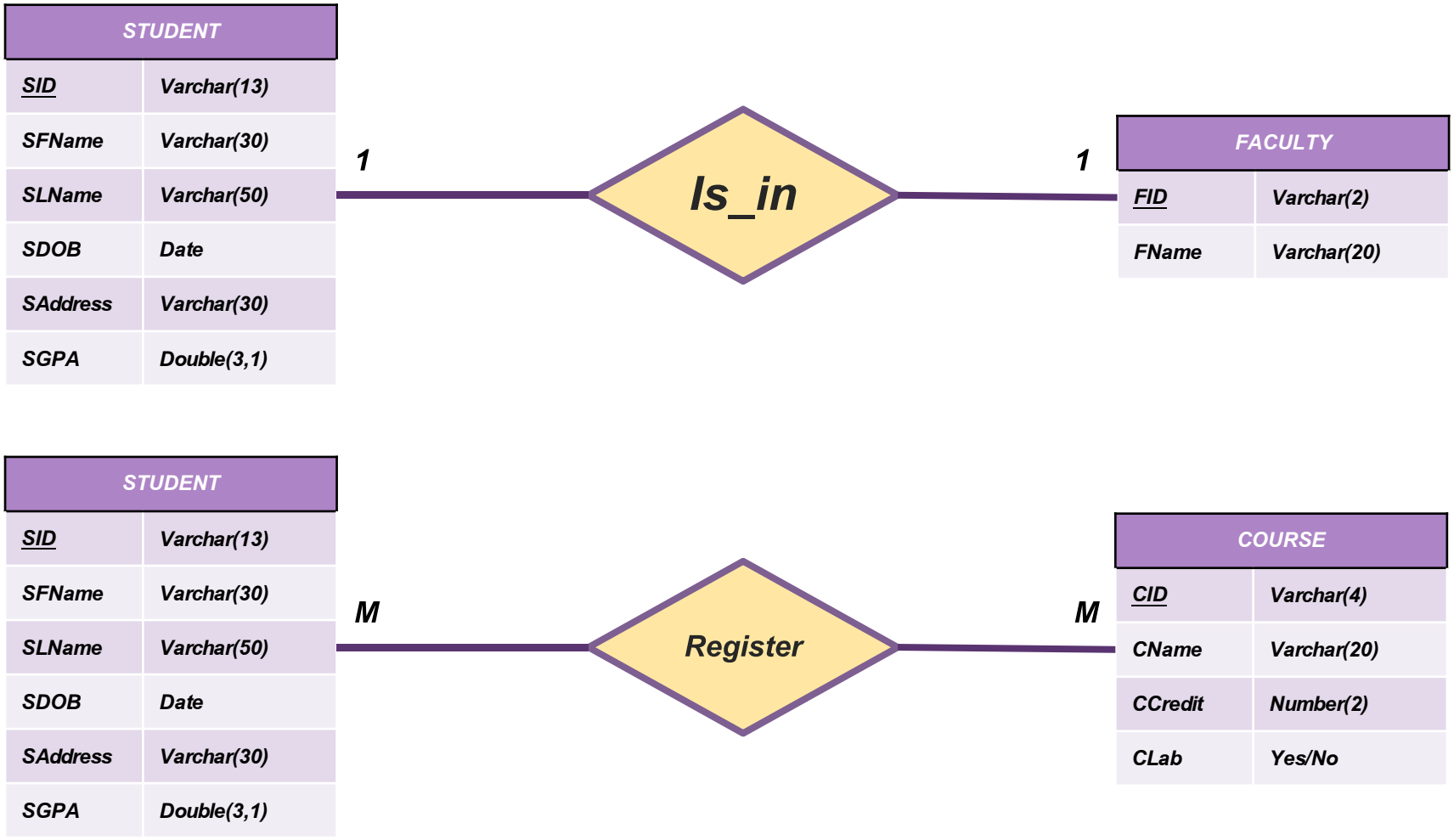


8. Example: Relationships in Students' Database

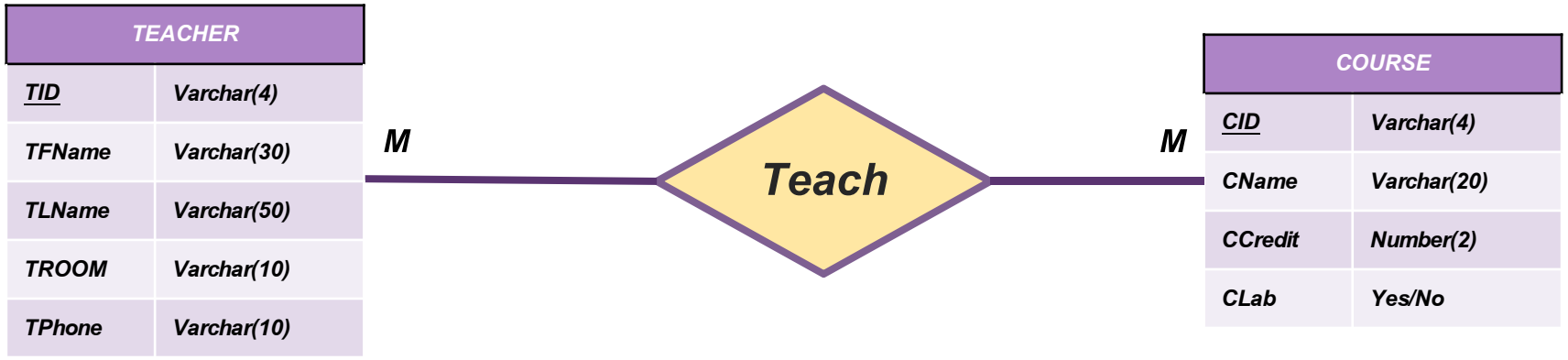
8. Relationships in Students' Database



8. Relationships in Students' Database



8. Relationships in Students' Database



8. Relationships in Students' Database