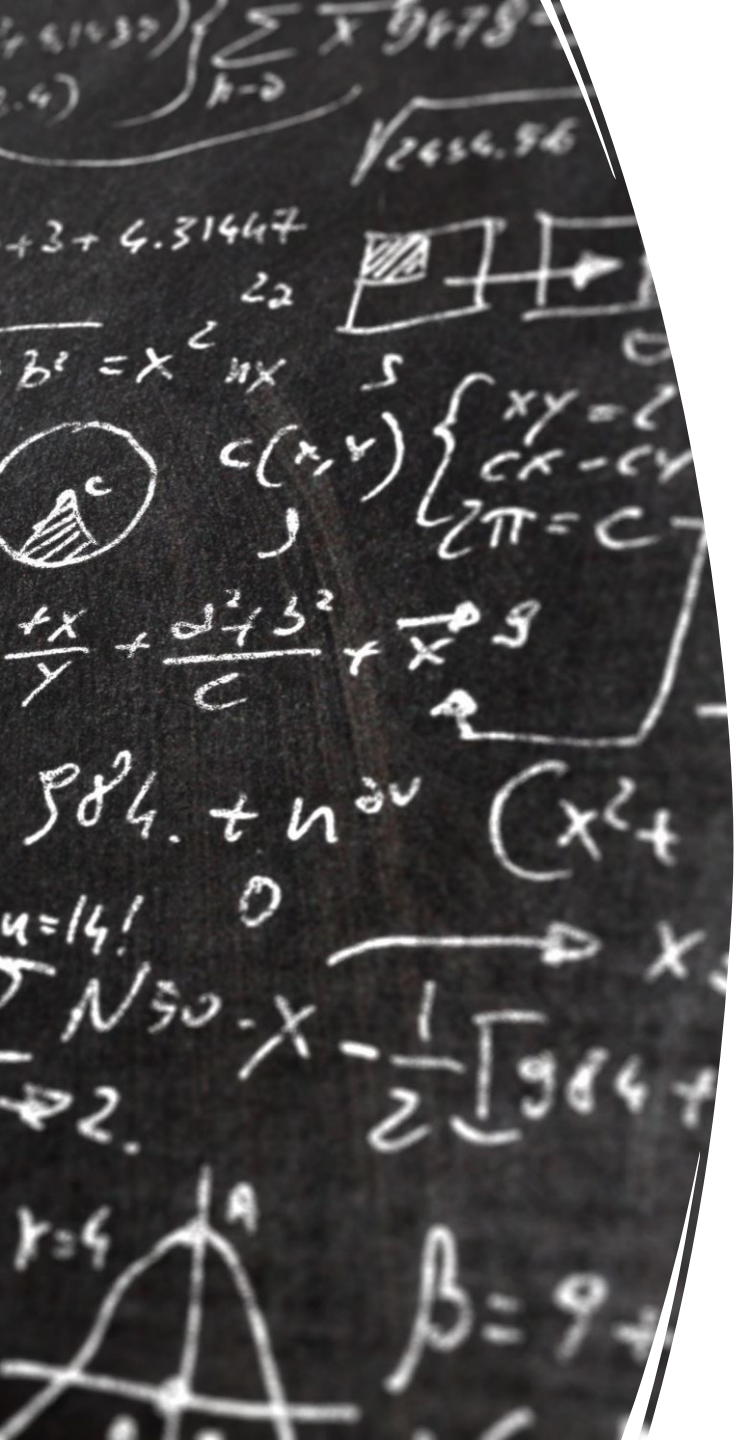

Information Communication Technologies

Lecture 8. Application Software

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Agenda

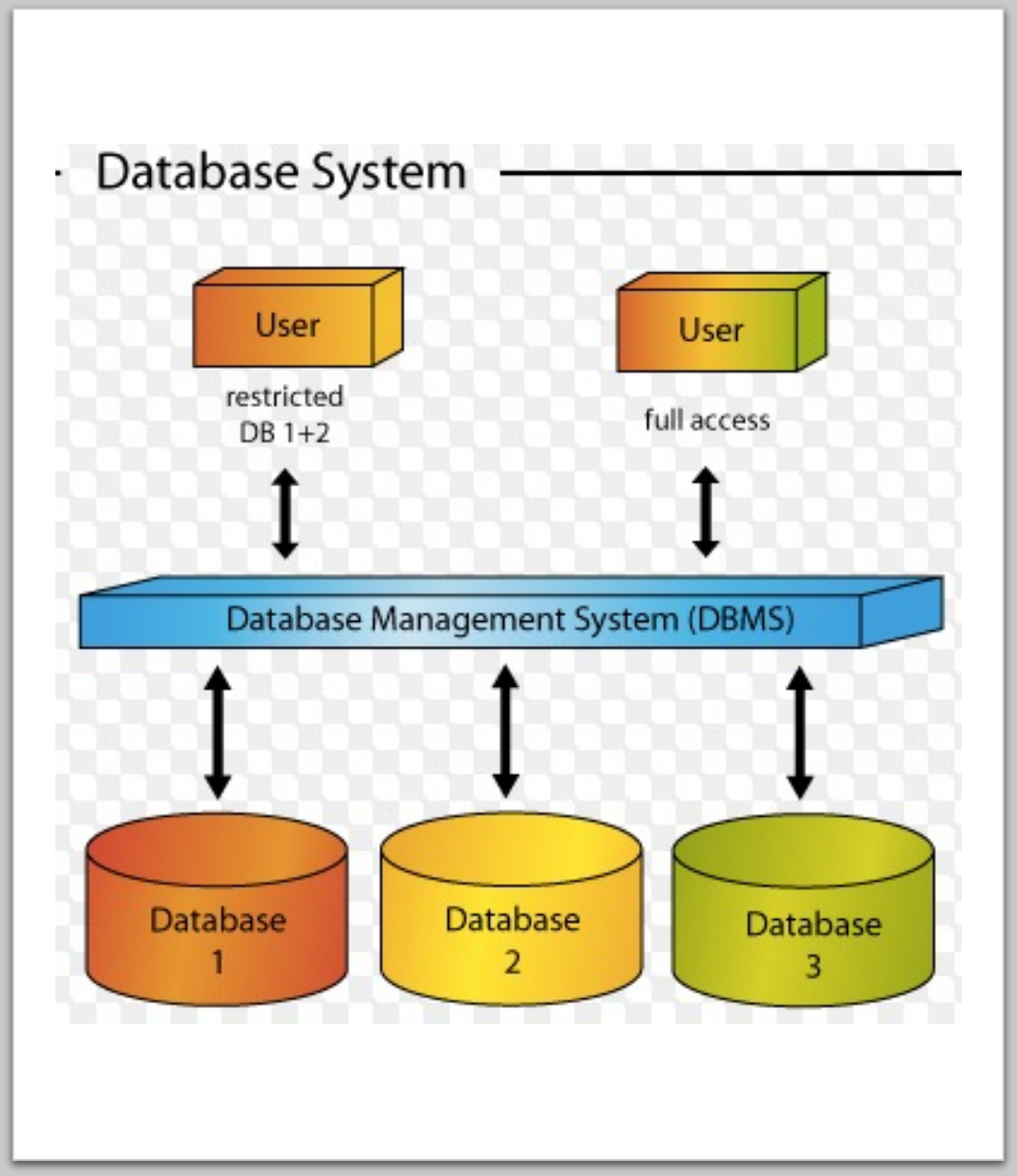
Application Software

Software Basics

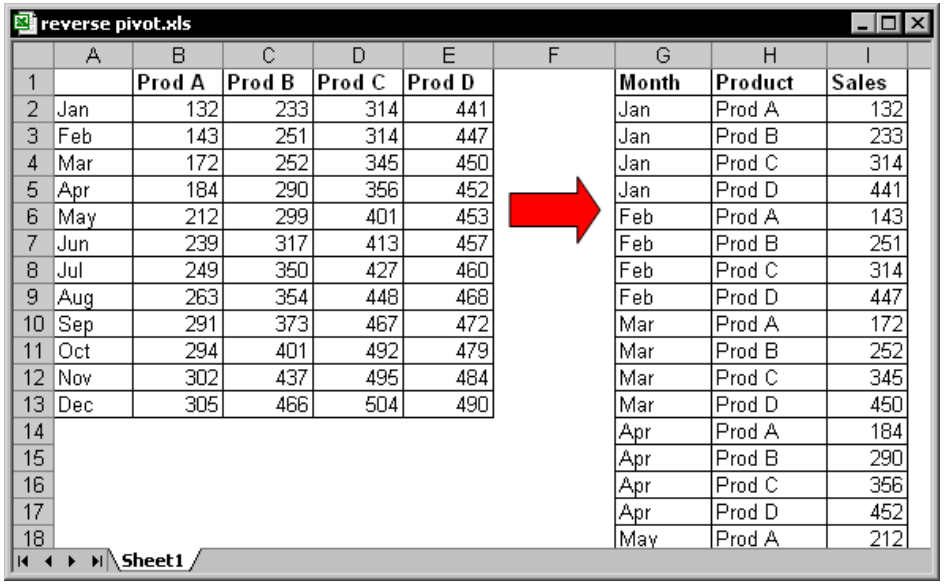
Databases

Databases

- A **database** is an organized collection of data.
- **Data files** are files where data is organized in a uniform format.



Databases (continued)



reverse pivot.xls

	A	B	C	D	E	F	G	H	I
1		**Prod A**	**Prod B**	**Prod C**	**Prod D**		**Month**	**Product**	**Sales**
2	Jan	132	233	314	441		Jan	Prod A	132
3	Feb	143	251	314	447		Jan	Prod B	233
4	Mar	172	252	345	450		Jan	Prod C	314
5	Apr	184	290	356	452		Jan	Prod D	441
6	May	212	299	401	453		Feb	Prod A	143
7	Jun	239	317	413	457		Feb	Prod B	251
8	Jul	249	350	427	460		Feb	Prod C	314
9	Aug	263	354	448	468		Feb	Prod D	447
10	Sep	291	373	467	472		Mar	Prod A	172
11	Oct	294	401	492	479		Mar	Prod B	252
12	Nov	302	437	495	484		Mar	Prod C	345
13	Dec	305	466	504	490		Mar	Prod D	450
14							Apr	Prod A	184
15							Apr	Prod B	290
16							Apr	Prod C	356
17							Apr	Prod D	452
18							May	Prod A	212

Sheet1

File and Database Concepts

A file contains records that are made up of fields

Data management refers to the tasks associated with maintaining and accessing the data stored in a data file.

Each data file has a ***file structure*** that describes the way in which the data is stored in that file.

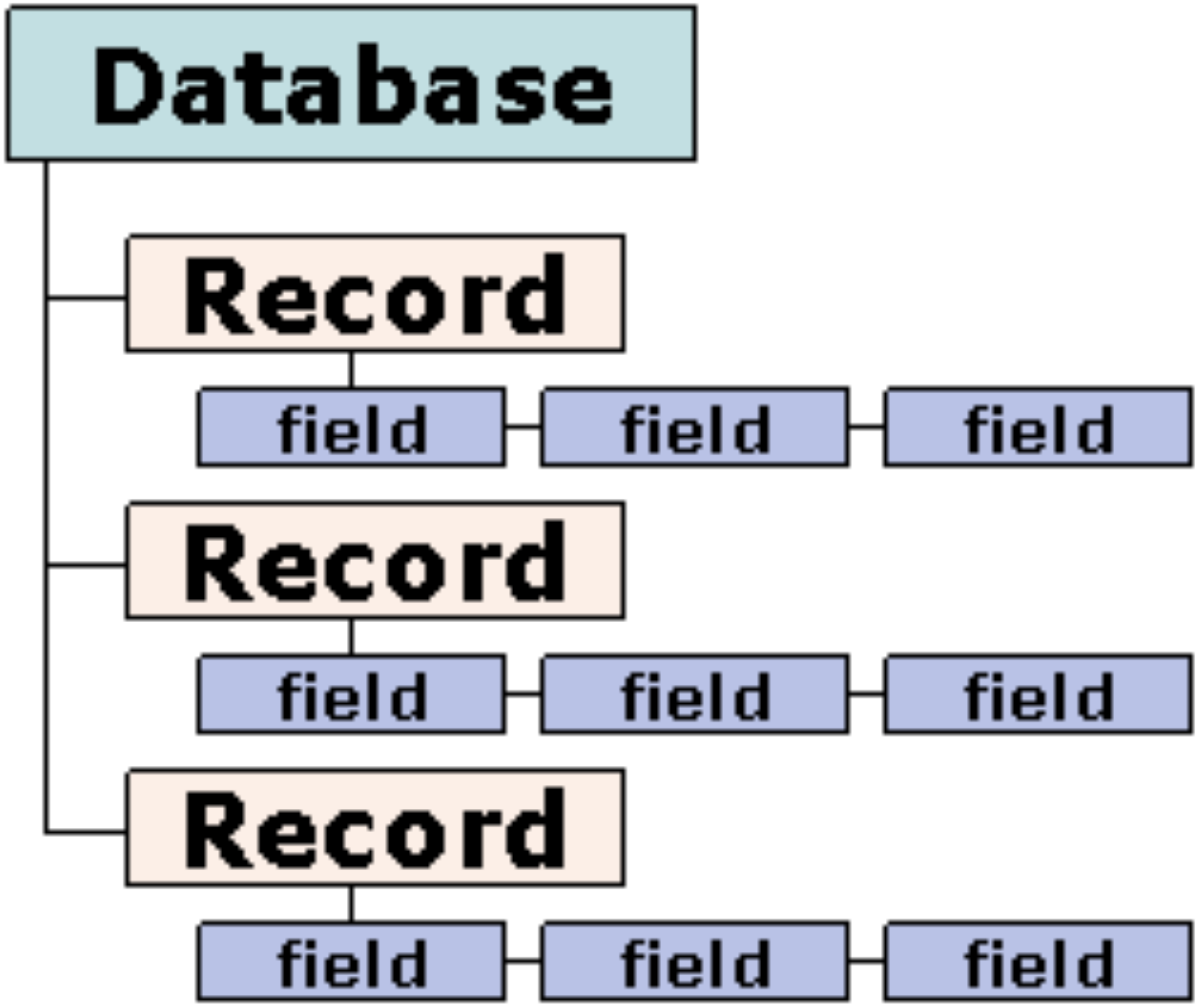
Databases (continued)

Fields: Smallest unit of meaningful data and forms the basic building block of data file.

Data types: the way the data is represented.

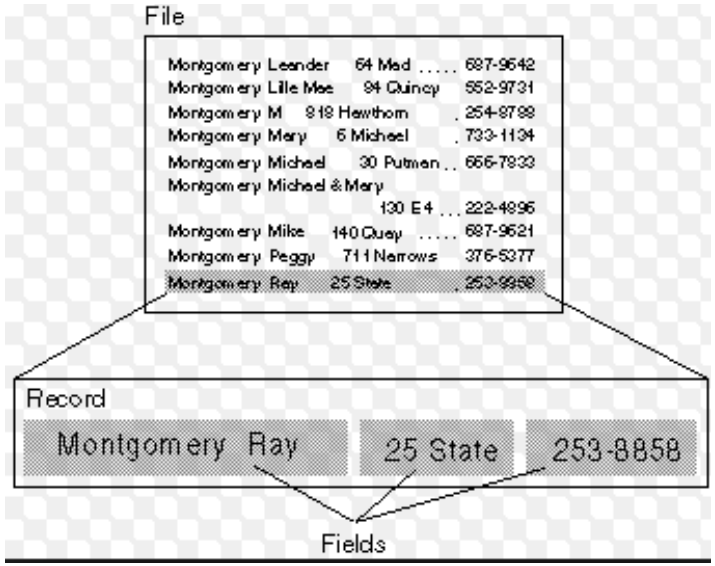
Entity: it is a person, place, thing or event about which data is stored.

Records: Collection of fields of data about on entity.


Database
Record
field
field
field
Record
field
field
field
Record
field
field
field

Fields

- A ***field*** contains the smallest unit of meaningful data and can be thought of as the basic building block for a data file.
- Each field has a ***field name*** that describes its contents.
- A ***variable-length field*** expands to fit the data you enter.
- A ***fixed-length field*** contains a predetermined number of bytes.
- *John Smith* is 10 characters long, *Thomas Horatio Jefferson* is 24 characters long.

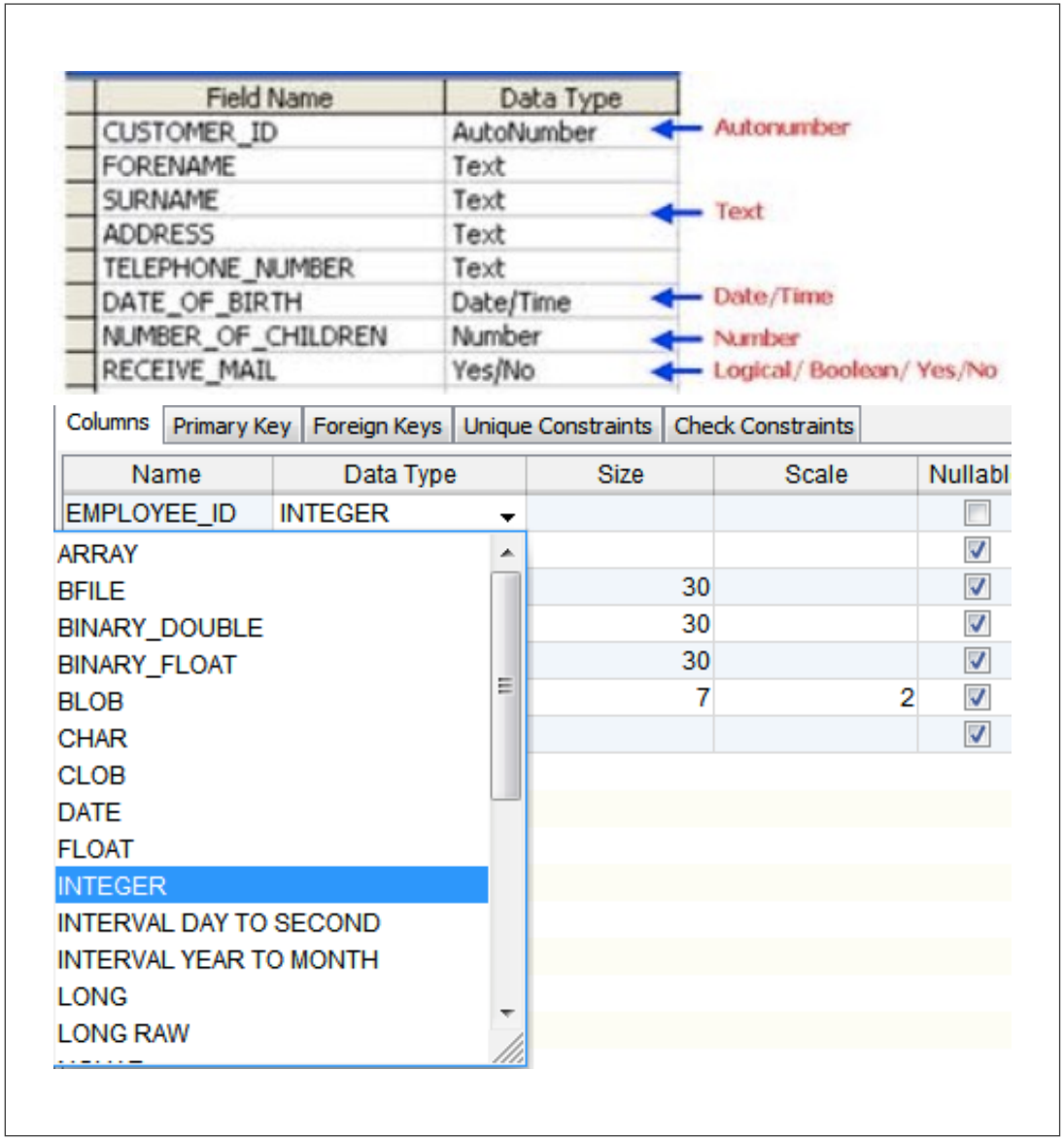


Data Types

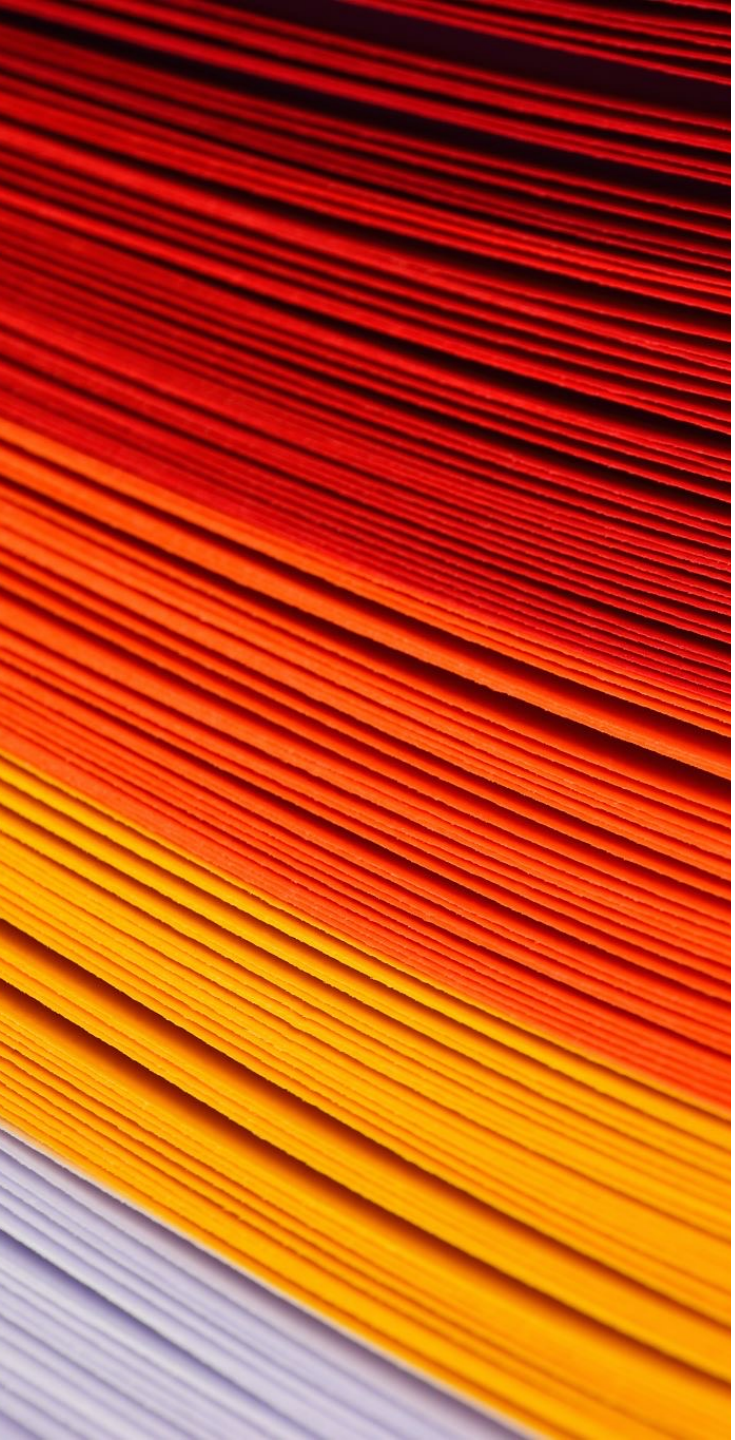
- **Determines the way a data is represented and manipulated.**
- Common data types are numeric and character.
- **Numeric data type**: to fields that contains numbers for mathematical calculation, averaging
  - **Real Numbers**: contains fractional numbers that is number with decimal points.
  - **Integers**: contains whole numbers

Data Types (continued)

- **Character (string) data type**: assigned to fields that is not used in mathematical calculations.
- **Date data type**: assigned to fields for manipulating dates.
- **Logical data type**: accepts two values such as yes/no or true/false.
- **Memo data type**: provides a variable length field in which you can store comments.


Field Name
Data Type
CUSTOMER_ID
AutoNumber
Autonumber
FORENAME
Text
SURNAME
Text
Text
ADDRESS
Text
TELEPHONE_NUMBER
Text
DATE_OF_BIRTH
Date/Time
Date/Time
NUMBER_OF_CHILDREN
Number
Number
RECEIVE_MAIL
Yes/No
Logical/ Boolean/ Yes/No
Columns
Primary Key
Foreign Keys
Unique Constraints
Check Constraints
Name
Data Type
Size
Scale
Nullabl
EMPLOYEE_ID
INTEGER
ARRAY
BFILE
BINARY_DOUBLE
BINARY_FLOAT
BLOB
CHAR
CLOB
DATE
FLOAT
INTEGER
INTERVAL DAY TO SECOND
INTERVAL YEAR TO MONTH
LONG
LONG RAW
30
30
30
7
2

Data Types

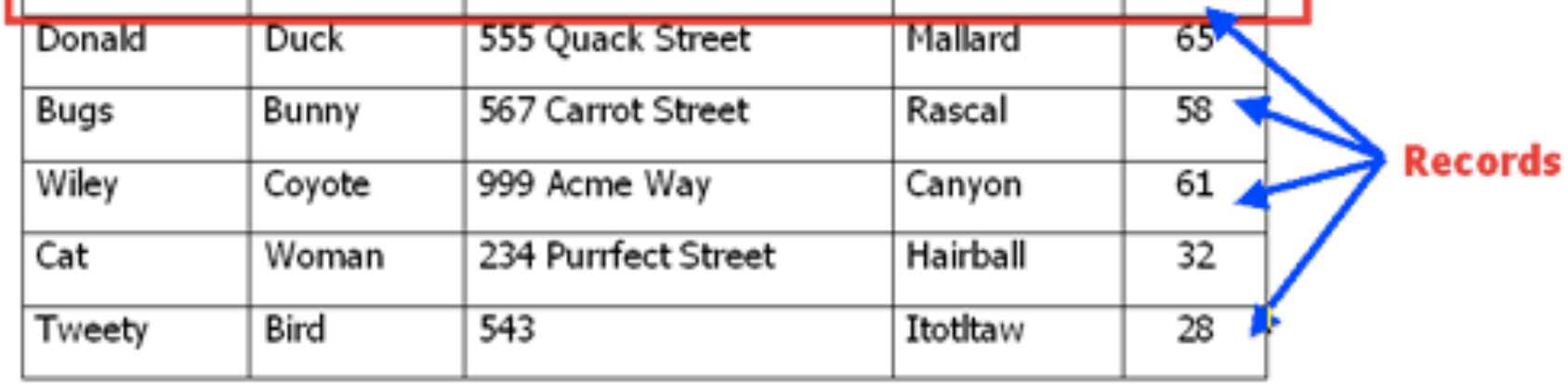


Records

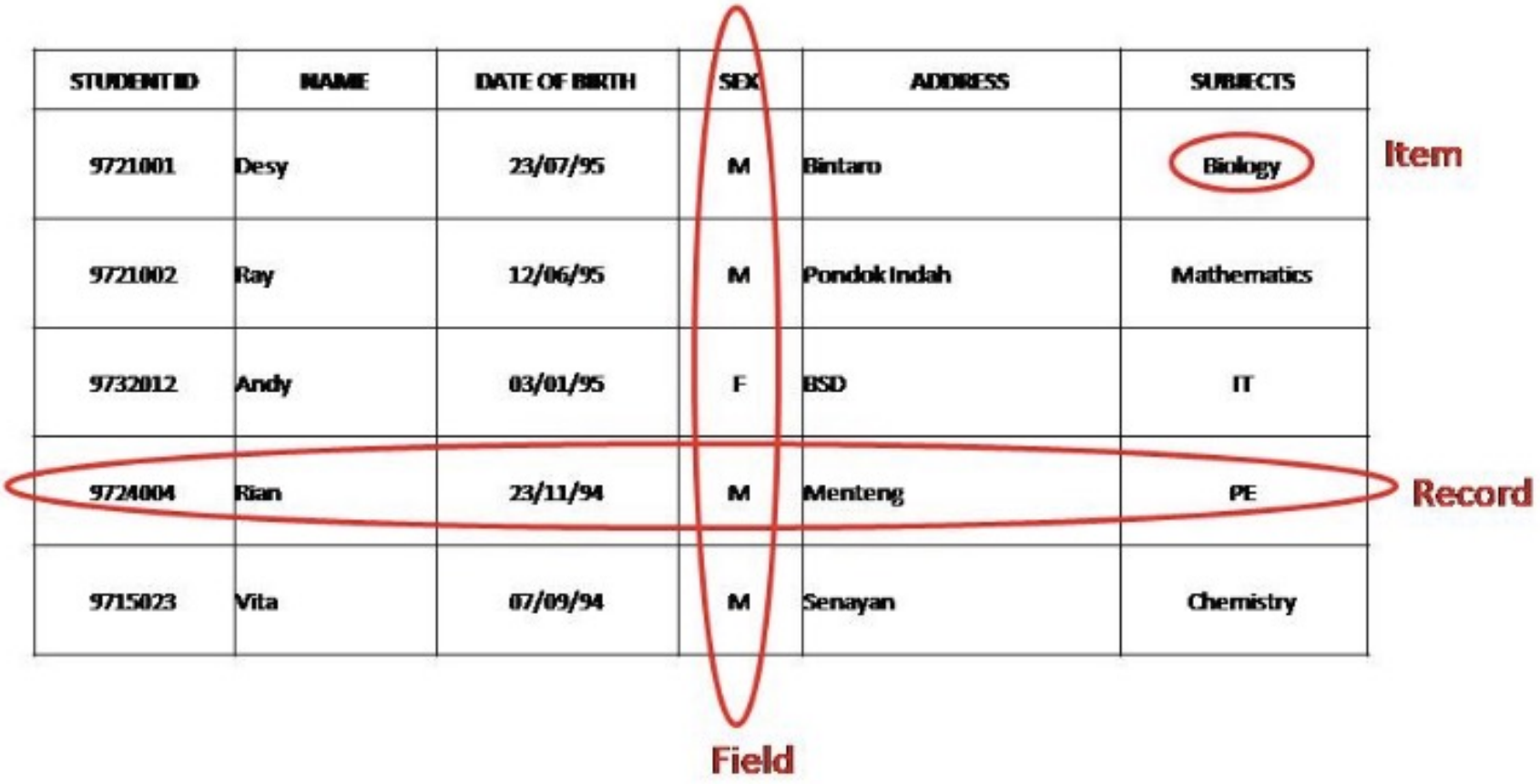
- **Records are collection of fields of data**
- **Record length** is a measure of maximum number of bytes a field can hold.
- **Record type:** structure of record.
- **Record occurrence:** entering data is referred as record occurrence.

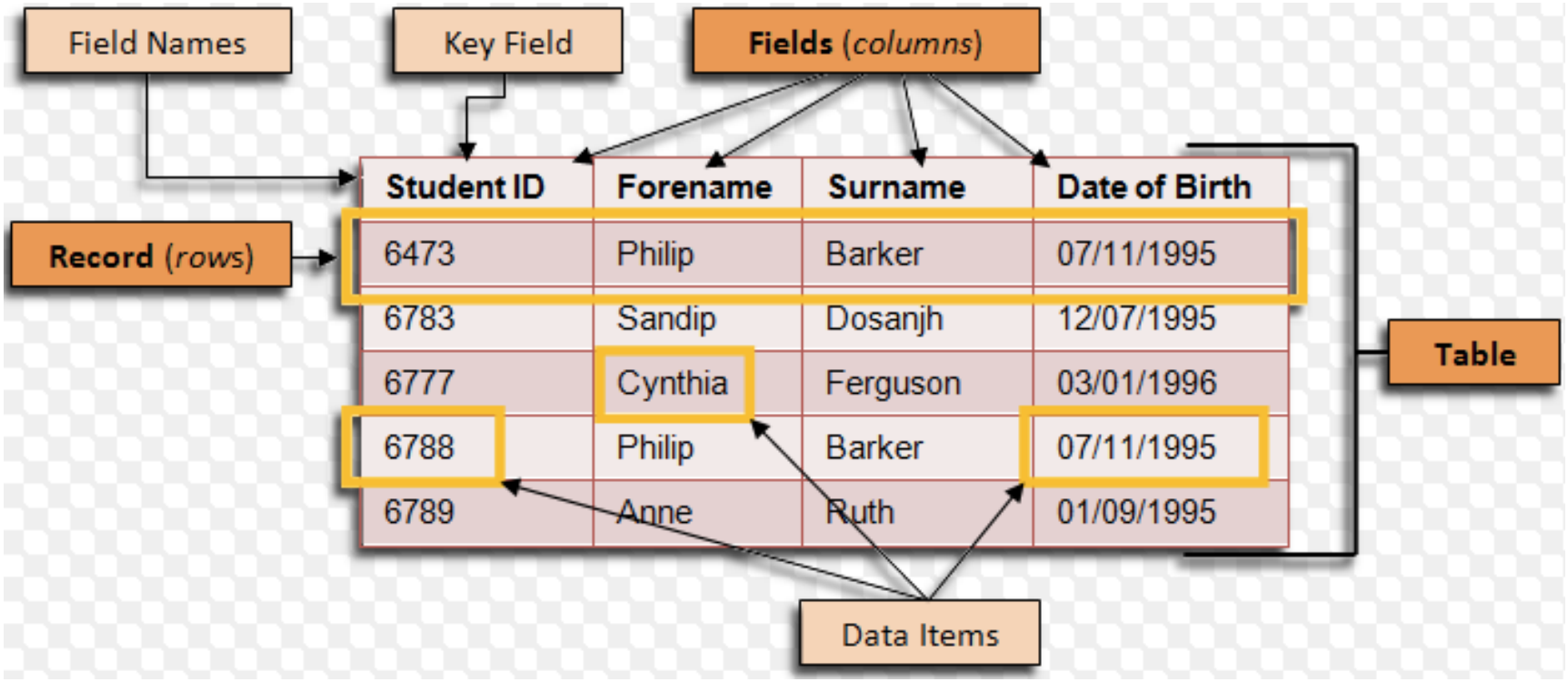
Records

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



Records


STUDENT ID
NAME
DATE OF BIRTH
SEX
ADDRESS
SUBJECTS
9721001
Desy
23/07/95
M
Bintaro
Biology
9721002
Ray
12/06/95
M
Pondok Indah
Mathematics
9732012
Andy
03/01/95
F
BSD
IT
9724004
Rian
23/11/94
M
Menteng
PE
9715023
Vita
07/09/94
M
Senayan
Chemistry
Item
Record
Field


Field Names
Key Field
Fields (columns)
Record (rows)
Table
Data Items
Student ID
Forename
Surname
Date of Birth
6473
Philip
Barker
07/11/1995
6783
Sandip
Dosanjh
12/07/1995
6777
Cynthia
Ferguson
03/01/1996
6788
Philip
Barker
07/11/1995
6789
Anne
Ruth
01/09/1995

Flat Files and Database

- ***Flat files***
  - refers to data file which has same field names, field length and data types.
  - A list of names, addresses, and phone numbers written on a sheet of paper is a flat file database.

Flat File Model

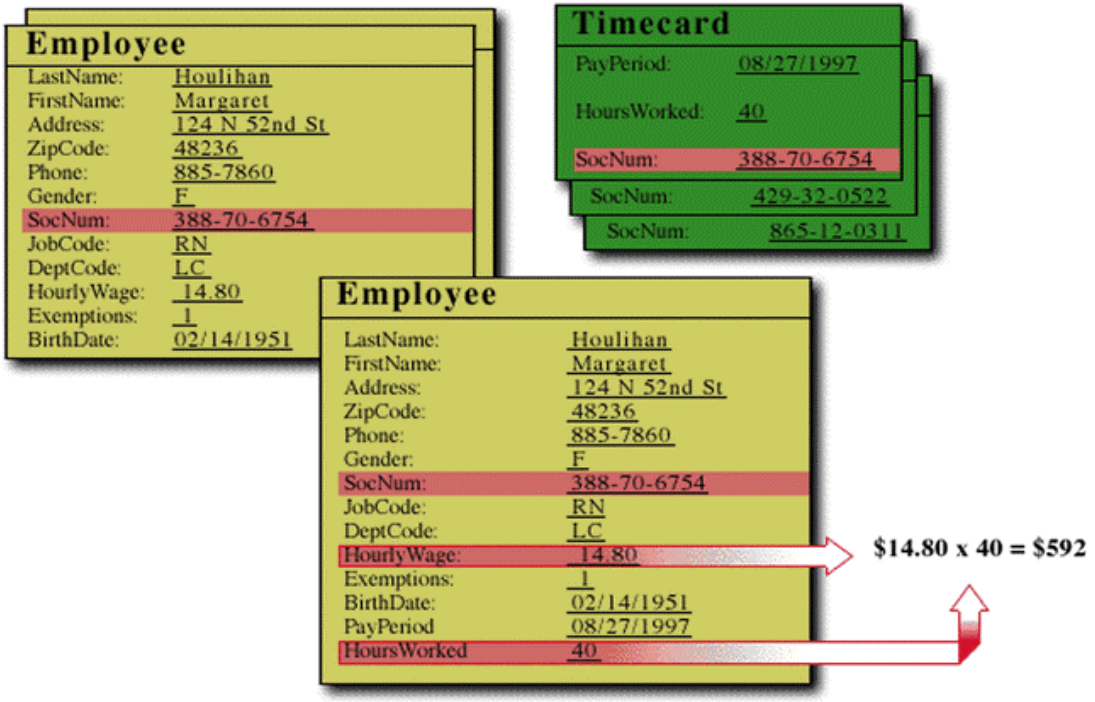
	Route No.	Miles	Activity
Record 1	I-95	12	Overlay
Record 2	I-495	05	Patching
Record 3	SR-301	33	Crack seal

Flat Files and Database (continued)

- ***Database:***
  - Variety of different record types related or consolidated into single unit.
  - Two flat files can be combined or joined to perform calculations.
  - Highly suitable complex data management tasks.
  - Maintained by database administrator.

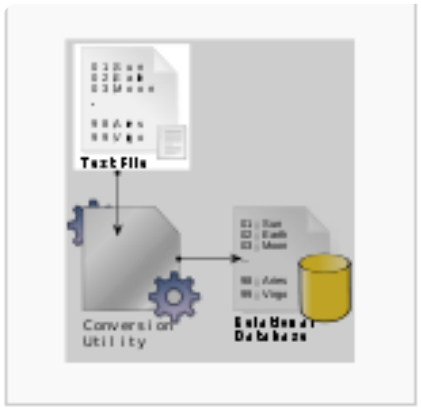
Databases

- When a computer uses related record types from a database to calculate pay, it can combine two records to create a record that contains the data from both files.

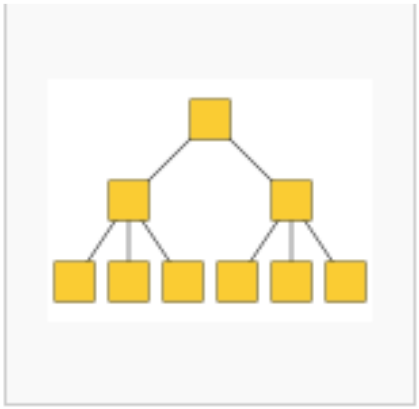


Databases (continued)

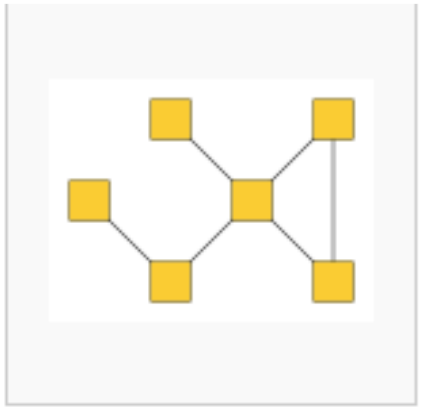
- A database has more flexibility than a flat file but is more difficult to design and maintain.
- A ***database administrator*** supervises database design, development, testing, and maintenance.
  - Data redundancy (избыточность данных)
  - Primary key
  - Relationships
  - Data integrity (целостность данных)



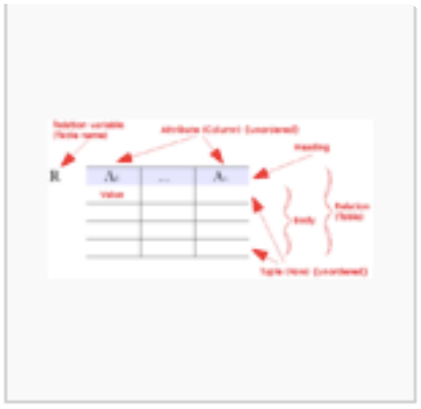
Flat model



Hierarchical model



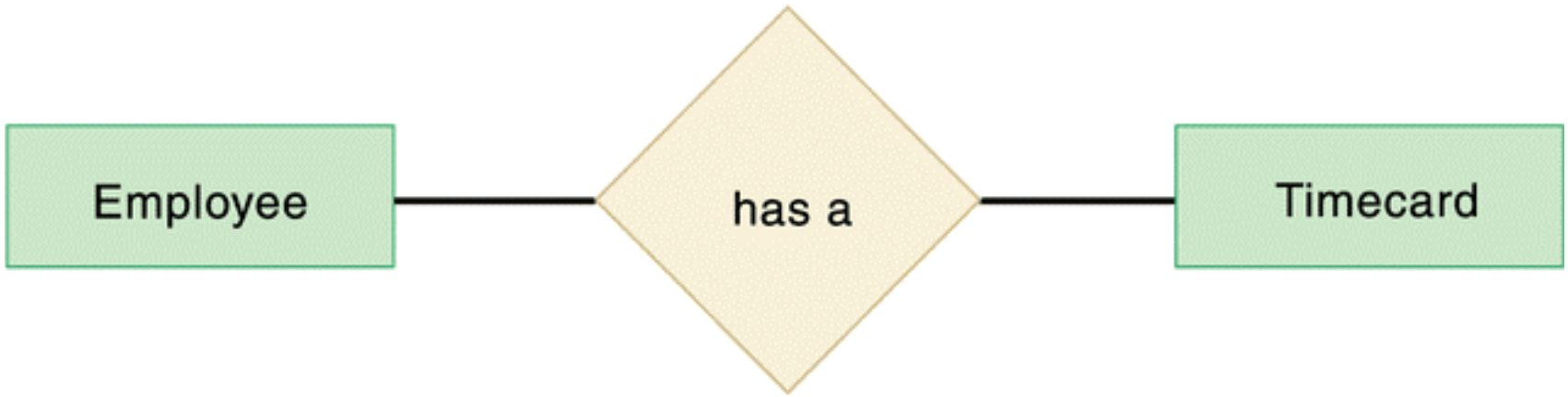
Network model



Relational model

Data Models

- A ***data model*** is a description of the way that data is stored in a database.
  - helps you understand the relationships between entities
  - helps you create efficient structure to hold your data



Entity Relationships

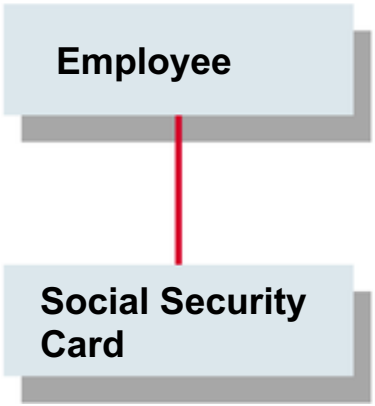
- A ***relationship*** is an association between entities.
- Database designers graphically depict data models using diagramming techniques.

Entity Relationships (continued)

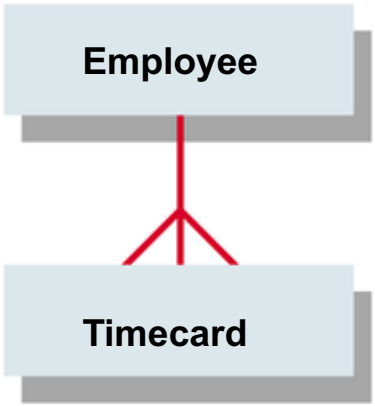
- A data diagram can also show ***cardinality*** – the number of occurrences that can exist between two record types.
- Three possible types of cardinality are:
  - one-to-one
  - one-to-many
  - many-to-many

Entity Relationships (continued)

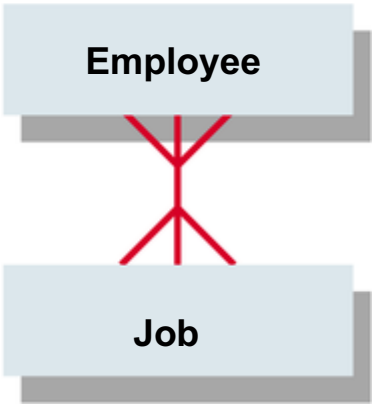
Diagramming cardinality



A one-to-one relationship is shown by using a single line to connect the boxes that represent record types.



A one-to-many relationship is shown by adding a “crow’s foot” to the end of the line next to the record type with many occurrences.



A many-to-many relationship is shown by adding a “crow’s foot” to both ends of the connecting line.

Entity Relationships (continued)

- ***One-to-one relationship*** = one record of a record type is related to only one record of another record type
- ***One-to-many relationship*** = one record in a record type may be related to more than one record of another record type
- ***Many-to-many relationship*** = one record in a particular record type can be related to many records in another record type and vice versa

Searching the Database/Information

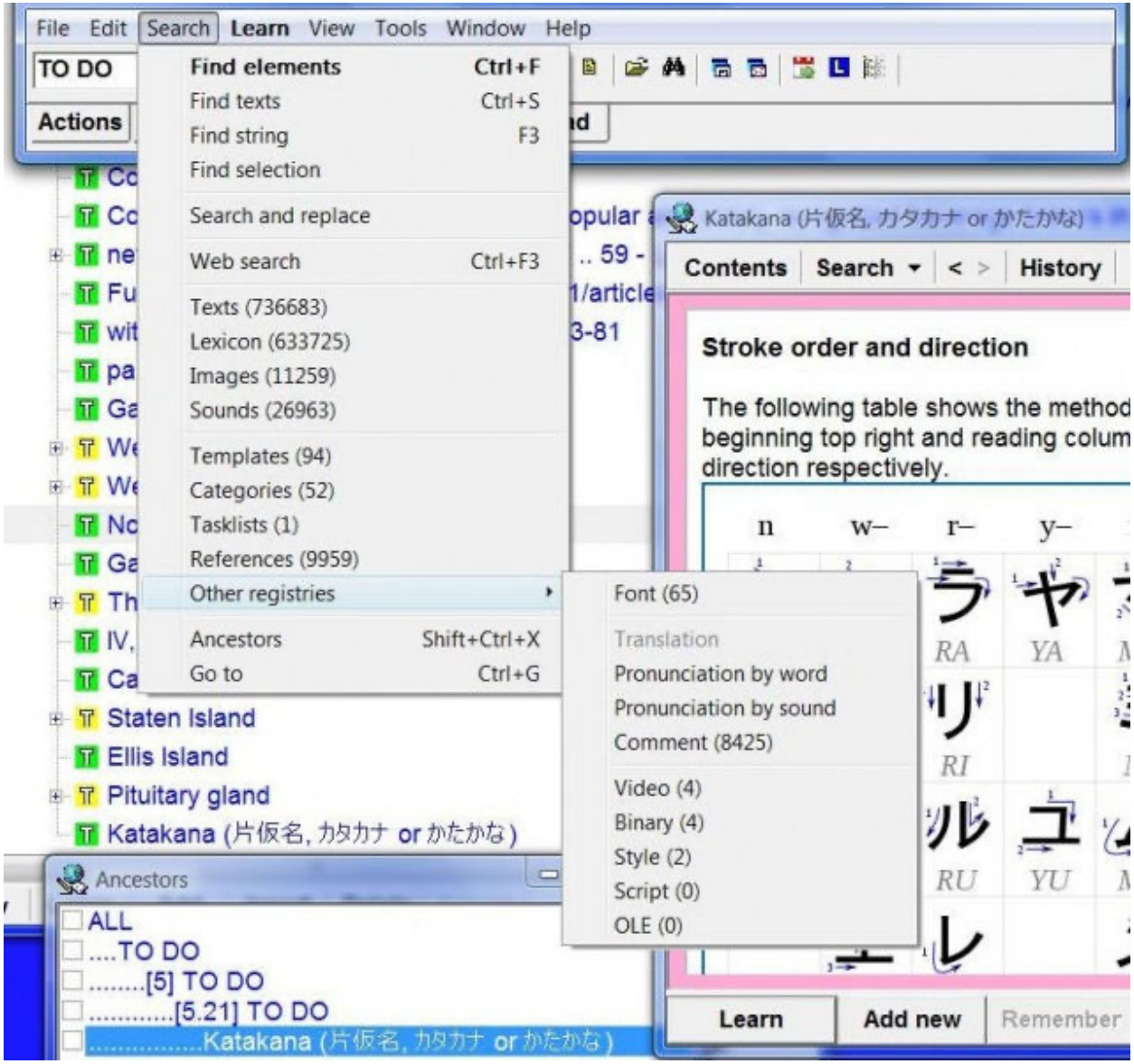
- Databases classified as **Structured and Free form databases**.
- **Structured forms** are arranged in an uniform format of records and fields.
- **Free-forms** are arranged loosely in the form of documents rather than as records

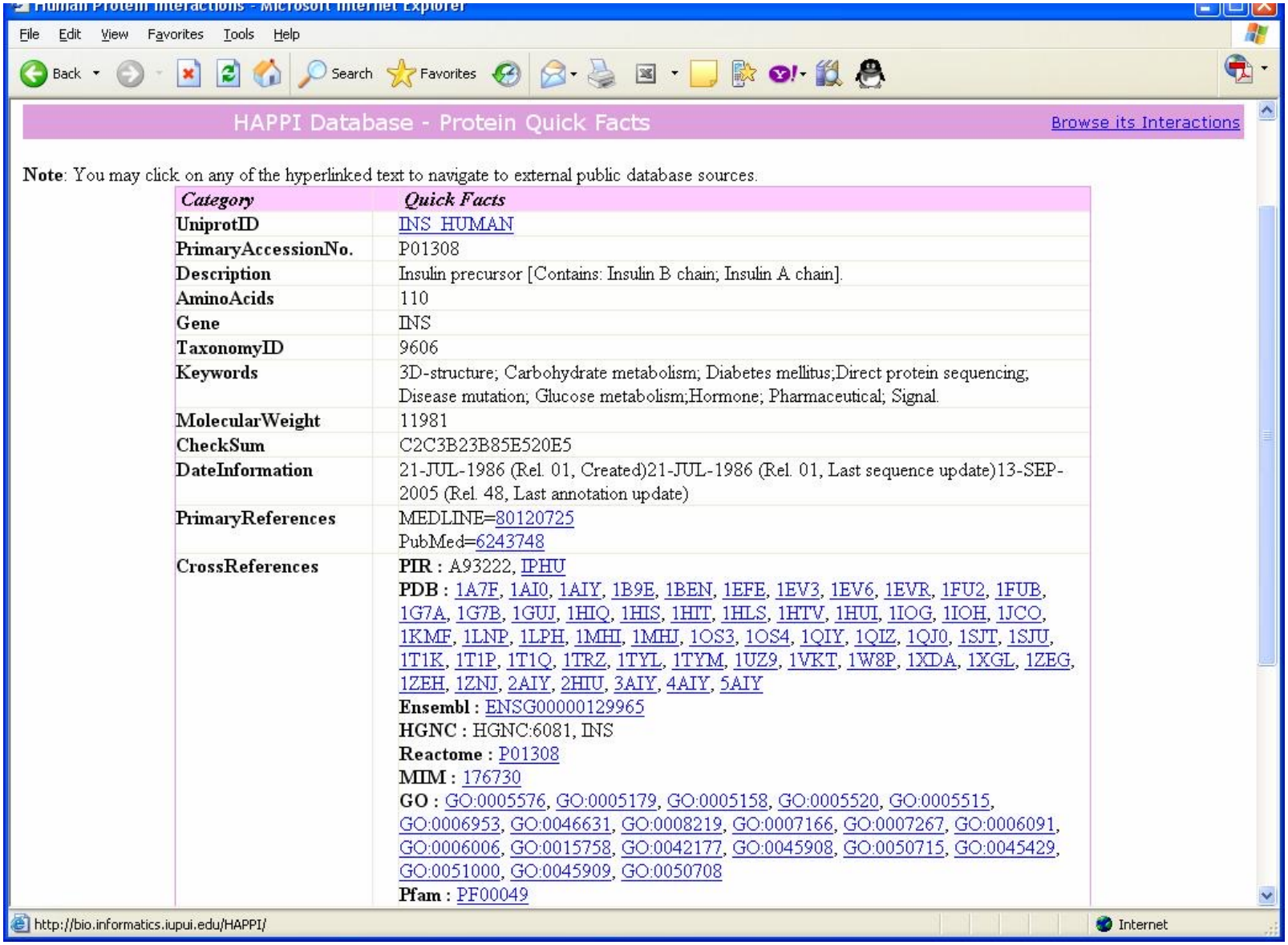
Searching the Database/Information (continued)

- **Data access software** is the interface used to search for information on a Database
- Different databases have different data access software
- Depending on data access software searching specifications using a menu, hypertext index, keyword search, query by example or query language

Menus and Hypertext Index

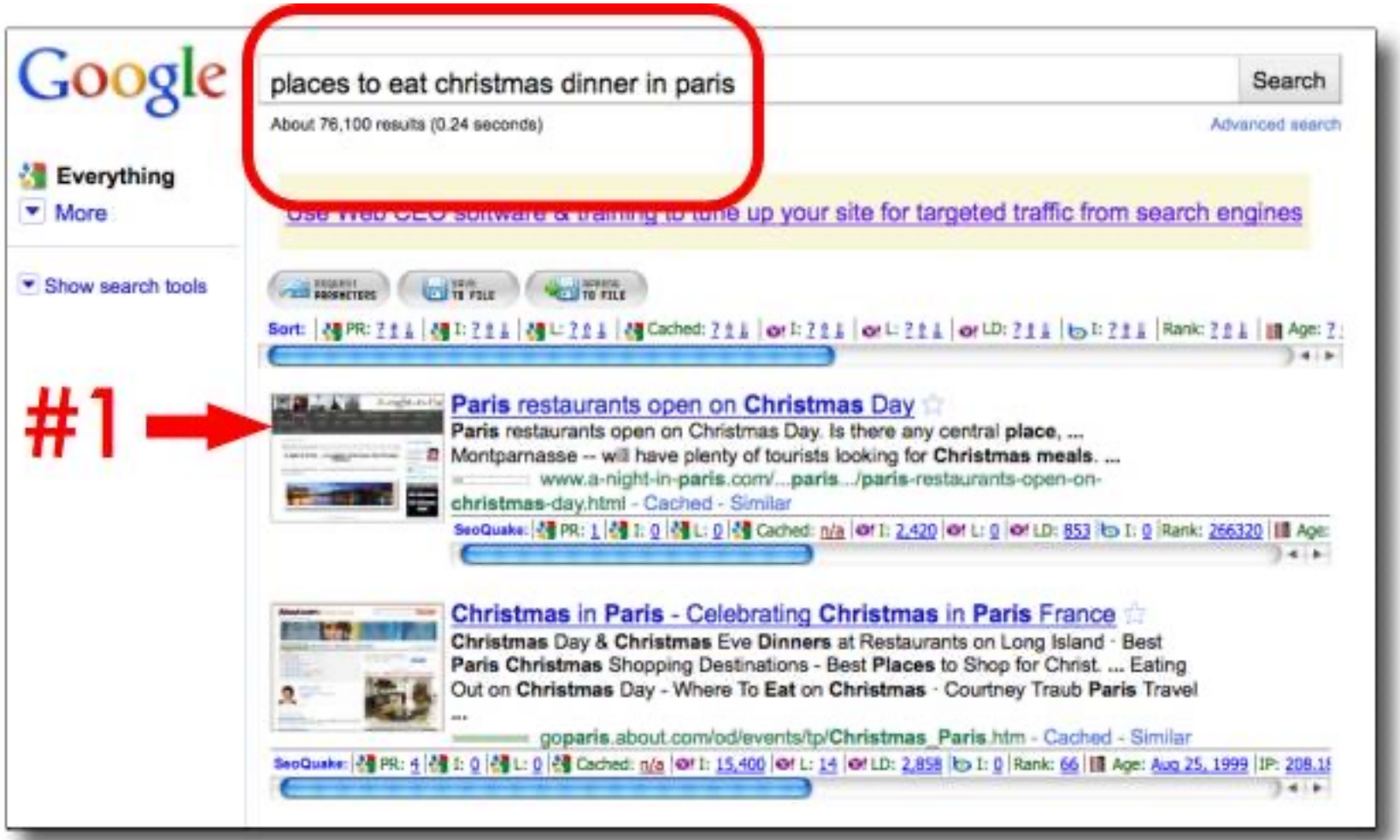
- Menus are similar to the ones used in most software
- Menus are being replaced by **Hypertext index**.
- **Hypertext database**: any object (text, picture, film) can be linked to any other object.
- Hypertext database useful for organizing large amounts of disparate information,
- Not designed for numerical analysis.


File Edit Search Learn View Tools Window Help
TO DO
Actions
Find elements Ctrl+F
Find texts Ctrl+S
Find string F3
Find selection
Search and replace
Web search Ctrl+F3
Texts (736683)
Lexicon (633725)
Images (11259)
Sounds (26963)
Templates (94)
Categories (52)
Tasklists (1)
References (9959)
Other registries
Ancestors Shift+Ctrl+X
Go to Ctrl+G
Font (65)
Translation
Pronunciation by word
Pronunciation by sound
Comment (8425)
Video (4)
Binary (4)
Style (2)
Script (0)
OLE (0)
Staten Island
Ellis Island
Pituitary gland
Katakana (片仮名, カタカナ or かたかな)
Ancestors
ALL
....TO DO
.....[5] TO DO
.....[5.21] TO DO
.....Katakana (片仮名, カタカナ or かたかな)
Katakana (片仮名, カタカナ or かたかな)
Contents Search History
Stroke order and direction
The following table shows the method
beginning top right and reading colum
direction respectively.
n w– r– y–
RA YA
RI
RU YU
Learn Add new Remember


Human Protein Interactions - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
HAPPI Database - Protein Quick Facts
Browse its Interactions
Note: You may click on any of the hyperlinked text to navigate to external public database sources.
Category
Quick Facts
UniprotID
INS_HUMAN
PrimaryAccessionNo.
P01308
Description
Insulin precursor [Contains: Insulin B chain; Insulin A chain].
AminoAcids
110
Gene
INS
TaxonomyID
9606
Keywords
3D-structure; Carbohydrate metabolism; Diabetes mellitus;Direct protein sequencing; Disease mutation; Glucose metabolism;Hormone; Pharmaceutical; Signal.
MolecularWeight
11981
CheckSum
C2C3B23B85E520E5
DateInformation
21-JUL-1986 (Rel. 01, Created)21-JUL-1986 (Rel. 01, Last sequence update)13-SEP-2005 (Rel. 48, Last annotation update)
PrimaryReferences
MEDLINE=80120725
PubMed=6243748
CrossReferences
PIR : A93222, IPHU
PDB : 1A7F, 1AI0, 1AIY, 1B9E, 1BEN, 1EFE, 1EV3, 1EV6, 1EVR, 1FU2, 1FUB, 1G7A, 1G7B, 1GUJ, 1HIQ, 1HIS, 1HIT, 1HLS, 1HTV, 1HUI, 1IOG, 1IOH, 1JCO, 1KMF, 1LNP, 1LPH, 1MHI, 1MHJ, 1OS3, 1OS4, 1QIY, 1QIZ, 1QJ0, 1SJT, 1SJU, 1T1K, 1T1P, 1T1Q, 1TRZ, 1TYL, 1TYM, 1UZ9, 1VKT, 1W8P, 1XDA, 1XGL, 1ZEG, 1ZEH, 1ZNJ, 2AIY, 2HIU, 3AIY, 4AIY, 5AIY
Ensembl : ENSG00000129965
HGNC : HGNC:6081, INS
Reactome : P01308
MIM : 176730
GO : GO:0005576, GO:0005179, GO:0005158, GO:0005520, GO:0005515, GO:0006953, GO:0046631, GO:0008219, GO:0007166, GO:0007267, GO:0006091, GO:0006006, GO:0015758, GO:0042177, GO:0045908, GO:0050715, GO:0045429, GO:0051000, GO:0045909, GO:0050708
Pfam : PF00049
http://bio.informatics.iupui.edu/HAPPI/
Internet

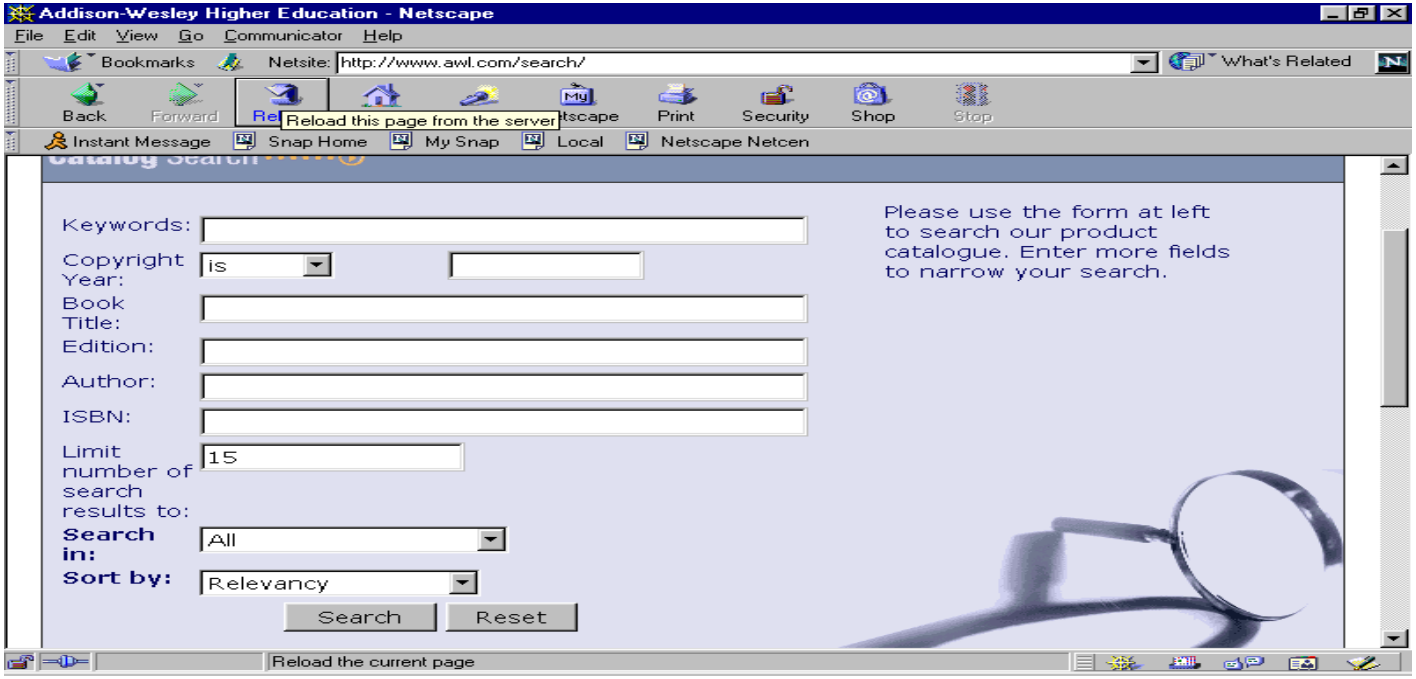
Keyword Search Engine

- A program that searches documents for specified keywords and returns a list of the documents where the keywords were found
- Boolean operators OR, AND & NOT operators are allowed in keyword searches.
- Search engines
  - *www.yahoo.com*
  - *www.google.com*
  - *www.lycos.com*
  - *www.altavista.com*
  - www.askjeeves.com


Google
places to eat christmas dinner in paris
Search
About 76,100 results (0.24 seconds)
Advanced search
Everything
More
Show search tools
#1
Paris restaurants open on Christmas Day
Paris restaurants open on Christmas Day. Is there any central place, ...
Montparnasse -- will have plenty of tourists looking for Christmas meals. ...
www.a-night-in-paris.com/...paris.../paris-restaurants-open-on-christmas-day.html - Cached - Similar
Christmas in Paris - Celebrating Christmas in Paris France
Christmas Day & Christmas Eve Dinners at Restaurants on Long Island · Best Paris Christmas Shopping Destinations - Best Places to Shop for Christ. ... Eating Out on Christmas Day - Where To Eat on Christmas · Courtney Traub Paris Travel ...
goparis.about.com/od/events/tp/Christmas_Paris.htm - Cached - Similar

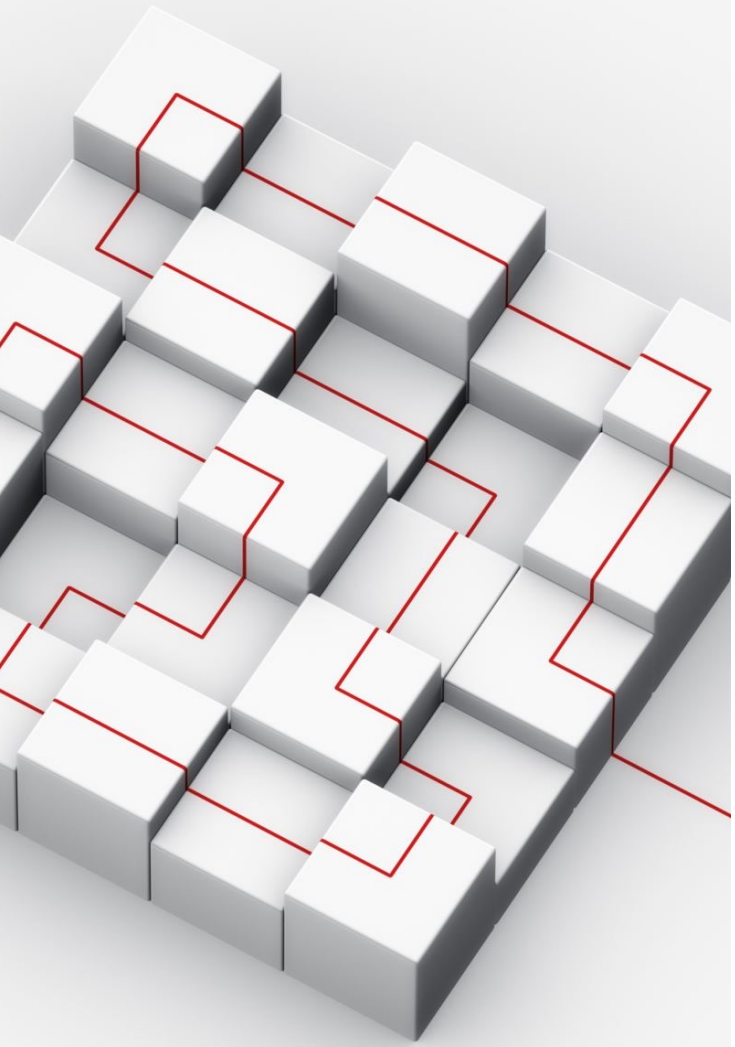
Query by Example

- **Query By Example (QBE)** refers to method of forming queries
- Database program displays a blank record with a space for each field.
- Eg:- for searching books through a catalogue



Query Language

- A specialized language consisting of a set of commands that directs the computer to **create databases**, **locate information**, **sort records** and **change the data in those records**.
- SQL pronounced as SEQUEL



Data Management Software

- **Data management software** create relational, hierarchical , object oriented, web enabled collection of data.
- Helps enter and manipulate data.
- Different types of data management software depends on
  - *the data model*
  - *flexibility you require to manipulate data*
  - *the resources allocated for data.*

Data Management Software (continued)

- Different types of data management software:
  - Custom software:
  - File management software
  - Database management software
  - Object oriented software
  - Web enabled database

Custom Software

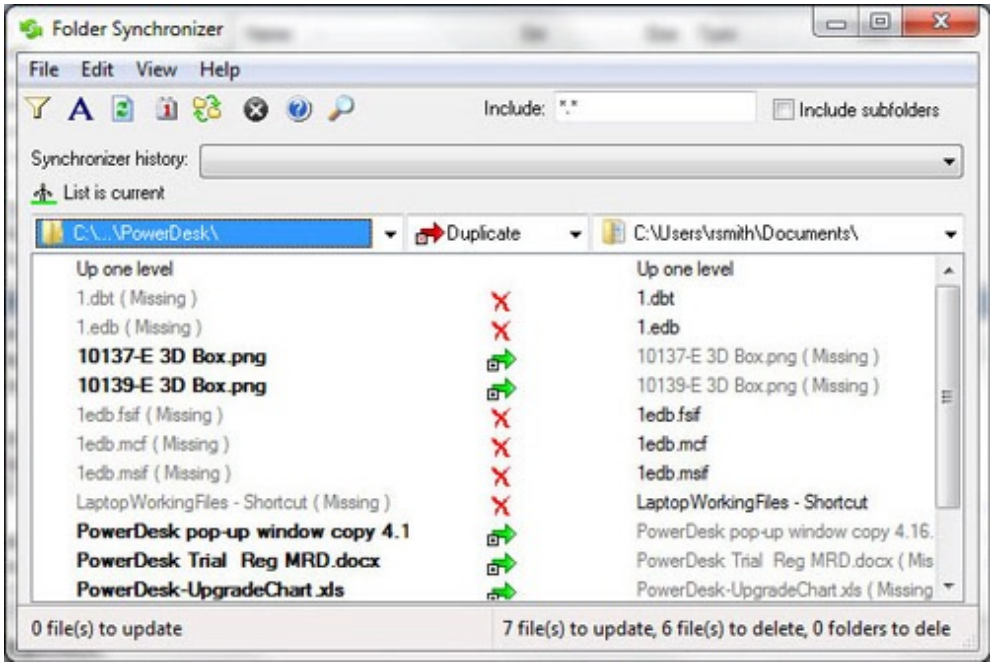
- Developed using programming languages.
- Data files are manipulated using

  custom programs.

- For exact needs of the organizations
- Created for manipulating all network, relational, object oriented, web enabled data files.

File Management Software

- Allows specify field names, lengths, data types for the data files created.
- Provides method to manage, organize, locate, sort and prints the manipulated data in a data file.
- Data independence

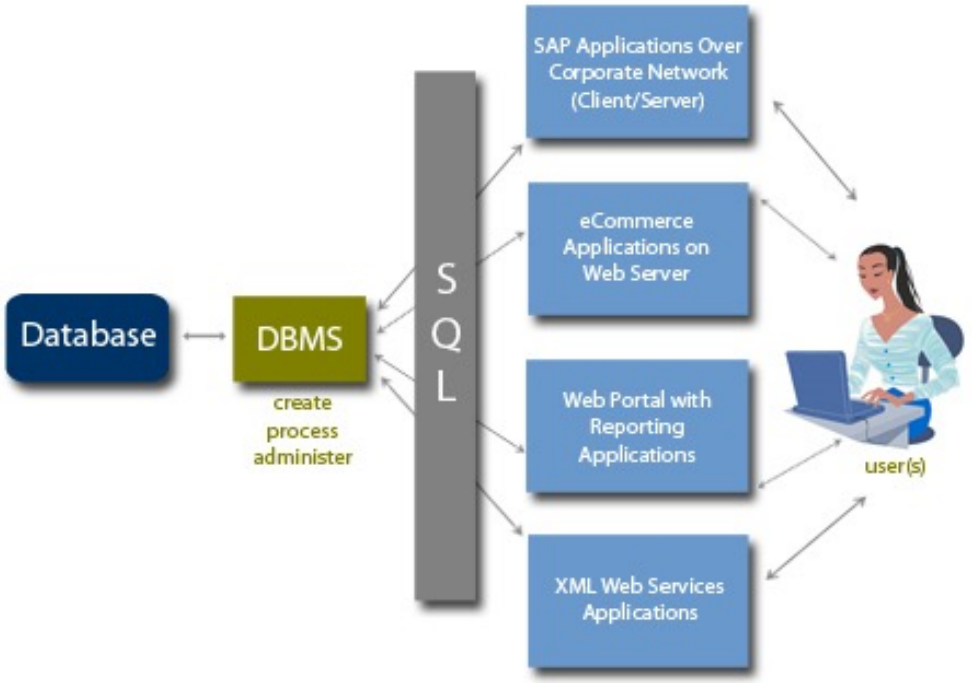


File Management Software (continued)

- **<u>Limitations:</u>**
  - Manipulate only one file at a time.
  - Manipulate only flat files.
  - Does not specify relationships between the data files.

Database Management Software

- Manipulates with more than one file at a time.
- Defines relationships between different record types.
- DBMS software is **loaded into server** which processes the requests for data from the DBMS software in **client machine**.



Object Oriented Tools

- To construct database it needs object oriented DBMS or object oriented language like **Small Talk.**
- Only the programs defining the object and classes are external to the DBMS.

Web-Enabled Database Tools

- Provides a way to access the database through internet by using a standard web browser.
- To interact with the web based database, pass requests from browser to the database and then send results back to browser.
- CGI programming provides this capability.

Web-Enabled Database Tools (continued)

- Programming languages: **Perl, C and Visual Basic.NET**
- **ASP**(Active Server Pages)**. NET**
- **Cold Fusion -** a web database development tool to interact with the HTML pages without programming.

End of Lecture 8