



CSE 204 - INTRO TO DATABASE SYSTEMS

INTRODUCTION

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QUOTE OF THE DAY

- Data is not information
- Information is not knowledge
- Knowledge is not understanding
- Understanding is not wisdom.
 - Clifford Stoll



OBJECTIVES

- Some common uses of database systems.
- Characteristics of file-based systems.
- Problems with file-based approach.
- Meaning of the term database.
- Meaning of the term Database Management System (DBMS).



OBJECTIVES

- Typical functions of a DBMS.
- Major components of the DBMS environment.
- Personnel involved in the DBMS environment.
- History of the development of DBMSs.
- Advantages and disadvantages of DBMSs.



EXAMPLES OF DATABASE APPLICATIONS

- Purchases from the supermarket
- Purchases using your credit card
- Booking a holiday at the travel agents
- Using the local library
- Taking out insurance
- Renting a video
- Using the Internet
- Studying at university



FILE-BASED SYSTEMS

- Collection of application programs that perform services for the end users (e.g. reports).
- Each program defines and manages its own data.



FILE-BASED PROCESSING

PropertyForRent

propertyNo	street	city	postcode	type	rooms	rent	ownerNo
PA14	16 Holhead Rd	Aberdeen	AB7 5SU	House	6	650	CO46
PL94	6 Argyll St	London	NW2	Flat	4	400	CO87
PG4	6 Lawrence St	Glasgow	G11 9QX	Flat	3	350	CO40
PG36	2 Manor Rd	Glasgow	G32 4QX	Flat	3	375	CO93
PG21	18 Dale Rd	Glasgow	G12	House	5	600	CO87
PG16	5 Novar Dr	Glasgow	G12 9AX	Flat	4	450	CO93

PrivateOwner

ownerNo	fName	lName	address	telNo
CO46	Joe	Keogh	2 Fergus Dr, Aberdeen AB2 7SX	01224-861212
CO87	Carol	Farrel	6 Achray St, Glasgow G32 9DX	0141-357-7419
CO40	Tina	Murphy	63 Well St, Glasgow G42	0141-943-1728
CO93	Tony	Shaw	12 Park Pl, Glasgow G4 0QR	0141-225-7025

Client

clientNo	fName	lName	address	telNo	prefType	maxRent
CR76	John	Kay	56 High St, London SW1 4EH	0207-774-5632	Flat	425
CR56	Aline	Stewart	64 Fern Dr, Glasgow G42 0BL	0141-848-1825	Flat	350
CR74	Mike	Ritchie	18 Tain St, PA1G 1YQ	01475-392178	House	750
CR62	Mary	Tregear	5 Tarbot Rd, Aberdeen AB9 3ST	01224-196720	Flat	600



FILE-BASED PROCESSING

Lease

leaseNo	propertyNo	clientNo	rent	payment Method	deposit	paid	rentStart	rentFinish	duration
10024	PA14	CR62	650	Visa	1300	Y	1-Jun-13	31-May-14	12
10075	PL94	CR76	400	Cash	800	N	1-Aug-13	31-Jan-14	6
10012	PG21	CR74	600	Cheque	1200	Y	1-Jul-13	30-Jun-14	12

PropertyForRent

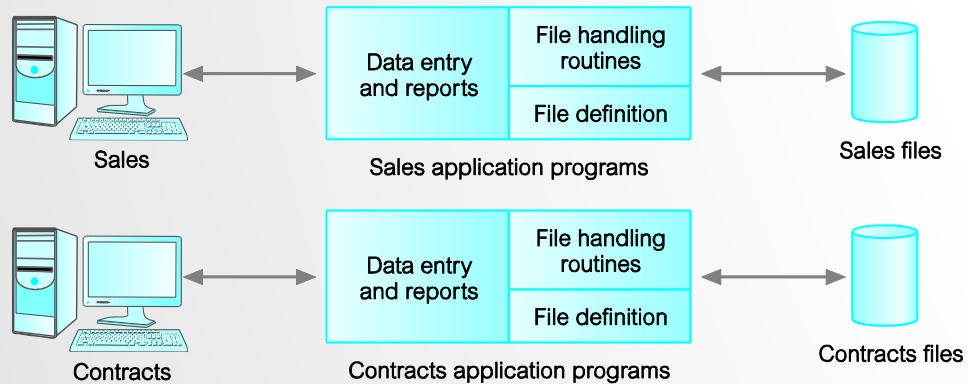
propertyNo	street	city	postcode	rent
PA14	16 Holhead	Aberdeen	AB7 5SU	650
PL94	6 Argyll St	London	NW2	400
PG21	18 Dale Rd	Glasgow	G12	600

Client

clientNo	fName	lName	address	telNo
CR76	John	Kay	56 High St, London SW1 4EH	0171-774-5632
CR74	Mike	Ritchie	18 Tain St, PA1G 1YQ	01475-392178
CR62	Mary	Tregear	5 Tarbot Rd, Aberdeen AB9 3ST	01224-196720



FILE-BASED PROCESSING



Sales Files

PropertyForRent (propertyNo, street, city, postcode, type, rooms, rent, ownerNo)

PrivateOwner (ownerNo, fName, lName, address, telNo)

Client (clientNo, fName, lName, address, telNo, prefType, maxRent)

Contracts Files

Lease (leaseNo, propertyNo, clientNo, rent, paymentMethod, deposit, paid, rentStart, rentFinish, duration)

PropertyForRent (propertyNo, street, city, postcode, rent)

Client (clientNo, fName, lName, address, telNo)

Sales Files

PropertyForRent (propertyNo, street, city, postcode, type, rooms, rent, ownerNo)

PrivateOwner (ownerNo, fName, lName, address, telNo)

Client (clientNo, fName, lName, address, telNo, prefType, maxRent)

Contracts Files

Lease (leaseNo, propertyNo, clientNo, rent, paymentMethod, deposit, paid, rentStart, rentFinish, duration)

PropertyForRent (propertyNo, street, city, postcode, rent)

Client (clientNo, fName, lName, address, telNo)

LIMITATIONS OF FILE-BASED APPROACH

- Separation and isolation of data
 - Each program maintains its own set of data.
 - Users of one program may be unaware of potentially useful data held by other programs.
- Duplication of data
 - Same data is held by different programs.
 - Wasted space and potentially different values and/or different formats for the same item.



LIMITATIONS OF FILE-BASED APPROACH

- Data dependence
 - File structure is defined in the program code.
- Incompatible file formats
 - Programs are written in different languages, and so cannot easily access each other's files.
- Fixed Queries/Proliferation of application programs
 - Programs are written to satisfy particular functions.
 - Any new requirement needs a new program.



DATABASE APPROACH

- Arose because:
 - Definition of data was embedded in application programs, rather than being stored separately and independently.
 - No control over access and manipulation of data beyond that imposed by application programs.
- Result:
 - the database and Database Management System (DBMS).



DATABASE

- Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides description of data to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

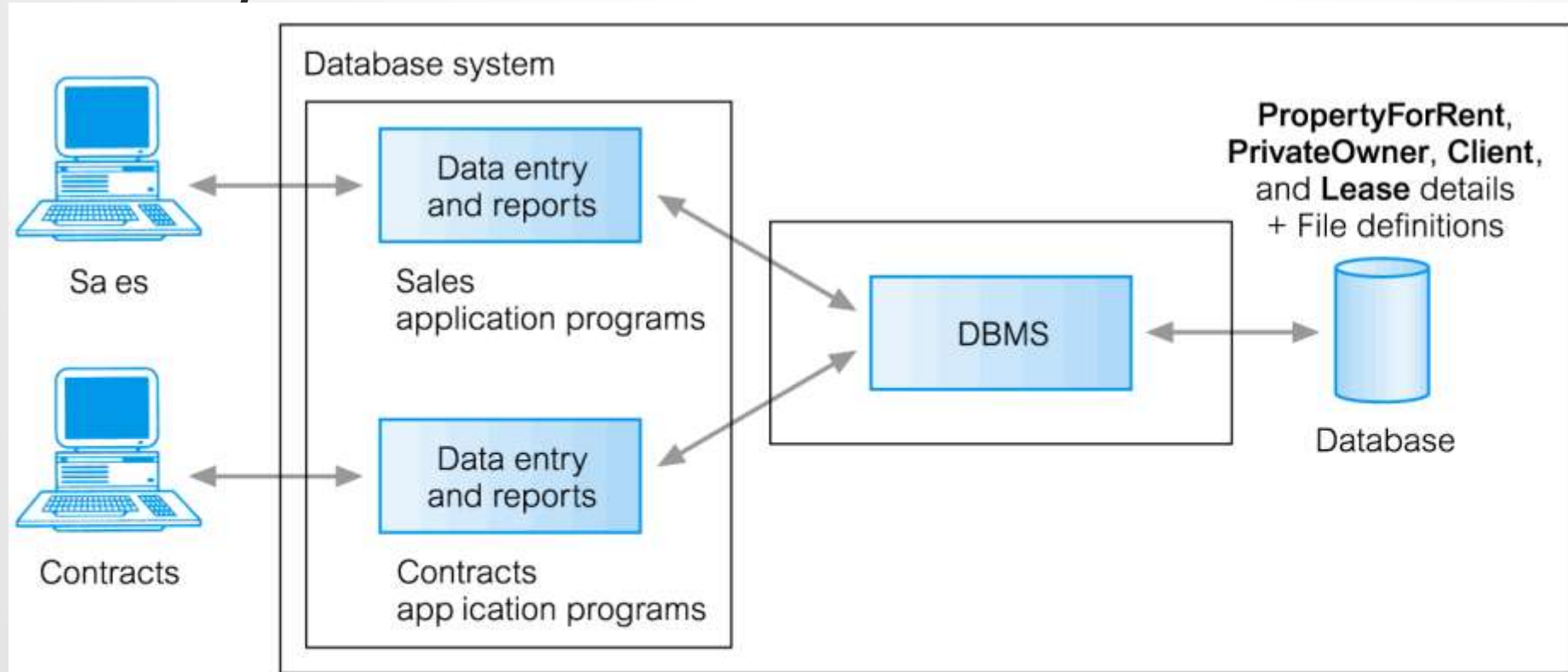


DATABASE MANAGEMENT SYSTEM (DBMS)

- A software system that enables users to define, create, maintain, and control access to the database.
- (Database) application program: a computer program that interacts with database by issuing an appropriate request (SQL statement) to the DBMS.



DATABASE MANAGEMENT SYSTEM (DBMS)



PropertyForRent (propertyNo, street, city, postcode, type, rooms, rent, ownerNo)

PrivateOwner (ownerNo, fName, lName, address, telNo)

Client (clientNo, fName, lName, address, telNo, prefType, maxRent)

Lease (leaseNo, propertyNo, clientNo, paymentMethod, deposit, paid, rentStart, rentFinish)

DATABASE APPROACH

- Data definition language (DDL).
 - Permits specification of data types, structures and any data constraints.
 - All specifications are stored in the database.
- Data manipulation language (DML).
 - General enquiry facility (query language) of the data.



DATABASE APPROACH

- Controlled access to database may include:
 - a security system
 - an integrity system
 - a concurrency control system
 - a recovery control system
 - a user-accessible catalog.



VIEWS

- Allows each user to have his or her own view of the database.
- A view is essentially some subset of the database.

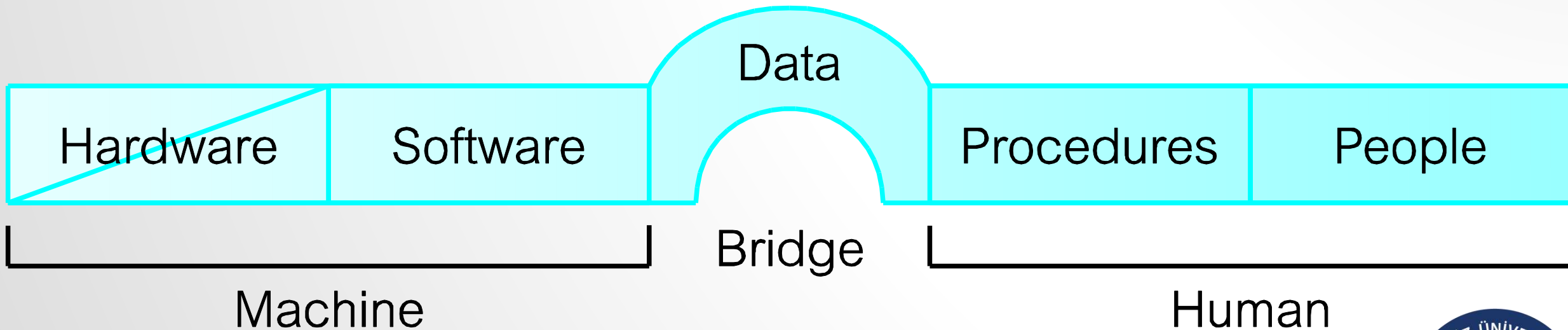


VIEWS - BENEFITS

- Reduce complexity
- Provide a level of security
- Provide a mechanism to customize the appearance of the database
- Present a consistent, unchanging picture of the structure of the database, even if the underlying database is changed



COMPONENTS OF DBMS ENVIRONMENT



COMPONENTS OF DBMS ENVIRONMENT

- Hardware
 - Can range from a PC to a network of computers.
- Software
 - DBMS, operating system, network software (if necessary) and also the application programs.
- Data
 - Used by the organization and a description of this data called the schema.
- Procedures
 - Instructions and rules that should be applied to the design and use of the database and DBMS.
- People



ROLES IN THE DATABASE ENVIRONMENT

- Data Administrator (DA)
- Database Administrator (DBA)
- Database Designers (Logical and Physical)
- Application Programmers
- End Users (naive and sophisticated)



HISTORY OF DATABASE SYSTEMS

- First-generation
 - Hierarchical and Network
- Second generation
 - Relational
- Third generation
 - Object-Relational
 - Object-Oriented



ADVANTAGES OF DBMSS

- Control of data redundancy
- Data consistency
- More information from the same amount of data
- Sharing of data
- Improved data integrity
- Improved security
- Enforcement of standards
- Economy of scale



ADVANTAGES OF DBMSS

- Balance conflicting requirements
- Improved data accessibility and responsiveness
- Increased productivity
- Improved maintenance through data independence
- Increased concurrency
- Improved backup and recovery services



DISADVANTAGES OF DBMSS

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure



ASSIGNMENT 1

- Using a language of your choice we will manipulate a file that holds information for courses. The file has the following format separated by commas
 - Course Department
 - Course Code (number)
 - Course Title
 - Course AKTS
- The operations you must implement are as follows:
 - Get a list of courses in the file (just department and code concatenated)
 - Add a new course (takes the parameters above in order)
 - Removes a course (only takes the department and course code as parameters)
 - Changes the AKTS for a course (takes department, course code, and new AKTS as parameters)
 - Changes the course code (takes department, current course code, and new course code as parameters)

