

DATABASE

INTRODUCTION

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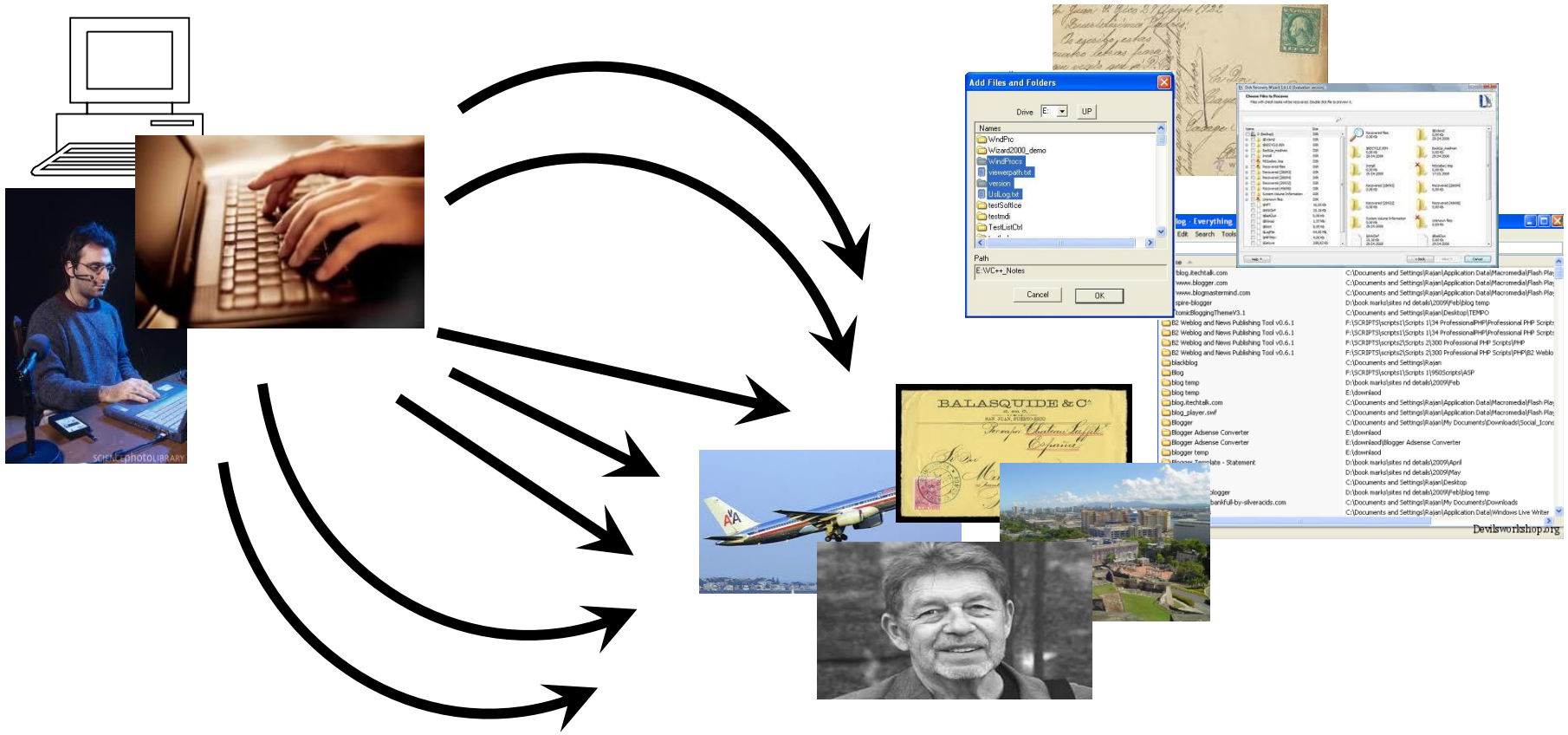
Outline

1. Basic concepts
2. Database Systems (Dbs)
3. Database components

1. Basic Concepts

Computer Systems

Applications which access to data
and process them



Stored data

Engineering Informatics

Software Engineering: Guarantee the functionality of applications



Databases: Way to store data ensuring persistent content and efficient access

Personal Use

Name: John
ID: 1234567 ←
Claim number: 32

C++

Python

Basic

Excel

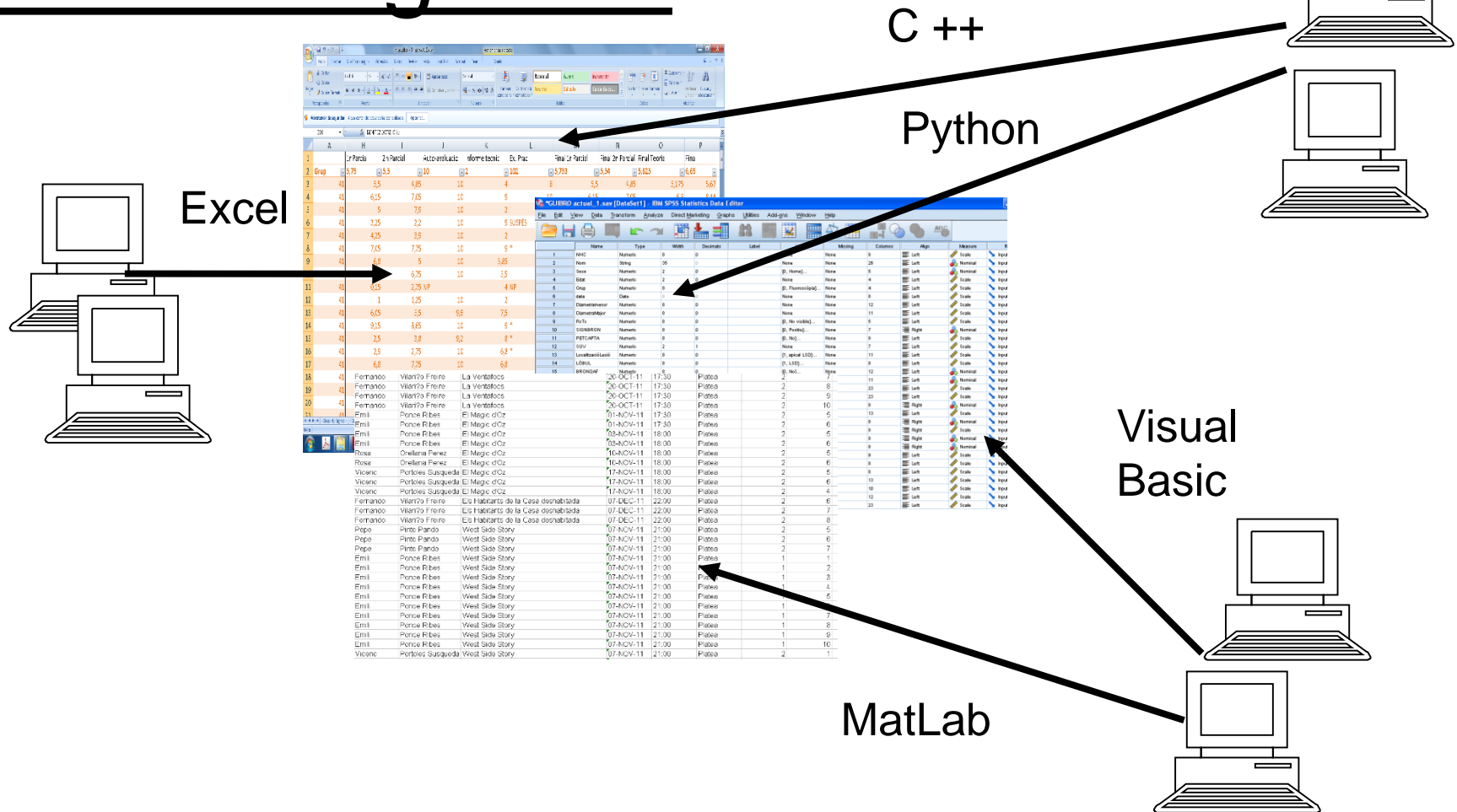
SPSS

MatLab

manual

Each user application has its own system with its particular format and access

Shared Big Data



There is a **centralized system** with standardized format and access for different applications

Access to large volumes of modifiable data

What would happen to a standard program using access by file if either one attribute is removed or the order/type of attributes are changed?

DNI	NOM	COGNOMS	ESPECTACLE	DATA	HORA	ZONA	FILA	NUMERO
11111111	Pepe	Pinto Pandc	Entre Tres	27/01/2012	18:00	Platea	1	3
11111111	Pepe	Pinto Pandc	Mar i Cel	02/03/2012	21:00	Platea	1	10
11111111	Pepe	Pinto Pandc	Entre Tres	23/02/2012	23:00	Platea	2	3
11111111	Pepe	Pinto Pandc	Entre Tres	23/02/2012	23:00	Platea	2	4
11111111	Pepe	Pinto Pandc	Entre Tres	01/03/2012	22:00	Platea	2	5
11111111	Pepe	Pinto Pandc	Entre Tres	01/03/2012	22:00	Platea	2	6
11111111	Pepe	Pinto Pandc	Entre Tres	17/03/2012	18:00	Platea	1	5
11111111	Pepe	Pinto Pandc	Entre Tres	17/03/2012	18:00	Platea	1	6
11111111	Pepe	Pinto Pandc	Els Pastorets	01/01/2012	18:00	Pis	1	5
22222222	José	Colorado G	Hamlet	06/04/2012	22:00	Platea	3	4
22222222	José	Colorado G	Hamlet	06/04/2012	22:00	Platea	3	5
22222222	José	Colorado G	Hamlet	06/04/2012	22:00	Platea	3	6
22222222	José	Colorado G	La extraña pareja	08/06/2012	22:00	Platea	1	5
33333333	Fernando	Vilariño Fre	Entre Tres	10/02/2012	18:00	Platea	1	5
33333333	Fernando	Vilariño Fre	Veus búlgares	29/09/2011	21:00	Platea	2	6
33333333	Fernando	Vilariño Fre	L'auca del senyor Esteve	23/02/2012	21:00	Platea	2	1
33333333	Fernando	Vilariño Fre	L'auca del senyor Esteve	23/02/2012	21:00	Platea	2	2
33333333	Fernando	Vilariño Fre	Els Pastorets	12/01/2012	18:00	Platea	1	6
33333333	Fernando	Vilariño Fre	Els Pastorets	12/01/2012	18:00	Platea	1	7
33333333	Fernando	Vilariño Fre	Els Pastorets	12/01/2012	18:00	Platea	1	8
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	1
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	2
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	3
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	4
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	5
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	6
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	7
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	8
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	9
33333333	Fernando	Vilariño Fre	La Ventafocs	20/10/2011	17:30	Platea	2	10

Shared files in centralized system with linked data

File: Tickets.txt

Fernando	Vilariño Freire	La Ventafocs	20-OCT-11	17:30	Platea	2	7
Fernando	Vilariño Freire	La Ventafocs	20-OCT-11	17:30	Platea	2	8
Fernando	Vilariño Freire	La Ventafocs	20-OCT-11	17:30	Platea	2	9
Fernando	Vilariño Freire	La Ventafocs	20-OCT-11	17:30	Platea	2	10
Emili	Ponce Ribes	El Magic d'Oz	01-NOV-11	17:30	Platea	2	5
Emili	Ponce Ribes	El Magic d'Oz	01-NOV-11	17:30	Platea	2	6
Emili	Ponce Ribes	El Magic d'Oz	03-NOV-11	18:00	Platea	2	5
Emili	Ponce Ribes	El Magic d'Oz	03-NOV-11	18:00	Platea	2	6
Rosa	Orellana Perez	El Magic d'Oz	10-NOV-11	18:00	Platea	2	5
Rosa	Orellana Perez	El Magic d'Oz	10-NOV-11	18:00	Platea	2	6
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	18:00	Platea	2	5
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	18:00	Platea	2	6
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	18:00	Platea	2	4
Fernando	Vilariño Freire	Els Habitants de la Casa deshabitada	07-DEC-11	22:00	Platea	2	6
Fernando	Vilariño Freire	Els Habitants de la Casa deshabitada	07-DEC-11	22:00	Platea	2	7
Fernando	Vilariño Freire	Els Habitants de la Casa deshabitada	07-DEC-11	22:00	Platea	2	8
Pepe	Pinto Pando	West Side Story	07-NOV-11	21:00	Platea	2	5
Pepe	Pinto Pando	West Side Story	07-NOV-11	21:00	Platea	2	6
Pepe	Pinto Pando	West Side Story	07-NOV-11	21:00	Platea	2	7

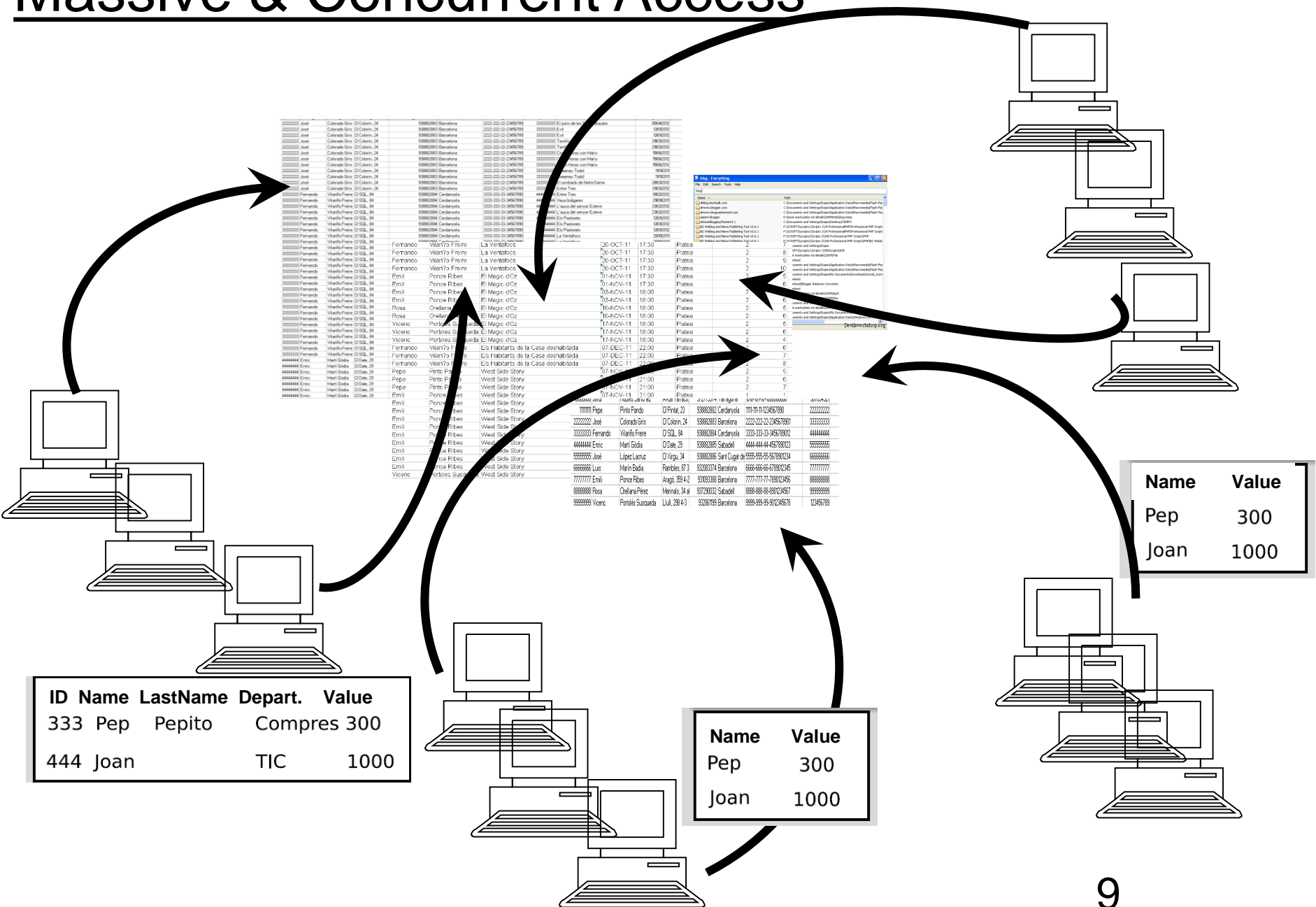
File: Clients.txt



11111111	Pepe	Pinto Pando	C/ Pintat, 23	938882882	Cerdanyola	1111-111-11-1234567890	222222222
22222222	José	Colorado Gris	C/ Colorin, 24	938882883	Barcelona	2222-222-22-2345678901	333333333
33333333	Fernando	Vilariño Freire	C/ SQL, 84	938882884	Cerdanyola	3333-333-33-3456789012	444444444
44444444	Enric	Martí Gòdia	C/ Date, 29	938882885	Sabadell	4444-444-44-4567890123	555555555
55555555	José	López Lacruz	C/ Xirgu, 34	938882886	Sant Cugat de	5555-555-55-5678901234	666666666
66666666	Luis	Marín Badia	Rambles, 87 3	932083374	Barcelona	6666-666-66-6789012345	777777777
77777777	Emili	Ponce Ribes	Aragó, 359 4-2	931093388	Barcelona	7777-777-77-7890123456	888888888
88888888	Rosa	Orellana Pérez	Merinals, 34 al	937290032	Sabadell	8888-888-88-8901234567	999999999
99999999	Vicenc	Portolés Susqueda	Llull, 298 4-3	932061199	Barcelona	9999-999-99-9012345678	123456789

It is necessary to guarantee a correct propagation of changes
(consistency of the information)

Massive & Concurrent Access



Database systems

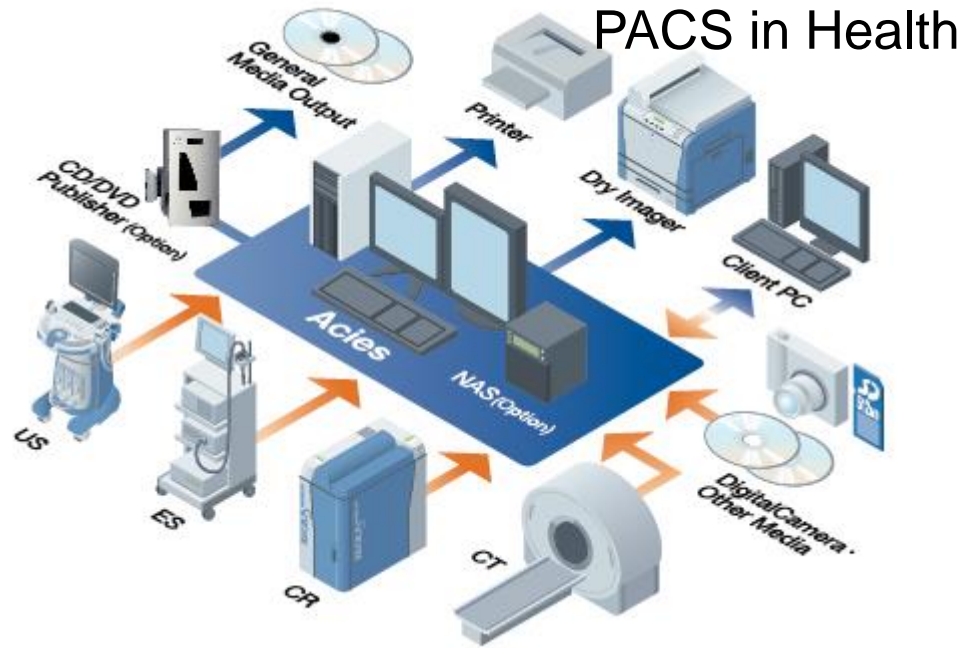
- ✓ Gives efficient access to large data volumes (access time, computer resources)
- ✓ Allow different requirements (format, sorting) of user data (multiuser centralized system)
- ✓ Stores data with modifiable structure

2. Database systems (DBS)

Definition: Computer storage systems for the manipulation of related data volumes in centralized system (multiuser).

- Insert new data into existing files
 - View data content
 - Update data (delete, insert)
 - Delete and add files
-
- They allow to guarantee the coherence of the content.
 - They describe objects from the real world at different abstraction levels.

Examples



Banking and accounting systems

ESCI Academic
Administration



Apps



Paradigms of the DBSs

Relational

Data homogeneity:

Logical structure which always keeps the same type of information (varying on number and type)

Data integrity:

Always guarantee ACID properties (Atomicity, Consistency, Isolation, Durability)

PostgreSQL



ORACLE

Non-Relational

Data heterogeneity:

Flexible logical structure that allows to keep the same type of information (varying on number and type)

Data integrity:

Always guarantee ACID properties (Atomicity, Consistency, Isolation, Durability)



DBSs Requirements

In order to guarantee a proper operation of all applications using data stored in a DB, the system must:

- Guarantee the **data integrity**
- Be **efficient**
- Grant **independency** between program code and data format

Integrity

- Content **consistency** and **coherence** of information stored in the DB.
- Avoid **redundancy** which are incorrect or duplicated values in the requested information.
- DBS must guarantee the data **integrity when content is modified** (insert, update and changes propagation).

Integrity. Incoherence

Definition: impossible value of the requested information

Avoid incorrect values in the requested information

Name: Pepe

DNI: -22.89792317

ClaimNumber: 33

Value: 0 €

Age: 5000

Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	1
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	1
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	1
Fernando	Vilari?o Freire	Els Habitants de la Casa deshabitada	07-DEC-11	2
Fernando	Vilari?o Freire	Els Habitants de la Casa deshabitada	07-DEC-11	2
Fernando	Vilari?o Freire	Els Habitants de la Casa deshabitada	07-DEC-11	2

??

44444444	Enric	Martí Gòdia	C/ Date, 29	938882885
55555555	José	López Lacruz	C/ Xingu, 34	938882886
66666666	Luis	Marín Badia	Rambles, 87 3	932083374
77777777	Emili	Ponce Ribes	Aragó, 359 4-2	931093388
88888888	Rosa	Orellana Pérez	Merinals, 34 al	937290032

Integrity. Inconsistency

Definition: same query gives different results depending on its implementation.

Two sources of information (files, field's files) which are equivalent (same semantical content) have different values

Name: Pepe
DNI: 3333333A
ClaimNumber: 33
Antiquity: 10
Amount: 100000

Name: Pepe
DNI: 3333333A
ClaimNumber: 33
Antiquity: 40
Amount: 100000

Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Vicenc	Portoles Susqueda	West Side Story	07-NOV-11

!!!!!!

22222222	José	Colorado Gris	C/ Colorin, 24	938882
33333333	Fernando	Vilarifio Freire	C/ SQL, 84	938882
44444444	Enric	Martí Gòdia	C/ Date, 29	938882
55555555	José	López Lacruz	C/ Xirgu, 34	938882
66666666	Luís	Marcús Radia	Rambles, 87 3	932083
77777777	Emilia	Ponce Ribes	Aragó, 359 4-2	931093
88888888	Rosa	Trallans Pérez	Marineta, 34 al	937796

Integrity. Redundancy

Repeated information has the following problems:

- Unnecessary disk usage
- Duplication on updates
- Risk of inconsistencies

Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Emili	Ponce Ribes	West Side Story	07-NOV-11
Vicente	Portoles Susqueda	West Side Story	07-NOV-11

44444444	Enric	Martí Gòdia	C/ Date, 29	938882
55555555	José	López Lacruz	C/ Xirgu, 34	938882
66666666	Luis	Marín Padia	Rambles, 87 3	932083
77777777	Emilia	Ponce Ribes	Aragó, 359 4-2	931093
88888888	Rosa	Irallana Pérez	Merinals 34 al	937296

DBS must guarantee minimum redundancy and update on information to all files if one is changed (change propagation)

Integrity. Examples

- Marks in negative → Incoherence
- More than two practical marks for the same student → Inconsistency

	A	B	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Grup	NIA	1r Parcial	2n Parcial	Auto-avaluació	Informe tècnic	Ex. Prac	Final 1r Parcial	Final 2n Parcial	Final Teoria	Condicions	NP	Promig brut	Final Expedient	Aprovats
2	41	1423875	4,75	3,25	10,00	5,80	5,00	4,75	7,75	6,25	1,00	1,00	6,16	6,2	1,00
3	41	1423991	7,65	6,35	10,00	5,50	10,00	7,65	6,35	7,00	1,00	1,00	7,90	7,9	1,00
4	41	1424840	1,75	0,00	7,14	3,30	4,00	1,75	0,00	*	SUSPÈS	1,00	2,92	2,9	0,00
5	41	1325938	6,40	5,65	10,00	9,10	6,00	6,40	5,65	6,03	1,00	1,00	7,03	7,0	1,00
6	41	1457898	5,25	4,50	0,00	2,50	5,00	5,25	6,90	6,08	1,00	1,00	4,43	4,4	0,00
7	41	1428718	3,00	NP	5,00	0,00	0,00	4,70	2,50	*	SUSPÈS	1,00	1,94	1,9	0,00
8	41	1423177	7,50	8,65	10,00	8,50	10,00	7,50	8,65	8,08	1,00	1,00	8,93	8,9	1,00
9	41	1423722	8,50	8,50	10,00	5,80	7,00	8,50	8,50	8,50	1,00	1,00	7,66	7,7	1,00
10	41	1359074	1,15	4,00	9,05	4,00	5,00	5,30	4,00	4,65	SUSPÈS	1,00	5,06	4,5	0,00
11	41	1397752	3,25	2,50	10,00	3,30	4,00	3,25	2,50	*	SUSPÈS	1,00	4,01	4,0	0,00
12	41	1423762	6,55	7,25	10,00	5,80	10,00	6,55	7,25	6,90	1,00	1,00	7,92	7,9	1,00
13	41	1424454	3,25	NP	0,00	5,30	10,00	5,85	4,10	5,00	1,00	1,00	6,05	6,1	1,00
14	41	1424822	7,50	6,40	8,57	8,50	7,00	7,50	6,40	6,95	1,00	1,00	7,44	7,4	1,00
15	41	1425085	4,85	7,65	10,00	5,80	8,00	7,25	7,65	7,45	1,00	1,00	7,54	7,5	1,00
16	41	1423802	8,00	8,90	10,00	5,80	10,00	8,00	8,90	8,45	1,00	1,00	8,54	8,5	1,00
17	41	1423574	NP	NP	3,10	0,00	8,00	5,25	6,25	5,75	1,00	1,00	5,01	5,0	1,00
18	41	1391463	8,75	9,75	10,00	4,80	10,00	8,75	9,75	9,25	1,00	1,00	8,66	8,7	1,00
19	41	1423957	7,50	6,20	9,05	6,50	6,00	7,50	6,20	6,85	1,00	1,00	6,74	6,7	1,00
20	41	1425096	2,25	NP	10,00	5,70	10,00	5,20	6,50	5,85	1,00	1,00	7,48	7,5	1,00
21	41	1424801	7,50	9,50	10,00	8,50	5,50	7,50	9,50	8,50	1,00	1,00	7,75	7,8	1,00
22	41	1362742	3,75	3,50	10,00	5,70	9,00	6,05	6,55	6,30	1,00	1,00	7,36	7,4	1,00
23	41	1395060	6,50	6,50	10,00	5,50	7,00	6,50	6,50	6,50	1,00	1,00	6,80	6,8	1,00
24	41	1425111	6,25	6,60	10,00	3,30	9,00	6,25	6,60	6,43	1,00	1,00	6,93	6,9	1,00
25	41	1424348	3,25	NP	10,00	5,70	7,00	6,25	5,75	6,00	1,00	1,00	6,64	6,6	1,00
26	41	1325626	8,40	6,65	10,00	8,50	10,00	8,40	6,65	7,53	1,00	1,00	8,71	8,7	1,00
27	41	1424116	8,15	8,10	10,00	4,20	7,00	8,15	8,10	8,13	1,00	1,00	7,19	7,2	1,00
28	41	1391319	5,75	5,00	10,00	5,50	8,00	5,75	5,00	5,38	1,00	1,00	6,65	6,7	1,00
29	41	1412688	4,00	4,25	9,29	0,00	6,00	4,85	4,25	4,55	SUSPÈS	1,00	4,55	4,5	0,00
30	41	1391967	NP	NP	9,52	3,70	5,00	6,30	2,25	*	SUSPÈS	1,00	4,90	4,5	0,00
31	41	1335425	2,00	3,00	8,33	0,00	9,00	3,50	5,75	*	SUSPÈS	1,00	5,38	4,5	0,00
32	41	1330701	4,05	5,00	2,38	6,00	6,00	4,05	7,16	5,61	1,00	1,00	5,48	5,5	1,00
33	41	1391630	6,75	6,50	2,14	5,70	5,00	6,75	6,50	6,63	1,00	1,00	5,50	5,5	1,00
34	41	1390533	2,50	2,65	5,48	5,70	5,00	3,00	3,75	*	SUSPÈS	1,00	4,54	4,5	0,00
35	41	1424269	9,00	9,75	10,00	8,50	10,00	9,00	9,75	9,38	1,00	1,00	9,45	9,5	1,00
36	41	1391873	6,25	4,60	10,00	5,80	8,00	6,25	4,60	5,43	1,00	1,00	6,73	6,7	1,00
37	41	1424310	4,75	4,85	10,00	3,30	7,00	4,75	9,15	6,95	1,00	1,00	6,54	6,5	1,00
38	41	1390042	4,75	4,50	10,00	5,70	9,00	4,75	5,15	5,00	1,00	1,00	6,82	6,8	1,00
39	41	1391015	5,75	6,90	10,00	3,90	7,00	5,75	6,90	6,33	1,00	1,00	6,41	6,4	1,00
40	41	1423737	5,75	5,75	10,00	4,80	8,00	5,75	5,75	5,75	1,00	1,00	6,66	6,7	1,00

Integrity. Examples

Repeated information → Redundancy

Solution: visitor name and surname could be represented as DNI

Fernando	Vilariño Freire	La Ventafoes	20-OCT-11	17:30	Platea	2	7
Fernando	Vilariño Freire	La Ventafoes	20-OCT-11	17:30	Platea	2	8
Fernando	Vilariño Freire	La Ventafoes	20-OCT-11	17:30	Platea	2	9
Fernando	Vilariño Freire	La Ventafoes	20-OCT-11	17:30	Platea	2	10
Emili	Ponce Ribes	El Magic d'Oz	01-NOV-11	17:30	Platea	2	5
Emili	Ponce Ribes	El Magic d'Oz	01-NOV-11	17:30	Platea	2	6
Emili	Ponce Ribes	El Magic d'Oz	03-NOV-11	18:00	Platea	2	5
Emili	Ponce Ribes	El Magic d'Oz	03-NOV-11	18:00	Platea	2	6
Rosa	Orellana Perez	El Magic d'Oz	10-NOV-11	18:00	Platea	2	5
Rosa	Orellana Perez	El Magic d'Oz	10-NOV-11	18:00	Platea	2	6
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	18:00	Platea	2	5
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	18:00	Platea	2	6
Vicenc	Portoles Susqueda	El Magic d'Oz	17-NOV-11	18:00	Platea	2	4
Fernando	Vilariño Freire	Els Habitants de la Casa deshabitada	07-DEC-11	22:00	Platea	2	6
Fernando	Vilariño Freire	Els Habitants de la Casa deshabitada	07-DEC-11	22:00	Platea	2	7
Fernando	Vilariño Freire	Els Habitants de la Casa deshabitada	07-DEC-11	22:00	Platea	2	8
Pepe	Pinto Pando	West Side Story	07-NOV-11	21:00	Platea	2	5
Pepe	Pinto Pando	West Side Story	07-NOV-11	21:00	Platea	2	6
Pepe	Pinto Pando	West Side Story	07-NOV-11	21:00	Platea	2	7
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	1
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	2
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	3
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	4
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	5
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	6
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	7
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	8
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	9
Emili	Ponce Ribes	West Side Story	07-NOV-11	21:00	Platea	1	10
Vicenc	Portoles Susqueda	West Side Story	07-NOV-11	21:00	Platea	2	1

Integrity. Examples

The DBS must guarantee the data integrity when the content is modified:

- Inserts and updates must be adjusted to the defined domain (Coherence)
- Propagation of updates and changes (Consistency)

Final Marks

	A	B	E	F	G	H	I	J	K
	Grup	NIA	1r Parcial	2n Parcial	Auto-avaluació	Informe tecnic	Ex. Prac	Final 1r Parcial	Final 2n Parcial
1	41	1423875	4,75	3,25	10,00	5,80	5,00	4,75	7,75
2	41	1423991	7,65	6,35	10,00	5,50	10,00	7,65	6,35
3	41	1424840	1,75	0,00	7,14	3,30	4,00	1,75	0,00
4	41	1325938	6,40	5,65	10,00	9,10	6,00	6,40	5,65
5	41	1457898	5,25	4,50	0,00	2,50	5,00	5,25	6,90
7	41	1428718	3,00	NP	5,00	0,00	0,00	4,70	2,50
8	41	1423177	7,50	8,65	10,00	8,50	10,00	7,50	8,65
9	41	1423722	8,50	8,50	10,00	5,80	7,00	8,50	8,50
10	41	1359074	1,15	4,00	9,05	4,00	5,00	5,30	4,00
11	41	1397752	3,25	2,50	10,00	3,30	4,00	3,25	2,50
12	41	1423762	6,55	7,25	10,00	5,80	10,00	6,55	7,25
13	41	1424454	3,25	NP	0,00	5,30	10,00	5,85	4,10
14	41	1424822	7,50	6,40	8,57	8,50	7,00	7,50	6,40
15	41	1425085	4,85	7,65	10,00	5,80	8,00	7,25	7,65
16	41	1423802	8,00	8,90	10,00	5,80	10,00	8,00	8,90
17	41	1423574	NP	NP	3,10	0,00	8,00	5,25	6,25
18	41	1391463	8,75	9,75	10,00	4,80	10,00	8,75	9,75
19	41	1423957	7,50	6,20	9,05	6,50	6,00	7,50	6,20
20	41	1425096	2,25	NP	10,00	5,70	10,00	5,20	6,50
21	41	1424801	7,50	9,50	10,00	8,50	5,50	7,50	9,50

1st Partial

NIA	1erParcial
1423875	4,75
1423991	7,65
1424840	1,75
1325938	6,4
1457898	5,25
1428718	3
1423177	7,5
1423722	8,5
1359074	1,15

2on Partial

NIA	2on Parcial
1423875	3,25
1423991	6,35
1424840	0,00
1325938	5,65
1457898	4,50
1428718	NP
1423177	8,65
1423722	8,50

Efficiency

DBS should minimize the maximum time for a query (given for access to all records) based on contents and functional needs of the DB:

- Storage Structures. Restructuring the disk information distribution (minimize access to disk)
- Compression Techniques. DBS compress the information to be stored into disk (minimize content)
- Characteristics of the devices where the data is stored.
- Concurrency Control of accesses of several users (priorities)

Independence. Modifiable structure

What would happens if: Add or remove fields?
Change the type of fields?

	A	B	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Grup	NIA	1r Parcial	2n Parcial	Auto-avaluació	Informe tècnic	Ex. Prac	Final 1r Parcial	Final 2n Parcial	Final Teoria	Condicions	NP	Promig brut	Final Expedient	Aprovats
2	41	1423875	4,75	3,25	10,00	5,80	5,00	4,75	7,75	6,25	1,00	1,00	6,16	6,2	1,00
3	41	1423991	7,65	6,35	10,00	5,50	10,00	7,65	6,35	7,00	1,00	1,00	7,90	7,9	1,00
4	41	1424840	1,75	0,00	7,14	3,30	4,00	1,75	0,00	*	SUSPÈS	1,00	2,92	2,9	0,00
5	41	1325938	6,40	5,65	10,00	9,10	6,00	6,40	5,65	6,03	1,00	1,00	7,03	7,0	1,00
6	41	1457898	5,25	4,50	0,00	2,50	5,00	5,25	6,90	6,08	1,00	1,00	4,43	4,4	0,00
7	41	1428718	3,00	NP	5,00	0,00	0,00	4,70	2,50	*	SUSPÈS	1,00	1,94	1,9	0,00
8	41	1423177	7,50	8,65	10,00	8,50	10,00	7,50	8,65	8,08	1,00	1,00	8,93	8,9	1,00
9	41	1423722	8,50	8,50	10,00	5,80	7,00	8,50	8,50	8,50	1,00	1,00	7,66	7,7	1,00
10	41	1359074	1,15	4,00	9,05	4,00	5,00	5,30	4,00	4,65	SUSPÈS	1,00	5,06	4,5	0,00
11	41	1397752	3,25	2,50	10,00	3,30	4,00	3,25	2,50	*	SUSPÈS	1,00	4,01	4,0	0,00
12	41	1423762	6,55	7,25	10,00	5,80	10,00	6,55	7,25	6,90	1,00	1,00	7,92	7,9	1,00
13	41	1424454	3,25	NP	0,00	5,30	10,00	5,85	4,10	5,00	1,00	1,00	6,05	6,1	1,00
14	41	1424822	7,50	6,40	8,57	8,50	7,00	7,50	6,40	6,95	1,00	1,00	7,44	7,4	1,00
15	41	1425085	4,85	7,65	10,00	5,80	8,00	7,25	7,65	7,45	1,00	1,00	7,54	7,5	1,00
16	41	1423802	8,00	8,90	10,00	5,80	10,00	8,00	8,90	8,45	1,00	1,00	8,54	8,5	1,00
17	41	1423574	NP	NP	3,10	0,00	8,00	5,25	6,25	5,75	1,00	1,00	5,01	5,0	1,00
18	41	1391463	8,75	9,75	10,00	4,80	10,00	8,75	9,75	9,25	1,00	1,00	8,66	8,7	1,00
19	41	1423957	7,50	6,20	9,05	6,50	6,00	7,50	6,20	6,85	1,00	1,00	6,74	6,7	1,00
20	41	1425096	2,25	NP	10,00	5,70	10,00	5,20	6,50	5,85	1,00	1,00	7,48	7,5	1,00
21	41	1424801	7,50	9,50	10,00	8,50	5,50	7,50	9,50	8,50	1,00	1,00	7,75	7,8	1,00
22	41	1362742	3,75	3,50	10,00	5,70	9,00	6,05	6,55	6,30	1,00	1,00	7,36	7,4	1,00
23	41	1395060	6,50	6,50	10,00	5,50	7,00	6,50	6,50	6,50	1,00	1,00	6,80	6,8	1,00
24	41	1425111	6,25	6,60	10,00	3,30	9,00	6,25	6,60	6,43	1,00	1,00	6,93	6,9	1,00
25	41	1424348	3,25	NP	10,00	5,70	7,00	6,25	5,75	6,00	1,00	1,00	6,64	6,6	1,00
26	41	1325626	8,40	6,65	10,00	8,50	10,00	8,40	6,65	7,53	1,00	1,00	8,71	8,7	1,00
27	41	1424116	8,15	8,10	10,00	4,20	7,00	8,15	8,10	8,13	1,00	1,00	7,19	7,2	1,00
28	41	1391319	5,75	5,00	10,00	5,50	8,00	5,75	5,00	5,38	1,00	1,00	6,65	6,7	1,00
29	41	1412688	4,00	4,25	9,29	0,00	6,00	4,85	4,25	4,55	SUSPÈS	1,00	4,55	4,5	0,00
30	41	1391967	NP	NP	9,52	3,70	5,00	6,30	2,25	*	SUSPÈS	1,00	4,90	4,5	0,00
31	41	1335425	2,00	3,00	8,33	0,00	9,00	3,50	5,75	*	SUSPÈS	1,00	5,38	4,5	0,00
32	41	1330701	4,05	5,00	2,38	6,00	6,00	4,05	7,16	5,61	1,00	1,00	5,48	5,5	1,00
33	41	1391630	6,75	6,50	2,14	5,70	5,00	6,75	6,50	6,63	1,00	1,00	5,50	5,5	1,00
34	41	1390533	2,50	2,65	5,48	5,70	5,00	3,00	3,75	*	SUSPÈS	1,00	4,54	4,5	0,00
35	41	1424269	9,00	9,75	10,00	8,50	10,00	9,00	9,75	9,38	1,00	1,00	9,45	9,5	1,00
36	41	1391873	6,25	4,60	10,00	5,80	8,00	6,25	4,60	5,43	1,00	1,00	6,73	6,7	1,00
37	41	1424310	4,75	4,85	10,00	3,30	7,00	4,75	9,15	6,95	1,00	1,00	6,54	6,5	1,00
38	41	1390042	4,75	4,50	10,00	5,70	9,00	4,75	5,15	5,00	1,00	1,00	6,82	6,8	1,00
39	41	1391015	5,75	6,90	10,00	3,90	7,00	5,75	6,90	6,33	1,00	1,00	6,41	6,4	1,00
40	41	1423737	5,75	5,75	10,00	4,80	8,00	5,75	5,75	5,75	1,00	1,00	6,66	6,7	1,00

◀ ▶ ...

Notes

1r Parcial

2n Parcial

Examen Pràctiques

Examen Pràctiques (RECU)

Auto-Avaluació

Informe Tècnic

Voluntaris

Grafiques

⊕

Independence. Access by content

-Independence between physical and logical.

-Table: Object (logical) from which you access to the data (physical)

Name	NIA	ClaimNum	Paid
Pepe	3333333	33	600
Joan	3333336	34	0

marks1.dat

Name: Pepe
DNI: 3333333
ClaimNumber: 33
Paid: 600

marks2.dat

Name: Joan
DNI: 3333336
ClaimNumber: 34
Paid: 0

Rows: Tuples or records("individuals",
"objects")

Columns: Attributes or fields ("properties")

Logical

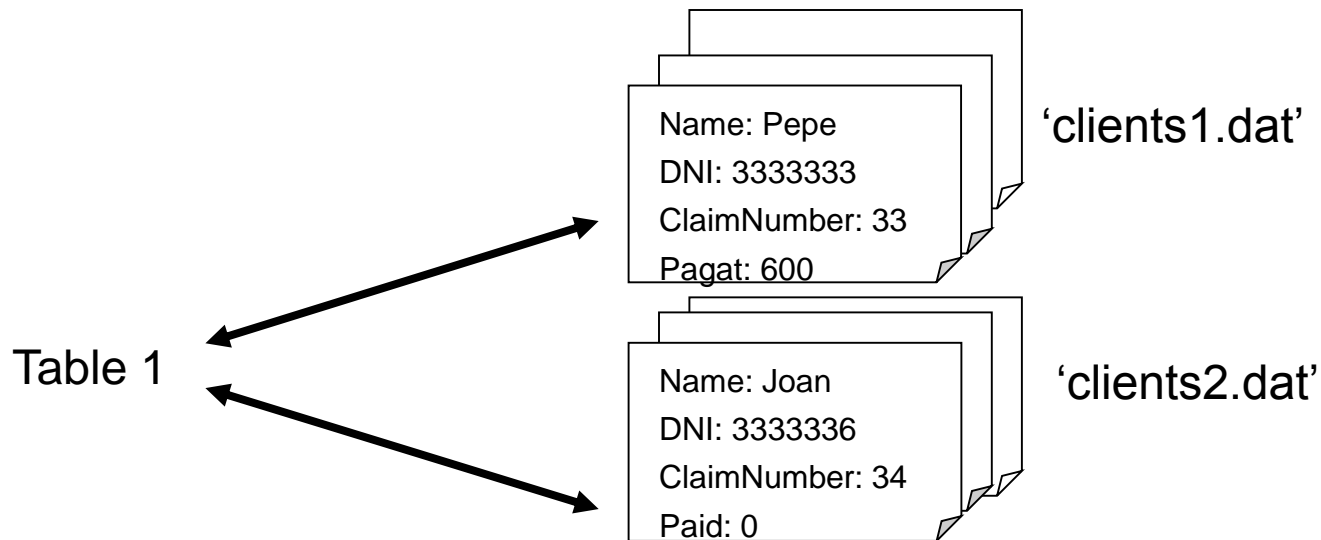
Physical

Independence. Access by content

DBS must ensure that changes in the storage structure and data access **do not affect** the applications that use them

Main requirement of a DBS

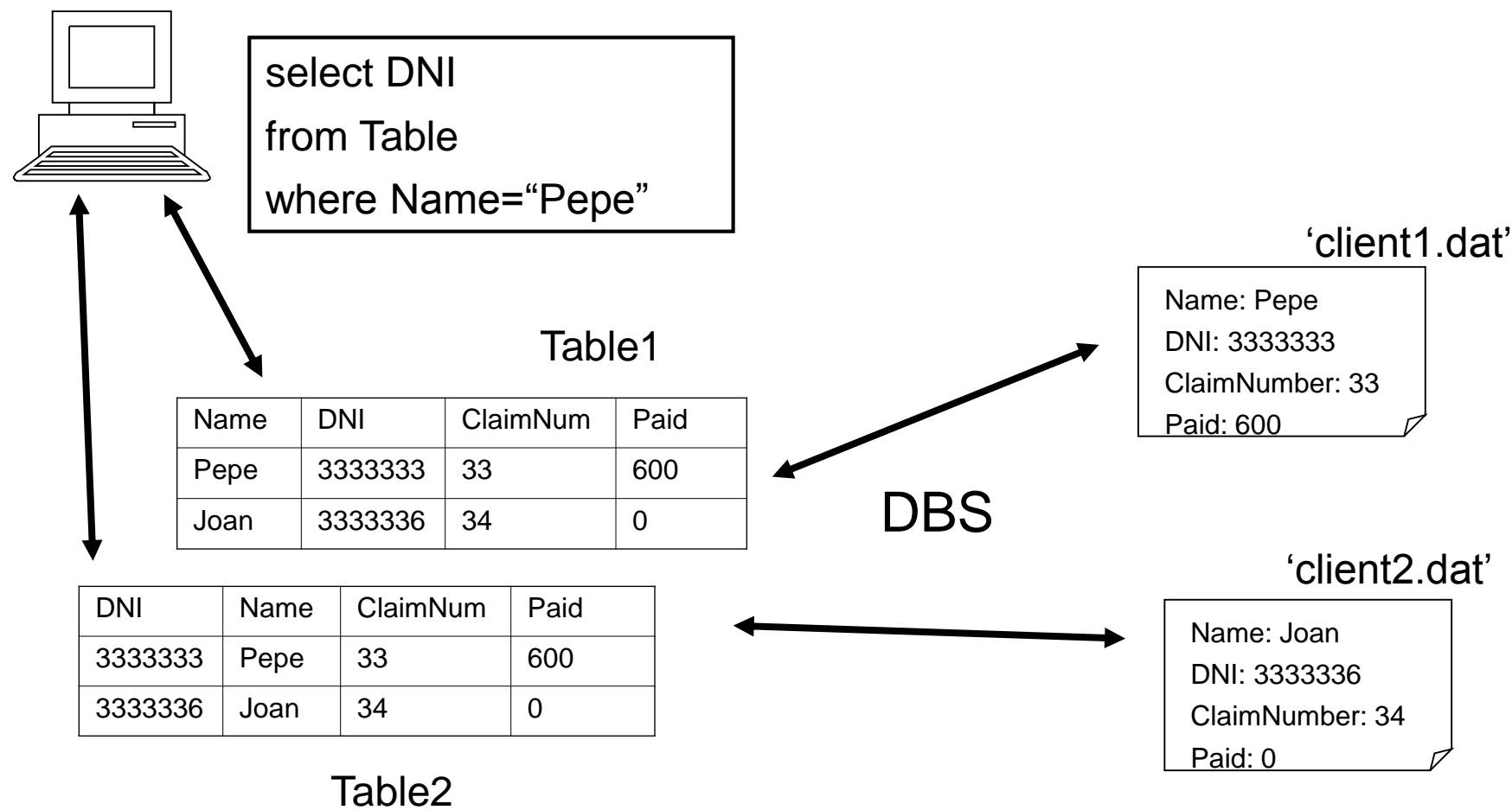
DBS guarantees simultaneous access to more than 1 physical file with the same logical file (identifier)



A unique identifier (Table)

Distribution of information in more than one physical file 22

Independence. Access by content



Logical access is by content and the DBS is responsible for searching the information at its corresponding physical address.

3.Components of a Database System

Components of a DBS

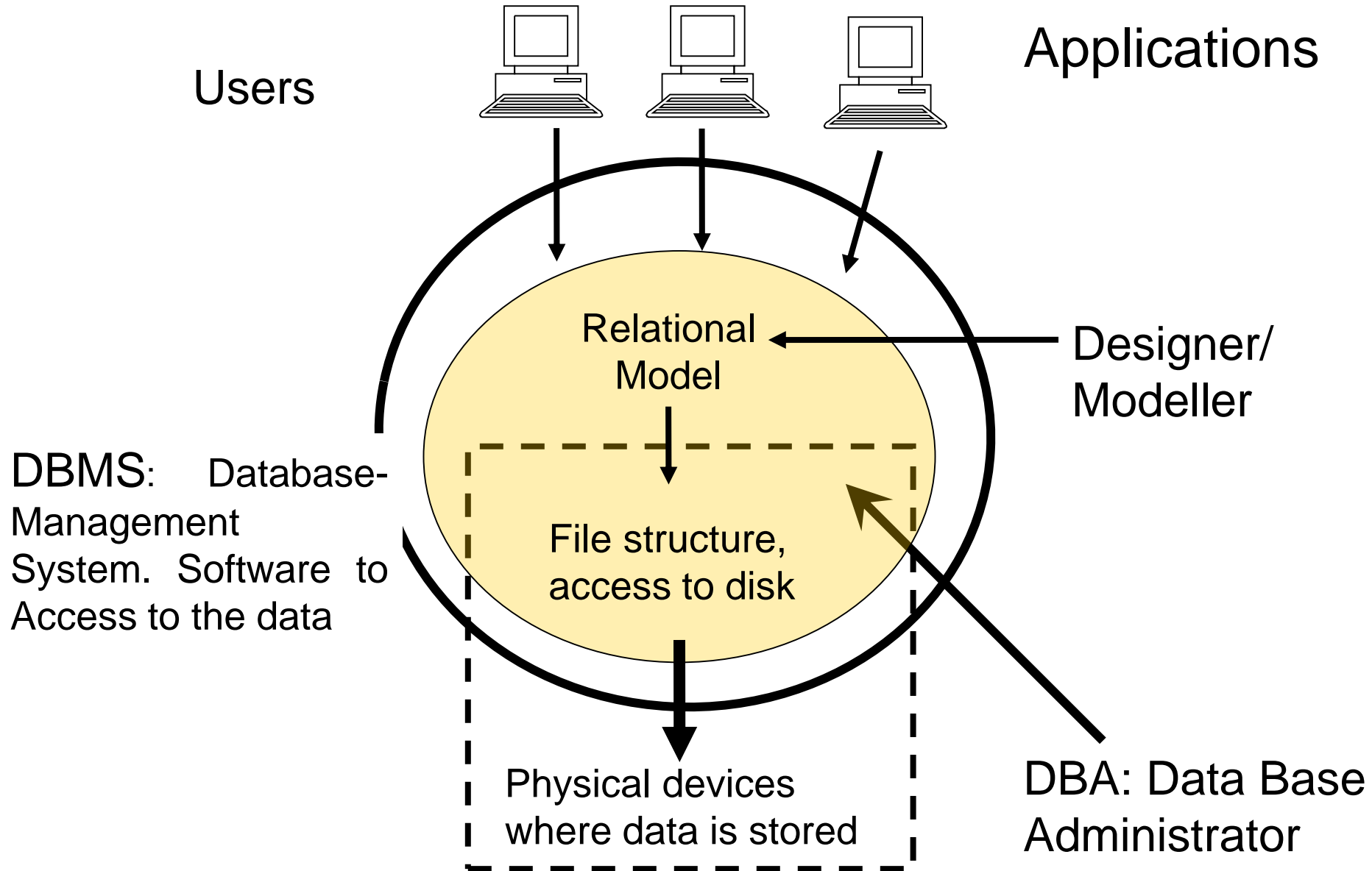
Computers

- Databases
- Hardware (where DBS is installed)
- Database-Management System (DBMS)
- Applications

Humans (Actors)

- Modelers
- DB Administrators DBA
- Programmers
- Final Users

Component: Users



Component: Users

Final user. Access to the DBS using applications developed by programmers

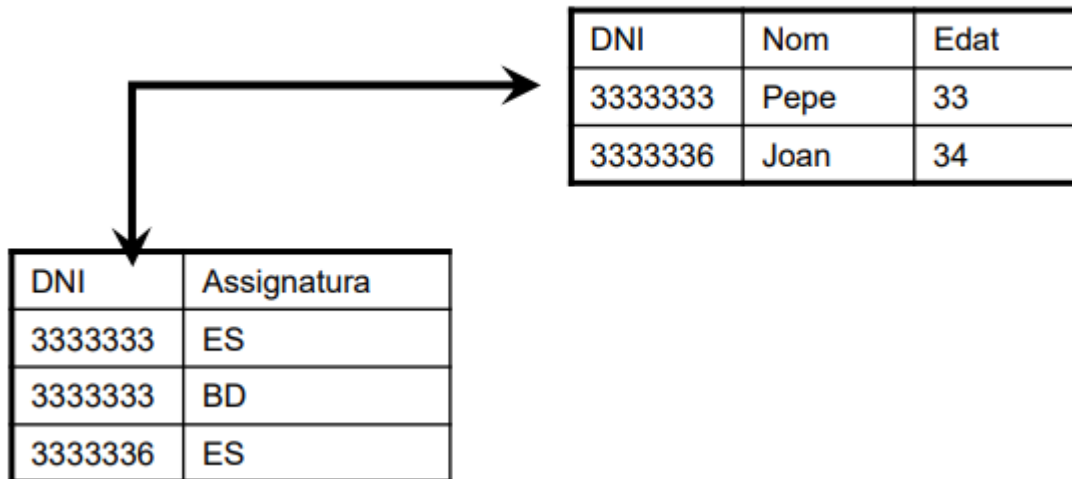
Programmer. Design applications that perform queries to the DBS using the DBMS language.

Data Base Administrator (DBA). Responsible to maintenance of the DBS:

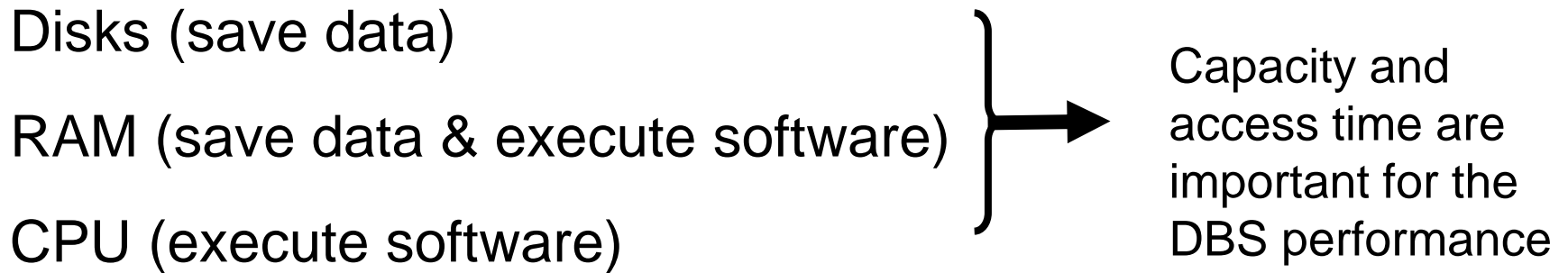
- File system (physical design)
- Permissions for data access
- Updating of information
- Security backups
- Performance system

Component: Database

Description of the data in related tables (Relational model) with access by content regardless of the structure of file which save the data and the type of disk access



Component: Hardware



Administrator manages the selection of the hardware

Component: DBMS

Data Base Management System (DBMS)

Software which allows create, keep and access to a DB



PostgreSQL



Component: DBMS

Manage access to DBS:

- Creation of the DB
- User requests (insert, consult, delete, ...)
- Write data to the files
- Data protection and access permissions
- Provides an independent view of hardware operating system through tables, attributes and a handling data language (SQL – Structured Query Language)

Component: DBMS

Manage and guarantee many properties of a DBS:

- Data integrity (propagation of changes)
- Access Control (security)
- Security backups
- Management of multiple user interfaces
- Performance of a DB (distribution of data in file)