

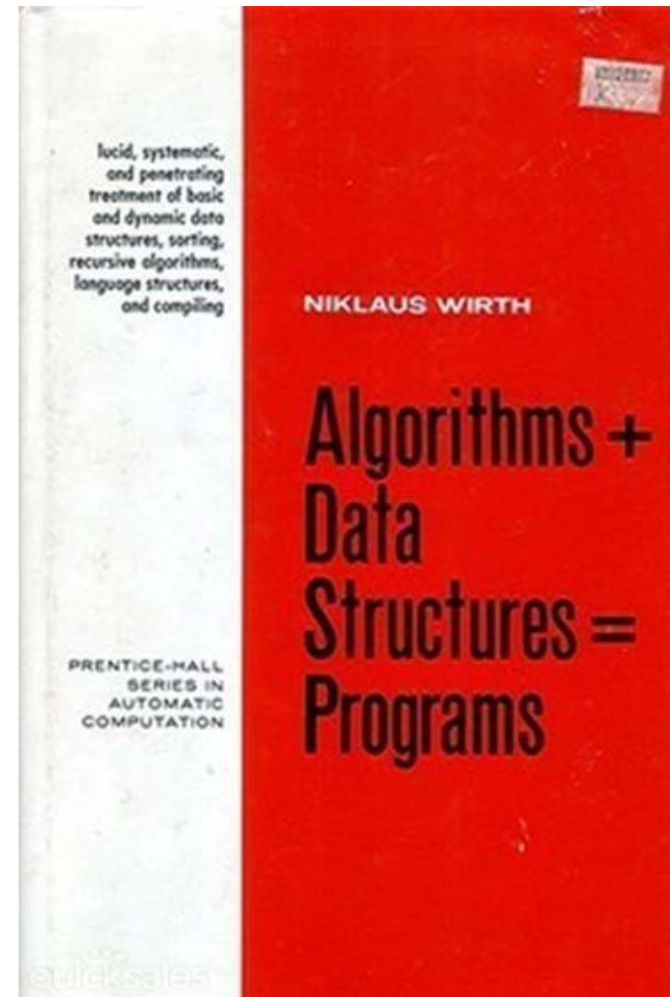


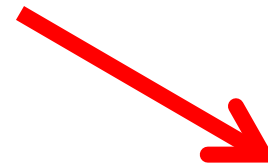
INFO 90002

Database Systems & Information Modelling

Week 01
Introduction to Databases

- Computer systems consist of *software* (algorithms) working to acquire, store and process *data*.
- You will learn about how to make software in other subjects.
- This subject is about *data*.





1900

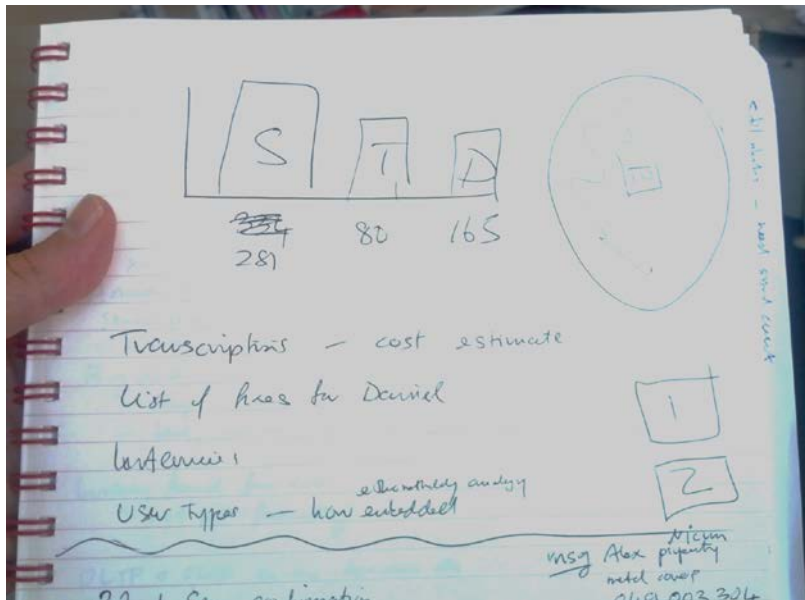
1950

1980

2000



- handwritten notes
- printed books
- spreadsheets etc



	A	B	C	D	E
1	My Holiday Budget ----->				
2					
3	Flights	\$10,000.00			
4	Accommodation	\$5,000.00	<- can this be reduced?		
5	Food	\$1,000.00			
6					
7		\$16,000.00	TOTAL		
8					
9					
10					
11					

80

NATURAL SELECTION.

CHAP. IV.

CHAPTER IV.

NATURAL SELECTION.

Natural Selection—its power compared with man's selection—its power on characters of trifling importance—its power at all ages and on both sexes—Sexual Selection—On the generality of intercrosses between individuals of the same species—Circumstances favourable and unfavourable to Natural Selection, namely, intercrossing, isolation, number of individuals—Slow action—Extinction caused by Natural Selection—Divergence of Character, related to the diversity of inhabitants of any small area, and to naturalisation—Action of Natural Selection, through Divergence of Character and Extinction, on the descendants from a common parent—Explains the Grouping of all organic beings.

How will the struggle for existence, discussed too briefly in the last chapter, act in regard to variation? Can the principle of selection, which we have seen is so potent in the hands of man, apply in nature? I think we shall see that it can act most effectually. Let it be borne in mind in what an endless number of strange peculiarities our domestic productions, and, in a lesser degree, those under nature, vary; and how strong the hereditary tendency is. Under domestication, it may be truly said that the whole organisation becomes in some degree plastic. Let it be borne in mind how infinitely complex and close-fitting are the mutual relations of all organic beings to each other and to their physical conditions of life. Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should sometimes occur in the course of thousands of generations? If such do occur, can we doubt (remem-

Tables

- Each row represents an instance of a set of entities
- Entities might be people, things, events, transactions...
- You can extract useful knowledge via simple, repetitive processes
- A natural fit for business and scientific data.

Tables computed according to the present obliquity of the ecliptic 1638

☉ in ♈							☉ in ♉								
Time from h. m. s.	10 ♈	11 ♈	12 ♈	Ascend ♈	2 ♈	3 ♈	Time from h. m. s.	10 ♉	11 ♉	12 ♉	Ascend ♉	2 ♉	3 ♉		
0. 0. 0	0	9	22	26	36	12	3	1. 51. 37	0	9	17	16	27	4	28
0. 3. 40	1	10	23	27	17	13	3	1. 55. 27	1	10	18	17	8	5	29
0. 7. 20	2	11	24	27	56	14	4	1. 59. 17	2	11	19	17	48	6	30
0. 11. 0	3	12	25	28	42	15	5	2. 3. 9	3	12	20	18	27	7	1
0. 14. 41	4	13	25	29	17	16	6	2. 6. 50	4	13	21	19	9	8	2
0. 18. 21	5	14	26	29	53	17	7	2. 10. 54	5	14	22	19	49	9	3
0. 22. 2	6	15	27	30	24	18	8	2. 14. 44	6	15	23	20	29	10	4
0. 25. 42	7	16	28	1. 14	10	19	9	2. 18. 37	7	16	24	21	10	11	5
0. 29. 23	8	17	29	1. 55	10	20	10	2. 22. 31	8	17	25	21	52	12	6
0. 33. 4	9	18	30	2. 33	19	21	11	2. 26. 25	9	18	26	22	32	13	7
0. 36. 45	10	19	1	3. 14	20	22	12	2. 30. 20	10	19	27	23	14	14	8
								34. 16	11	20	28	23	53	15	9
								38. 13	12	21	29	24	36	16	10
								42. 10	13	22	30	25	17	17	11
								46. 8	14	23	31	25	58	18	12
								50. 7	15	24	32	26	40	19	13
								54. 7	16	25	33	27	22	20	14
								58. 7	17	26	34	28	4	21	15
								2. 7	18	27	35	29	10	22	16
								6. 9	19	28	36	30	16	23	17
								10. 12	20	29	37	31	22	24	18
								14. 15	21	30	38	32	28	25	19
								18. 19	22	31	39	33	34	26	20
								22. 23	23	32	40	34	40	27	21
								26. 29	24	33	41	35	46	28	22
								30. 25	25	34	42	36	52	29	23
								34. 41	26	35	43	37	58	30	24
								38. 49	27	36	44	38	4	31	25
								42. 57	28	37	45	39	10	32	26
								47. 6	29	38	46	40	16	33	27

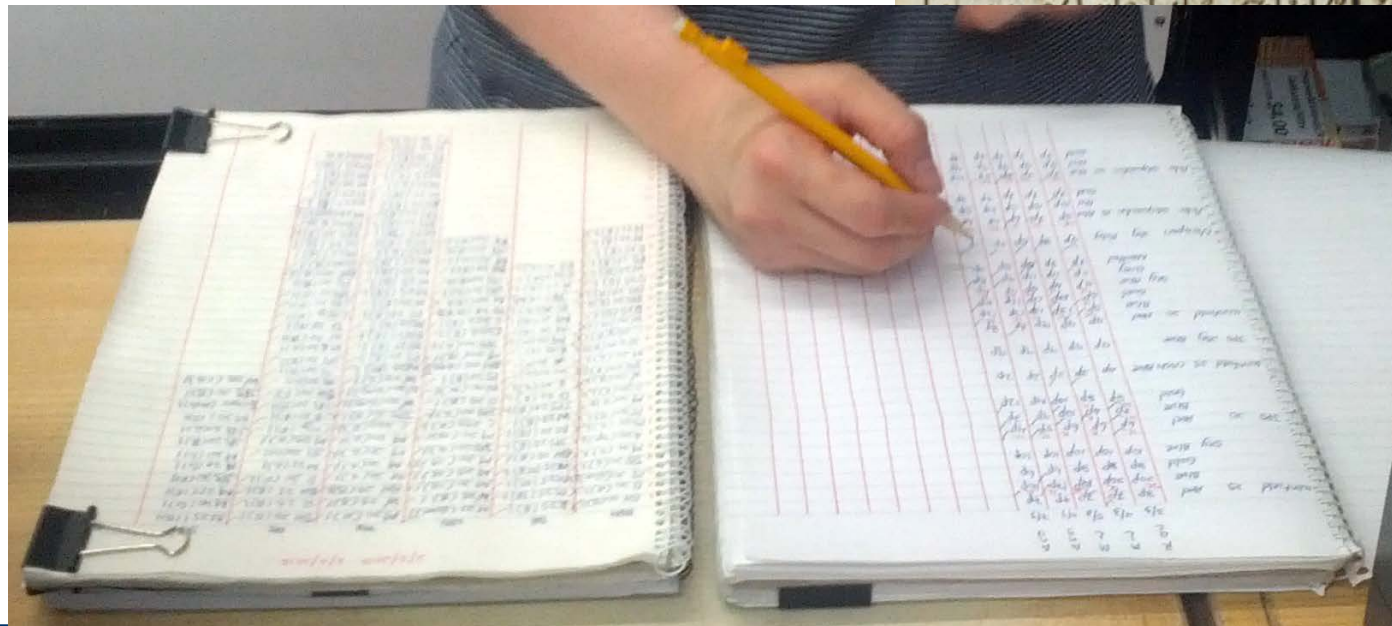
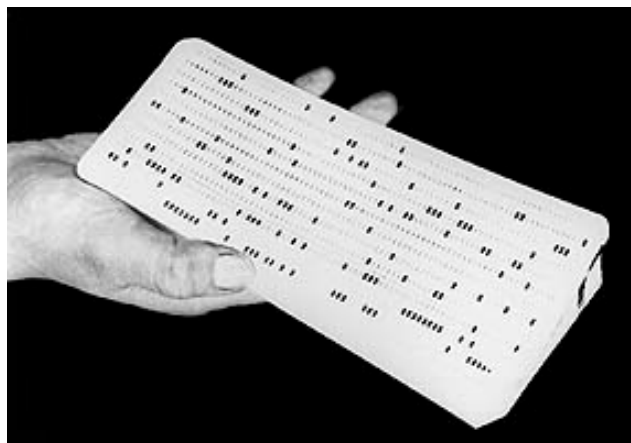


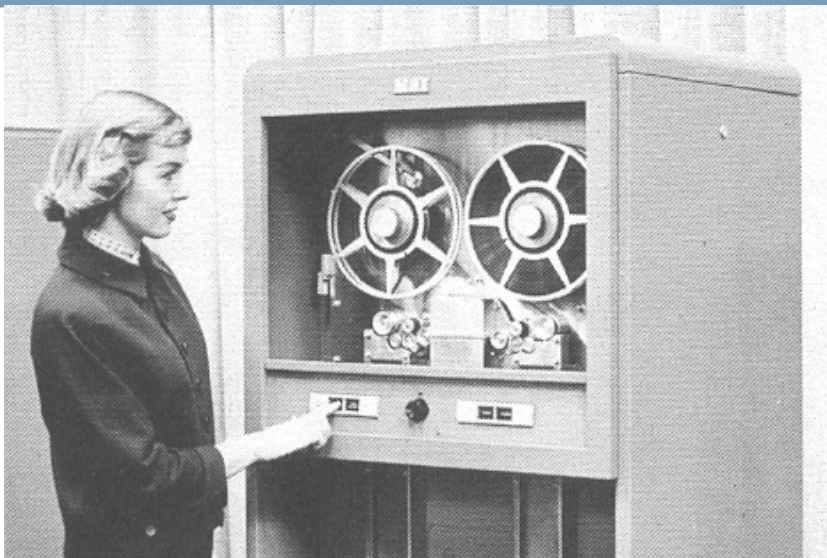
Table of rows -> Deck of cards

1890 US census

1	2	3	4	CM	UM	Jp	Ch	Oc	In	20	50	80	Dv	Un	3	4	3	4	A	E	L	a	g
5	6	7	8	CL	UL	O	Mi	Qd	Mo	25	55	85	Wd	CY	1	2	1	2	B	F	M	b	h
1	2	3	4	CS	US	Mb	B	M	0	30	60	0	2	Mr	0	15	0	15	C	G	N	c	i
5	6	7	8	No	Hd	Wf	W	F	5	35	65	1	3	Sg	5	10	5	10	D	H	O	d	k
1	2	3	4	Fh	Ff	Fm	7	1	10	40	70	90	4	0	1	3	0	2	St	I	P	e	l
5	6	7	8	Hh	Hf	Hm	8	2	15	45	75	95	100	Un	2	4	1	3	4	K	Un	f	m
1	2	3	4	X	Un	Ft	9	3	i	c	X	R	L	E	A	6	0	US	Ir	Sc	US	Ir	Sc
5	6	7	8	Ot	En	Mt	10	4	k	d	Y	S	M	F	B	10	1	Gr	En	Wa	Gr	En	Wa
1	2	3	4	W	R	OK	11	5	l	e	Z	T	N	G	C	15	2	Sw	FC	EC	Sw	FC	EC
5	6	7	8	7	4	1	12	6	m	f	NG	U	O	H	D	Un	3	Nw	Bo	Hu	Nw	Bo	Hu
1	2	3	4	8	5	2	Oc	0	n	g	a	V	P	I	Al	Na	4	Dk	Fr	It	Dk	Fr	It
5	6	7	8	9	6	3	0	p	o	h	b	W	Q	K	Un	Pa	5	Ru	Ot	Un	Ru	Ot	Un

https://www.census.gov/history/www/innovations/technology/the_hollerith_tabulator.html



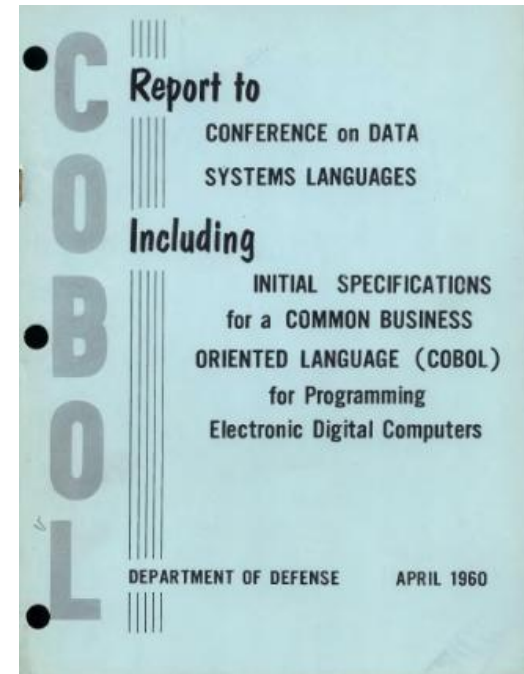


EMP_RECORD...	EMP_ID	EMP_REGION	EMP_DEPT	EMP_HIRE_D...	E...	E...	EMP_...	EMP_SALARY	EMP_NAME	EMP_SKIL
68	3715	4	153	09061987	9	6	1987	14000000	IRENE HIRSH	041085
62	39412	1	650	03119590	3	11	9590	167000000	ANN FAHEY	031099
56	1939	2	265	09281988	9	28	1988	21300000	EMILY WILM...	021077
50	3502	2	165	07041985	7	4	1985	19500000	CATHEZINE ...	011015
44	4435	2	117	05141989	5	14	1989	17000000	AGNES KING	00
68	1673	3	138	07021985	7	2	1985	16800000	MARTIN XU	041033
62	4181	3	161	02031988	2	3	1988	15900000	JOHN DURN	030045
56	1443	1	265	12028900	12	2	8900	6000000	PAT DUNN	021055
50	3607	3	127	08072000	8	7	2000	18300000	ANDREA HIN...	011014
44	1775	3	288	02051989	2	5	1989	2700000	PETER JONES	00
68	1209	2	165	05121986	5	12	1986	17300000	DIDRA WILK...	041065

<http://www.computerhistory.org/timeline/memory-storage/>

<http://groups.engin.umd.umich.edu/CIS/course.des/cis400/cobol/cobol.html>

```
DATA DIVISION.  
FILE SECTION.  
FD StudentFile.  
01 StudentRec.  
    88 EndOfStudentFile    VALUE HIGH-VALUES.  
    02 StudentId            PIC 9(7).  
    02 StudentName.  
        03 Surname          PIC X(8).  
        03 Initials         PIC XX.  
    02 DateOfBirth.  
        03 YOBirth          PIC 9(4).  
        03 MOBirth          PIC 9(2).  
        03 DOBirth          PIC 9(2).  
    02 CourseCode          PIC X(4).  
    02 Gender              PIC X.
```



Problems with flat-files:

- data access routines must be programmed in detail
- each program must include full detail of data structure
- multiple users cannot simultaneously access data
- multiple copies of data - not centrally managed

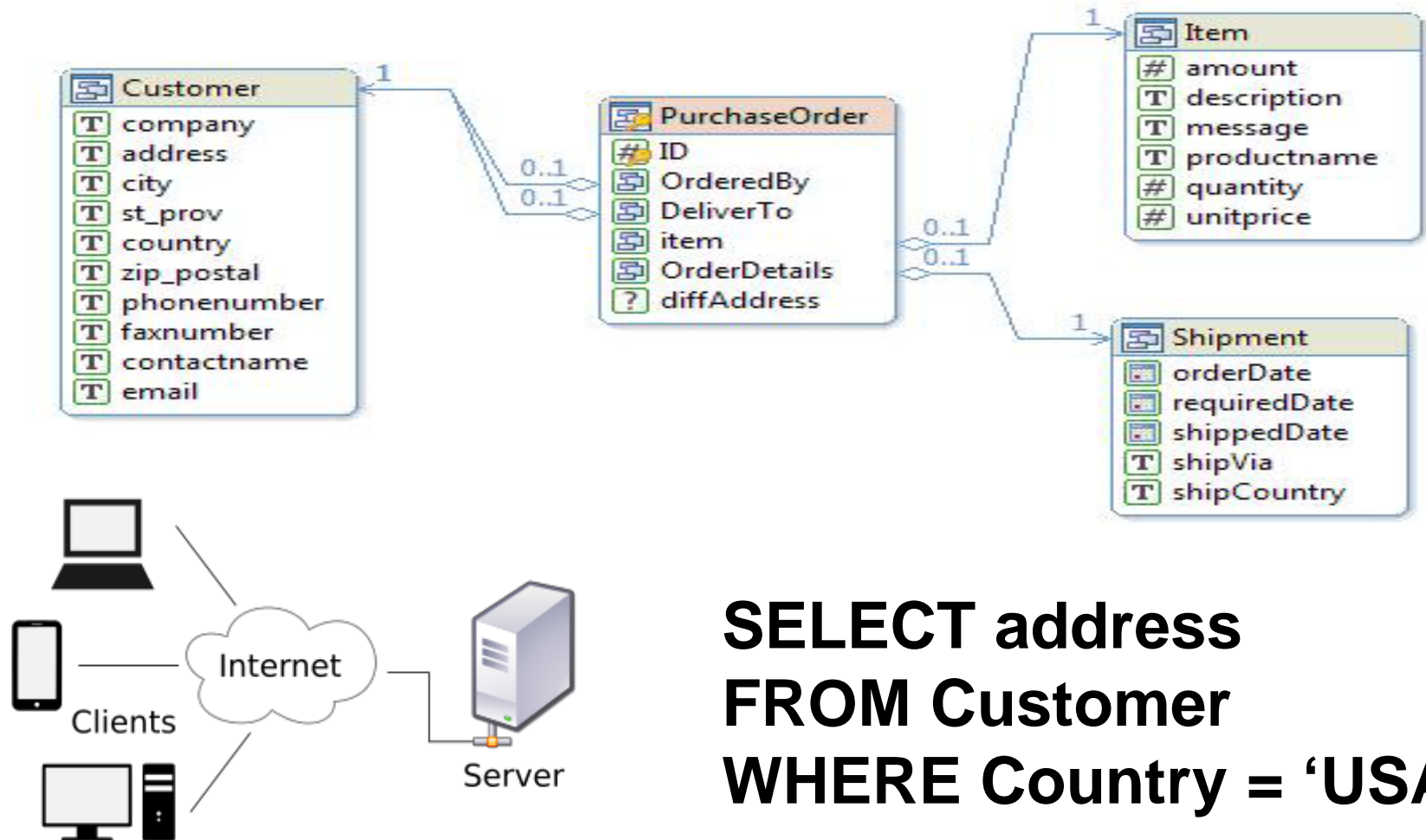
- the first relational databases from Oracle and IBM appear around 1980



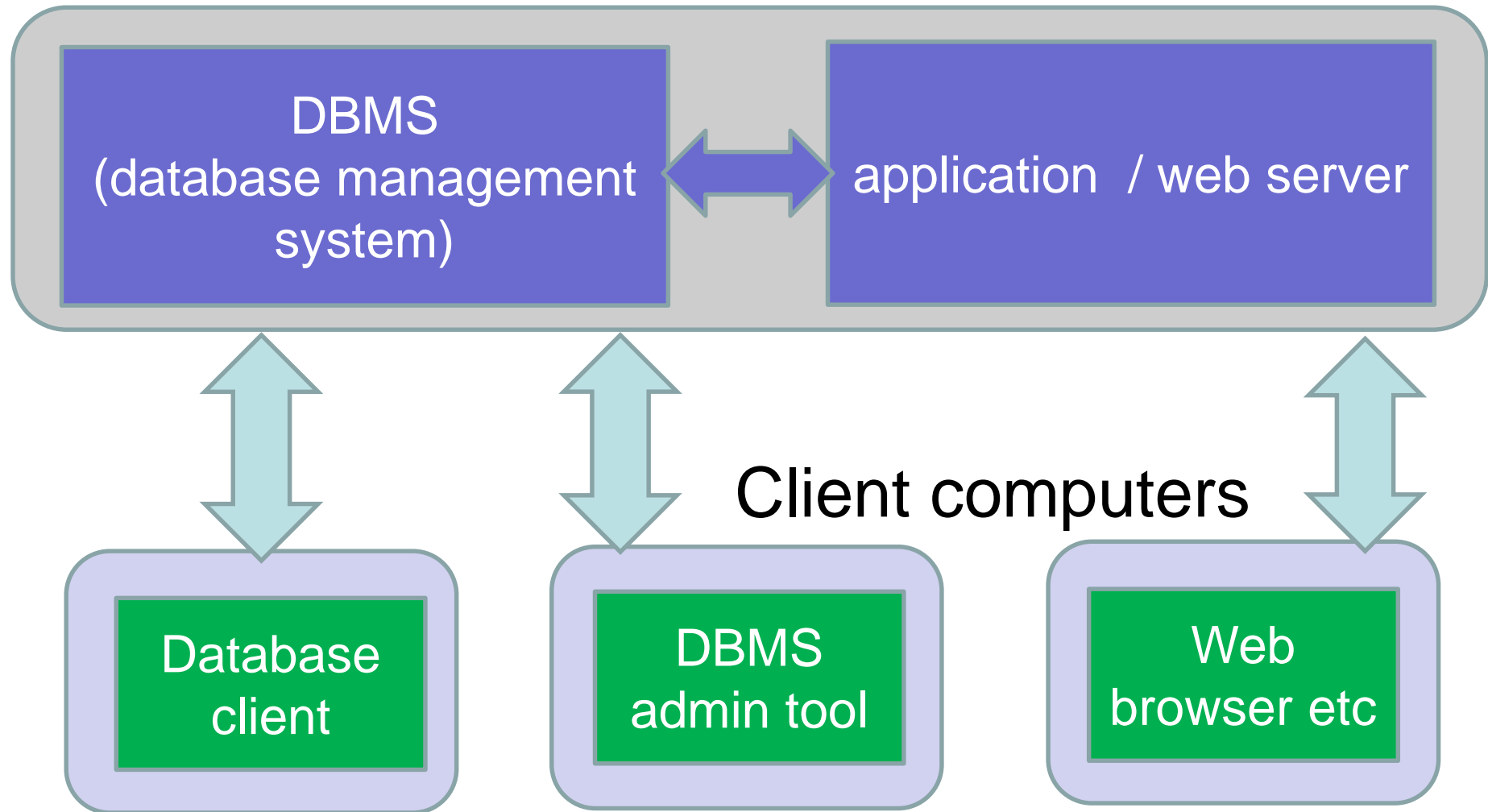
- others appear later

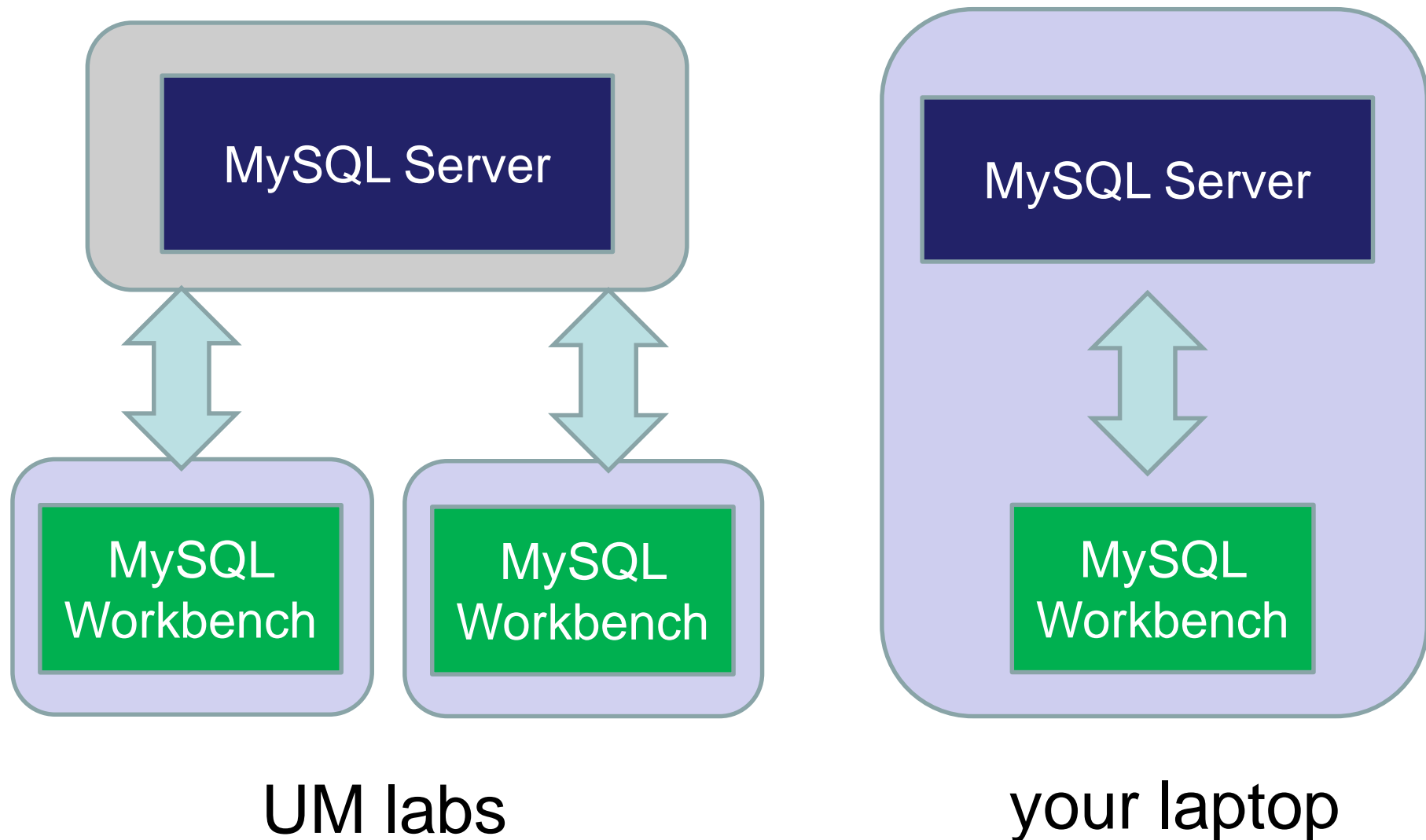


- entity-relationship diagrams, client-server architecture, SQL language



Server computer





- Design the database

- data modelling, E-R diagrams

- Implement the database

- data definition language DDL

- Data access / programming

- data manipulation language DML

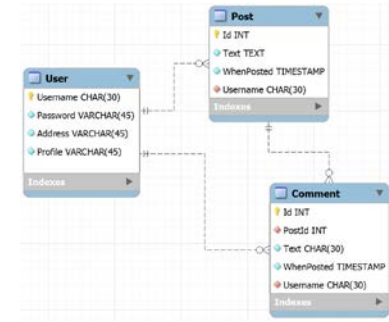
- Database administration

- data control language DCL

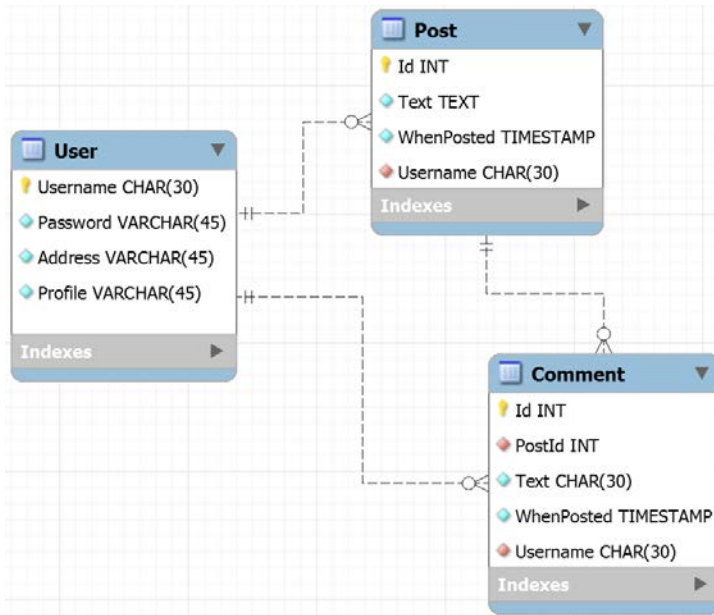
- Create
- Drop
- Alter
- Rename

- Select
- Insert
- Update
- Delete

- Grant
- Revoke



- What are the entities that need to be tracked?
- What attributes will be recorded about each entity?
- What are the relationships between entities?
- What are the cardinalities of relationships?



You will be given requirements such as:

“We have many users.

Users may enter posts into the system.

Each post is entered by exactly one user.

Users can comment on posts.

A post can be commented on many times.”

- An investment bank has a number of **branches**. Within each branch a number of **departments** operate and are structured in a hierarchical manner. The bank employs around 3000 **staff** who are **assigned to work** in the various **departments** across the **branches**. There are essentially three types of special **employees** where extra details required by the system. There are **dealers** who carry out **investments** who have **limits** imposed upon them for how much they can spend. There are **IT compliance managers** who's **Basel2 role** is required to be stored and there are **HR managers** that need have their **assessment number** recorded (along with other details not specified here).
- We need a database to record staff details including which department and branch they are assigned...



- what you can do with the **client alone**:
 - create E-R diagrams
- what you can do when **connected to a server**
 - create a working database
 - convert E-R diagram to a database
 - insert/update/delete/read data
- where servers might be
 - localhost (software running on your PC)
 - network (software running on a server host)

Installing MySQL

- It may be useful to install the free MySQL Server and Workbench software on your own computer.
- Download the appropriate installer from <http://dev.mysql.com/downloads/mysql/>
- (free 'Community' version vs pay-for 'Enterprise' version)
- Mac users may get better results from MAMP
 - <https://www.mamp.info/en/downloads/>
- Web developers may prefer (or already have) XAMPP
 - <https://www.apachefriends.org/download.html>
- Download the installer and run it on your computer.