Design problems

Insertion test

INVENTORY	
part	ID
quantity	
warehouse	ID
warehouse-address	

Inventory

part	quantity	warehouse	warehouse-address

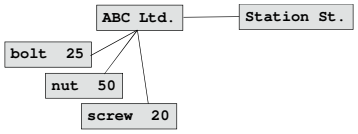
Insertion test

Repetition of associations

NULLs

Inventory

part	quantity	warehouse	warehouse-address
bolt	25	ABC Ltd.	Station St.
nut	50	ABC Ltd.	Station St.
screw	20	ABC Ltd.	Station St.
NULL	NULL	King Bros.	Compton St.



Problems revealed by an insertion test

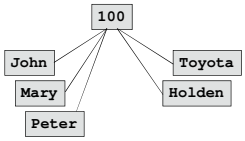
Address of a warehouse is repeated as many time as many different parts are stored in the warehouse

If at some point in time there are no parts stored in a warehouse then there may be no rows to keep a warehouse address or the values of certain attributes must be set to NULL

Another insertion test

Employee

emp#	child	car
100	John	Toyota
100	Mary	Toyota
100	John	Holden
100	Mary	Holden
100	Peter	Holden
100	Peter	Toyota



Data explosion

Problems revealed by an insertion test

Car registration number must be repeated with each child name

Child name must be repeated with each car registration number,

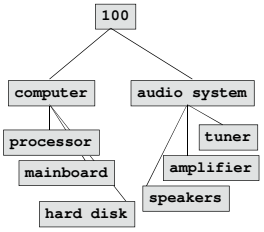
If at some point in time a person has no children (or cars) then value of attribute child (or car) must be set to NULL

Yet another insertion test

Repetition of associations

Shipment

supp#	product	part
100	computer	processor
100	computer	mainboard
100	computer	hard disk
100	audio system	tuner
100	audio system	amplifier
100	audio system	speakers
101	NULL	NULL



NULL values

Problems revealed by an insertion test

Association between supplier number and product name is repeated the same number of time as the number of product's components

If at some point in time a supplier supplies no products than `NULL` symbols must be inserted into a table

Join test

Supplier

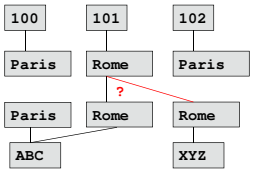
supp#	location
100	Paris
101	Rome
102	Paris

Company

cname	location
ABC	Paris
ABC	Rome
XYZ	Rome

Spurious row

supp#	location	cname
100	Paris	ABC
101	Rome	ABC
101	Rome	XYZ
102	Paris	ABC



Problem revealed by a join test

Join of relational tables `Supplier` and `Company` creates the spurious rows that represent wrong information

Deletion test

Additional deletions

Shipment

supp#	product	part
100	computer	processor
100	computer	mainboard
100	computer	hard disk
100	audio system	tuner
100	audio system	amplifier
100	audio system	speakers
101	NULL	NULL

Accidental deletion

Problem revealed by a deletion test

Deletion of a row triggers deletion of the other rows in the same table

Deletion of a row accidentally deletes other information

Update test

Additional modifications

Waterloo St.

Inventory

part	quantity	warehouse	warehouse-address
bolt	25	ABC Ltd.	Station St.
nut	50	ABC Ltd.	Station St.
screw	20	ABC Ltd.	Station St.
NULL	NULL	King Bros.	Compton St.

Problem revealed by an update test

Modification of a row triggers modifications of the other rows in the same table

Good design guidelines

Design a relational table such that it is easy to explain its meaning

Do not combine unrelated attributes into the same table

Design a relational table such that insertion, deletion and update tests do not cause problems

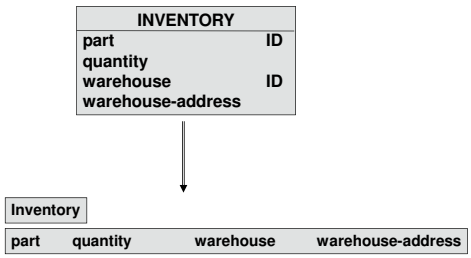
Minimize the number of attributes whose values may be null

Design the relational tables such that they can be joined with equality conditions on attributes that are either primary or foreign keys in a way that no spurious rows are generated

… and the first of all …

… always start from conceptual modeling !!!

… not all conceptual schemas are correct !



How to prove that my design is correct ?

References

Elmasri R., Navathe S. B., *Fundamentals of Database Systems*, chapter 10.1

R. Ramakrishnan, J. Gehrke *Database Management Systems*, chapter 19.1