cphbusiness

Performance

Today's Topics

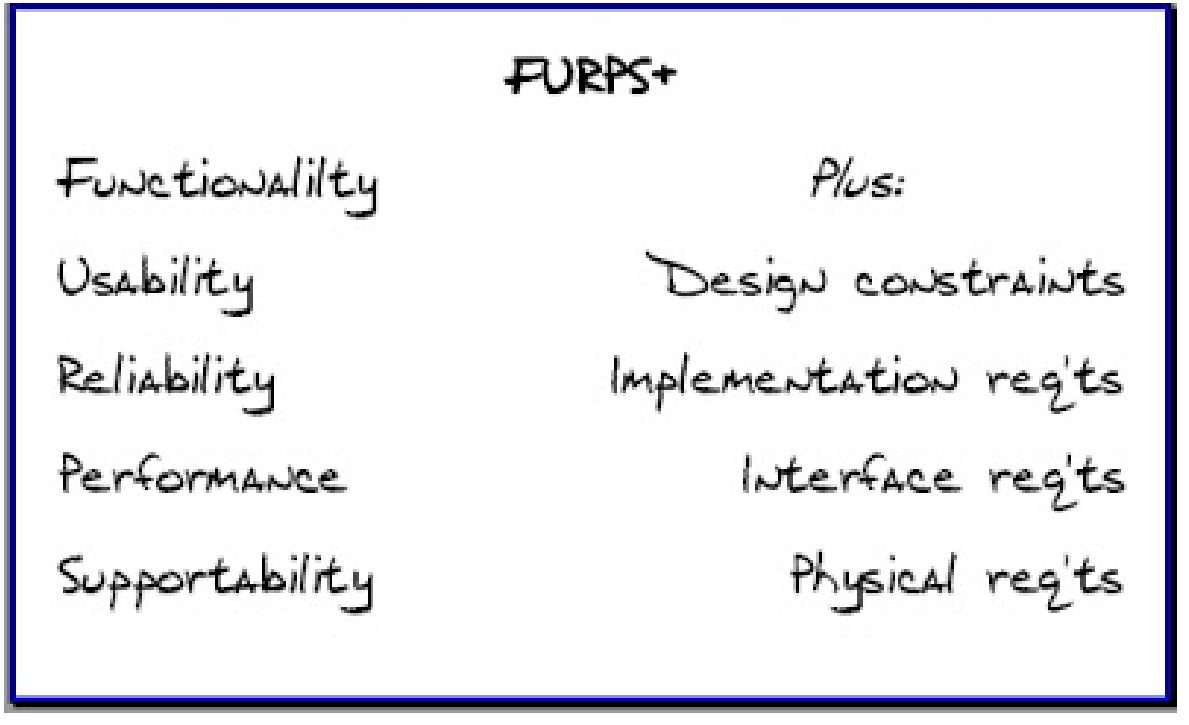
- Different types of requirements
- Performance
  - Stored procedures
  - Indexes
- Exercises

cphbusiness

Requirements

FURPS+

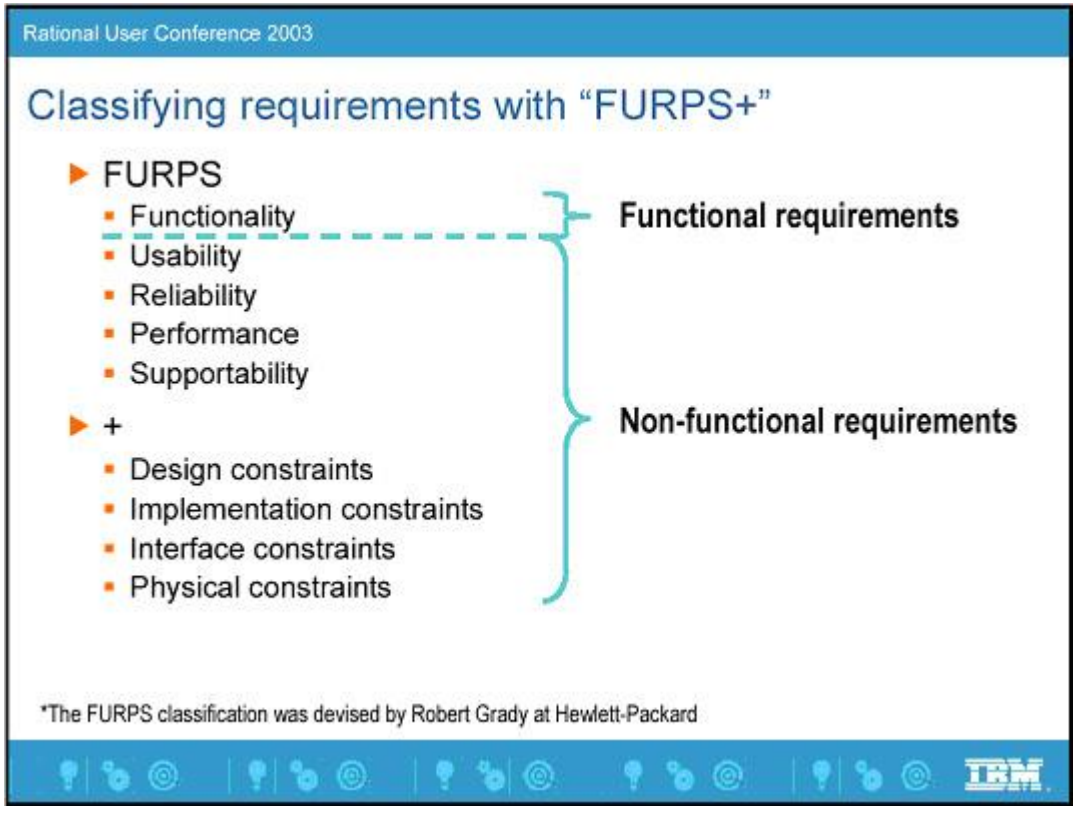
- What does FURPS acronym mean?



Source: https://en.wikipedia.org/wiki/FURPS &
http://agileinaflash.blogspot.dk/2009/04/furps.html

FURPS+

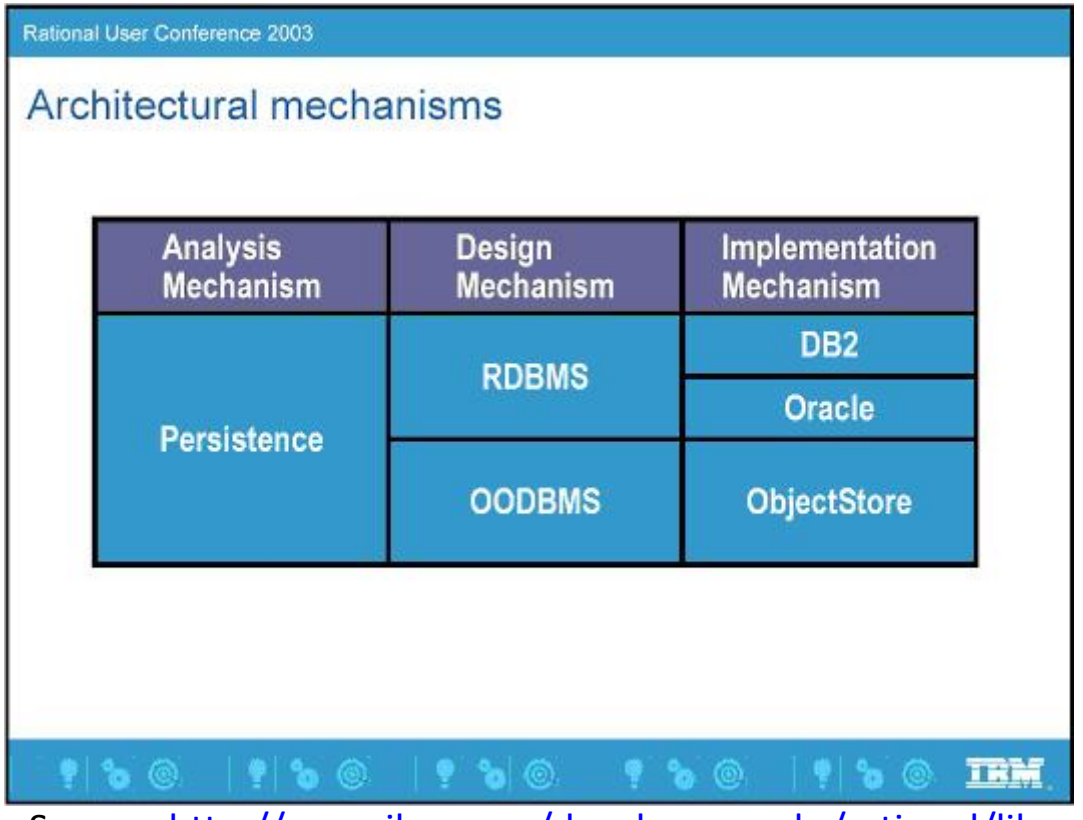
- What does FURPS acronym mean?



Source: http://www.ibm.com/developerworks/rational/library/3975.html

Capturing constraints

- Design and implementation constraint example
  - What database type to choose?
  - What database product to choose?



Source: http://www.ibm.com/developerworks/rational/library/3975.html

How to improve performance

- Techniques to improve response time
  - Indexes
  - Stored procedures

- Both are database techniques and both come at a price ☺

- In module 2, you will learn about performance improvement of your Java code

cphbusiness

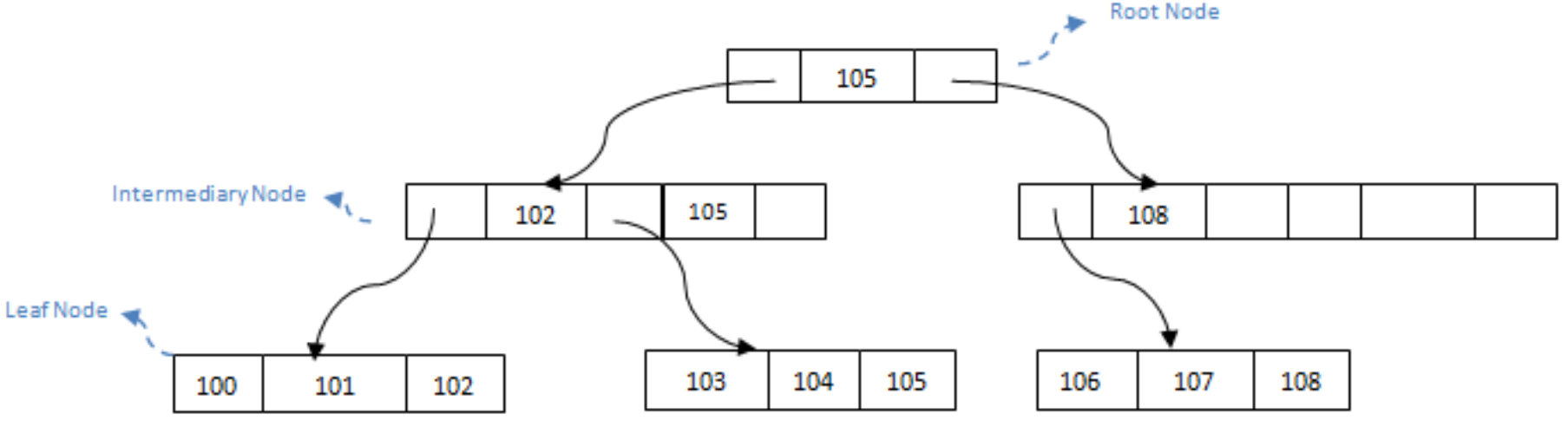
Indexes

Index

- What are indexes?
- Datastructure
  - B-Tree
- Optimizes operations
  - e.g limiting number of records in search
- Queries can run without indexes – takes long time
- Pointer to the data in table in mysql
  - e.g index in a book
- What happens if data is updated?

Index

STUDENT		
STUDENT_ID	STUDENT_NAME	ADDRESS
100	Joseph	Alaiedon Township
101	Allen	Fraser Township
102	Chris	Clinton Township
103	Patty	Troy
104	Jack	Fraser Township
105	Jessica	Clinton Township
106	James	Troy
107	Antony	Alaiedon Township
108	Jacob	Troy



Index

- Table Employees

eno	ename	zip	hdate	index
1000	Jones	67226	1995-12-12	2
1001	Smith	60606	1992-01-01	3
1002	Brown	50302	1944-09-01	1

Index

- Table Employees

index	eno	ename	zip	hdate
1	1002	Brown	50302	1944-09-01
2	1000	Jones	67226	1995-12-12
3	1001	Smith	60606	1992-01-01

Indexing

- If you often search by certain non-key column(s), you can speed up response time by putting an index on the column(s).

Zipcodes example 1

- Get zipcodes from Danish postal service:
  - http://www.postnord.dk/da/Privat/Kundeservice/postnummerkort/Sider/postnummerkort.aspx

- We only need postnr + and bynavn in excel file. Remove rest of the fields.
- Remove duplicate zipcodes, e.g. 1055, 1165.

- Convert to UTF-8 format. Windows users might do this via Notepad.

Zipcodes example 2

- Create table in SQL Workbench:

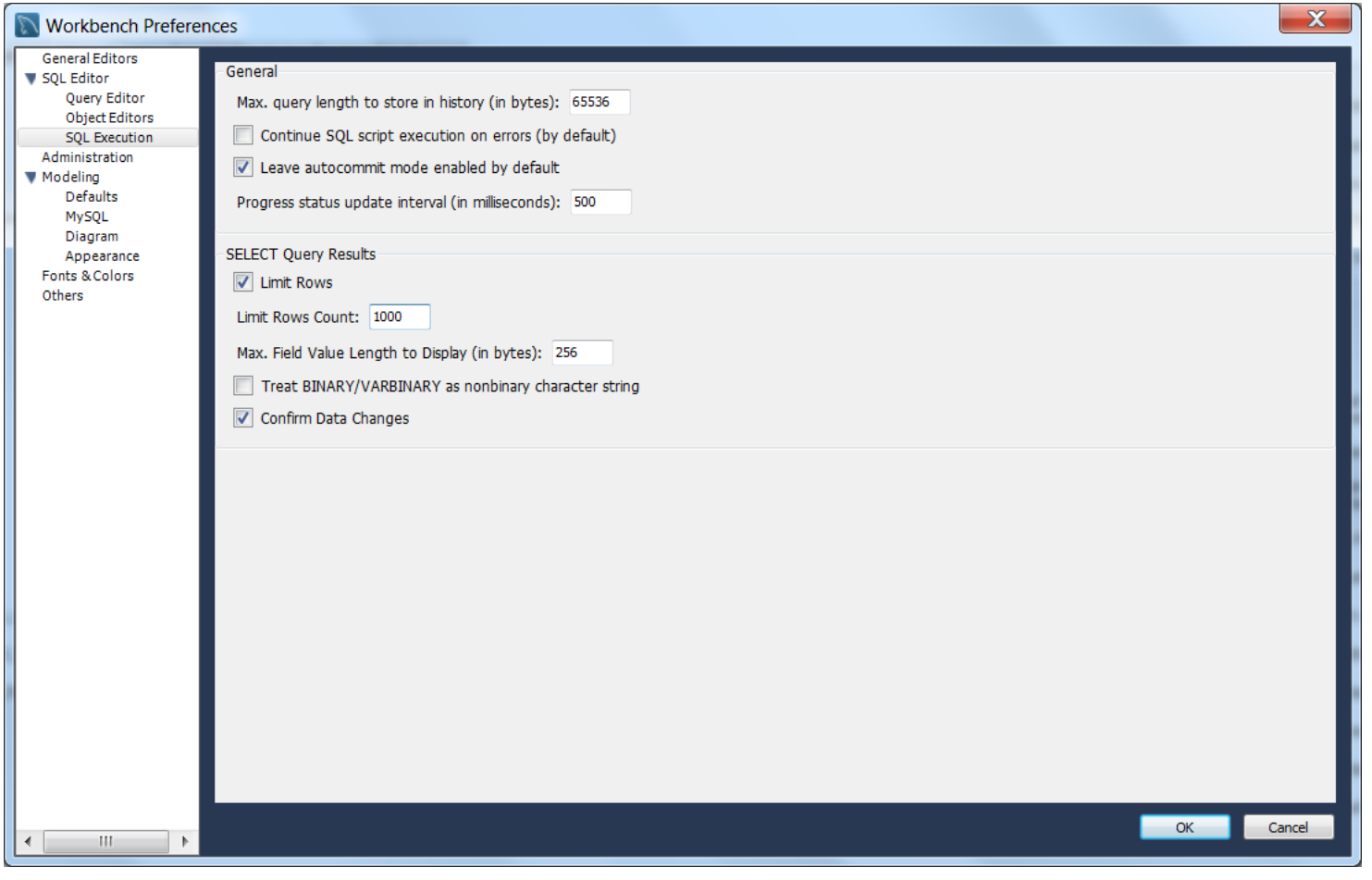
```
create table zipcodes(
    zip int(4) not null,
    city varchar(60) not null,
    primary key (zip)
)
```

- Import from file with LOAD DATA statement:

```
LOAD DATA INFILE 'C:/2sem2017/postnummerutf8.txt'
INTO TABLE zipcodes
FIELDS TERMINATED BY ';'
LINES TERMINATED BY '\r\n'
IGNORE 2 ROWS;
```

Zipcodes example 3

- **Workbench → Edit → Preferences – change Limit Rows Count to 2000.**



cphbusiness

Zipcodes example 4

- Create copy of zip codes table (notice, you don’t get any primary key!!!)

```
create table zipcodesindex as
select * FROM zipcodes;
```

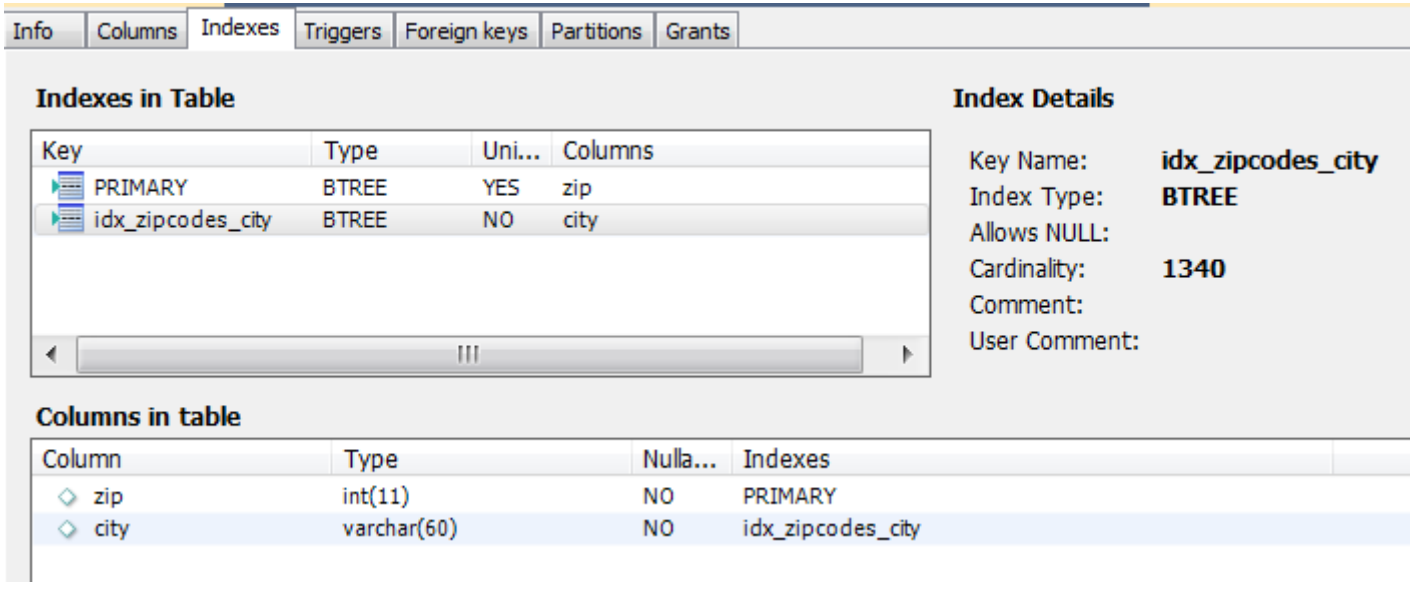
- Alternatively, create a table as normally in order to get a primary key and insert copy of data afterwards with this statement:

```
insert into zipcodesindex
select * from zipcodes
```

Zipcodes example 5

- Create index on new table

```
CREATE INDEX idx_zipcodes_city
ON zipcodesindex (city)
```



Zipcodes example 6

How to measure search with/without index

Without index

SELECT * FROM zipcodes
where city like 'M%';

Timing (as measured at client side):
Execution time: 0:00:0.00000000

Timing (as measured by the server):
Execution time: 0:00:0.00062948
Table lock wait time: 0:00:0.00000000

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 28
Rows examined: 1340

Joins per Type:
Full table scans (Select_scan): 1
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 0

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
No Index used

With index

SELECT * FROM zipcodesindex
where city like 'M%';

Timing (as measured at client side):
Execution time: 0:00:0.00000000

Timing (as measured by the server):
Execution time: 0:00:0.00024974
Table lock wait time: 0:00:0.00000000

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 28
Rows examined: 28

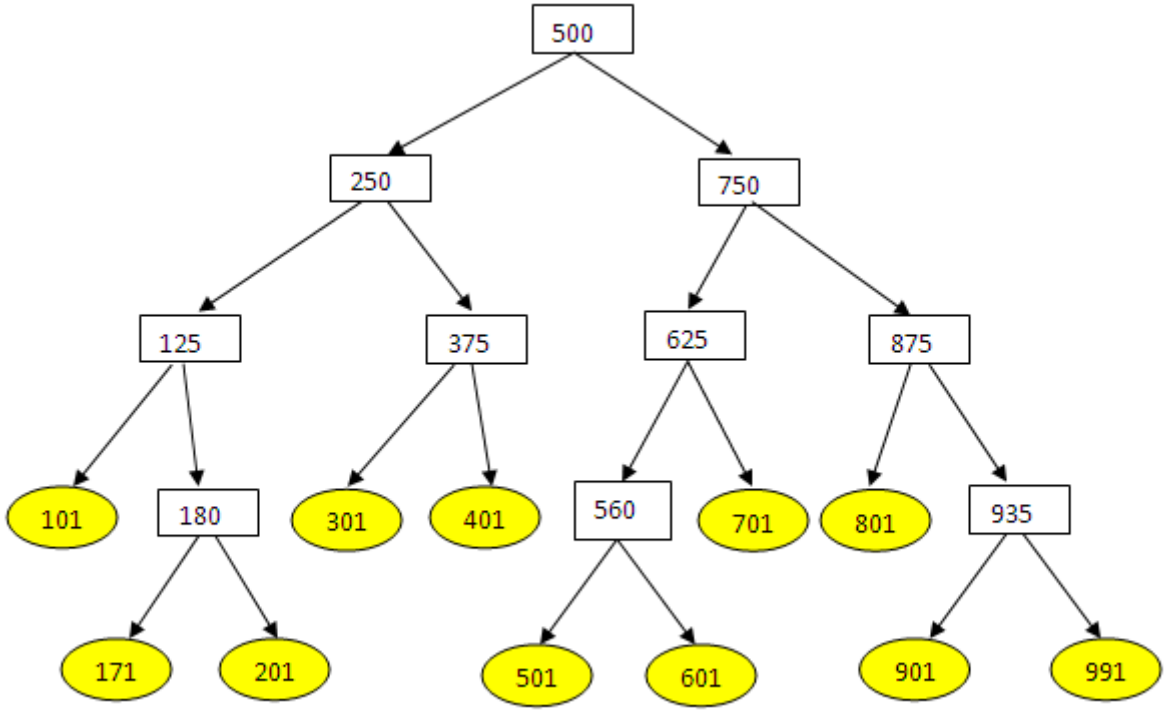
Joins per Type:
Full table scans (Select_scan): 0
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 1

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
At least one Index was used

Zipcodes example 7

- Indexing comes at a price: every time a data record is changed or inserted, the B tree must be updated



cphbusiness



Stored procedures

Stored procedure example 1

- Create stored procedure that retrieves all zip codes

```
DELIMITER //
CREATE PROCEDURE GetAllZipcodes()
BEGIN
SELECT *  FROM zipcodes;
END //
```

Resource: http://www.mysqltutorial.org/getting-started-with-mysql-stored-procedures.aspx

Stored procedure example 2

- Call stored procedure (in MySQL Workbench):

```
call GetAllZipcodes()
```

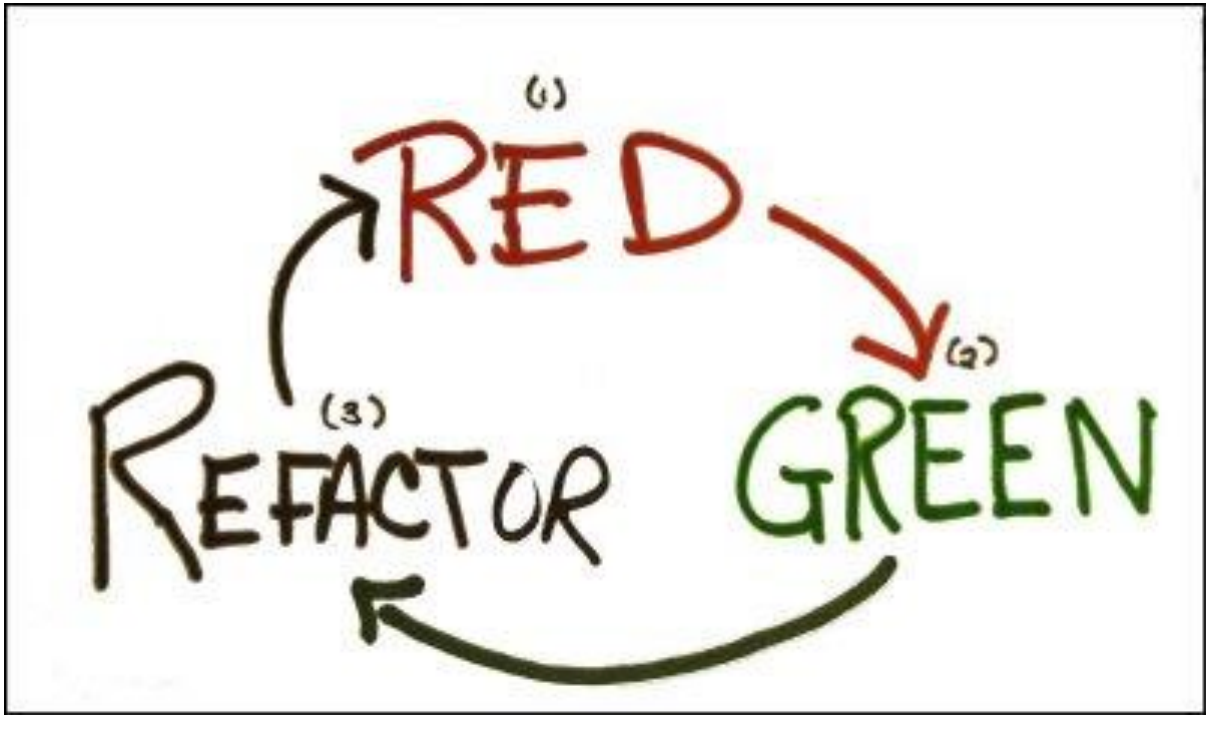
Stored procedure example 3

Call stored procedure from jdbc code:

```
...
CallableStatement call = null;
try {
 call = con.prepareCall("{call GetAllZipcodes()}");
 boolean hadResults = call.execute();
 if (hadResults) {
    rs = call.getResultSet();
    while (rs.next()) {
        city = rs.getString("city");
        zip = rs.getInt("zip");
        codes.add(new Zipcode(zip, city));
    }
}
...
```

Test-Driven Development

- Let’s see the stored procedure run for real!
- Let’s do it in a JUnit test (tests give us confidence that our code is on the right track)



Stored procedure parameters

```
DELIMITER //
CREATE PROCEDURE GetZipcodes(IN cityName varchar(50))
BEGIN
SELECT *  FROM zipcodes
 where city like cityName;
END //
```

Call in JDBC code:

```
call = con.prepareCall("{call GetZipcodes(?)}");
call.setString(1, city);
```

Exercises

- See document in exercise folder