Data Bases II
Fragmentation

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Exam from 30/10/2014

You have a distributed data base with 3 locations: `Dalmine`, `Caniana`, and `Salvecchio`.

This is the following global schema:

```
Course(CourseId, Campus, Title, Professor, Cfu)
CoursePlan(StudId, CourseId)
Student(StudId, Campus, Name, Degree)
```

Tables `Course` and `Student` are fragmented by the attribute `Campus`. Students can choose courses from other campuses.

The `CoursePlan` table is fragmented following the fragmentation of `Student`.

Write at two transparency levels (fragmentation and language) the SQL commands that

1. Move Mario Rossi from Caniana to Dalmine
2. Change the campus of “Data Bases 2” from Dalmine to Salvecchio

Solution query 1

Fragmentation transparency

```
UPDATE Student
SET Campus = "Dalmine"
WHERE Name = "Mario Rossi" AND Campus = "Caniana"
```

Language transparency

```
INSERT INTO Student_D @ Dalmine
SELECT StudId, "Dalmine", Name, Degree
FROM Student_C @ Caniana
WHERE Name = "Mario Rossi";

INSERT INTO CoursePlan_D @ Dalmine
SELECT * FROM CoursePlan_C @ Caniana
WHERE StudId = (SELECT StudId
                FROM Student_C @ Caniana
                WHERE Name = "Mario Rossi");
```

```
DELETE FROM CoursePlan_C @ Caniana
WHERE StudId = (SELECT StudId
                FROM Student_C @ Caniana
                WHERE Name = "Mario Rossi");

DELETE FROM Student_C @ Caniana
WHERE Name = "Mario Rossi";
```

Solution query 2

Fragmentation transparency

```
UPDATE Course
SET Campus = "Salvecchio"
WHERE Title = "Data Bases 2"
```

Language transparency

```
INSERT INTO Course_S @ Salvecchio
SELECT CourseId, "Salvecchio", Title, Professor, Cfu
FROM Course_D @ Dalmine
WHERE Title = "Data Bases 2";

DELETE FROM Course_D @ Dalmine
WHERE Title = "Data Bases 2";
```

Exam from 08/11/2018

You have a distributed data base for a bank over n branches. This is the global schema:

```
Account(AccountId, Client, Branch, Balance)
Operation(OperationId, AccountId, Amount, Description, Date)
Movement(MovementId, FromAccountId, ToAccountId, Amount, Date, Description)
```

Table `Account` is fragmented by `Branch`, while `Operation` and `Movement` are fragmented by following `Account`. Most of movements operate between accounts from the same branch.

Describe the fragmentation strategy to adopt in this context. Then, at both transparency level, show how to implement a SQL query that changes the branch of account 12345 from 1 to 2.

Fragmentation strategy

Given in relational algebra

$$
\begin{aligned}
\text{Account}_i &= \sigma_{\text{Branch}=i}(\text{Account}) \\
\text{Operation}_i &= \text{Operation} \rtimes \text{Account}_i \\
\text{Movement}_i &= \text{Movement} \underset{\text{FromAccountId} = \text{AccountId}}{\rtimes} \text{Account}_i
\end{aligned}
$$

Query

Fragmentation transparency

```
UPDATE Account SET Branch = 2 WHERE AccountId = 12345
```

Language transparency

```
INSERT INTO Account₂ @ 2
SELECT AccountId, Client, 2, Balance
FROM Account₁ @ 1
WHERE AccountId = 12345;

INSERT INTO Operation₂ @ 2
SELECT *
FROM Operation₁ @ 1
WHERE AccountId = 12345;

INSERT INTO Movement₂ @ 2
SELECT *
FROM Movement₁ @ 1
WHERE FromAccountId = 12345;
```

```
DELETE FROM Movement₁ @ 1
WHERE FromAccountId = 12345;

DELETE FROM Operation₁ @ 1
WHERE AccountId = 12345;

DELETE FROM Account₁ @ 1
WHERE AccountId = 12345;
```