**I. Distributed Database Schema**

**1.1. Global Database Tables**

We have 5 global tables: Student, Teacher, Subject, Course, Registration

|  |
| --- |
| **Global Tables: Course Registration System** |
| **STUDENT** (id string **key**, citizen\_identity\_number string, first\_name string, last\_name string, gender string, dob date, phone\_number string, email string, department string, class string, nationality string, address string, current\_year integer, graduation\_year integer, status string, picture string, regilion string, parent\_name string, parent\_phone\_number string)  **TEACHER** (id string **key**, citizen\_identity\_number string, first\_name string, last\_name string, gender string, dob date, phone\_number string, email string, department string, nationality string, address string, picture string, regilion string)  **SUBJECT** (id string **key**, name\_vi string, name\_en string, credit integer, department string, pre\_subject string)  **COURSE** (id string **key**, teacher\_id string, subject\_id string, date\_start date, date\_end date, capacity integer, lesson string, time string, language string, room string, semester integer, year integer, is\_open)  **REGISTRATION** (id string **key**, course\_id string, student\_id string, date\_created date, date\_edited string, status string) |

*Table 1. Global database tables*

Graphical user interface, application, Teams

Description automatically generated

**1.2. Table Description**

* **STUDENT** (id string **key**, citizen\_identity\_number string, first\_name string, last\_name string, gender string, dob date, phone\_number string, email string, department string, class string, nationality string, address string, current\_year integer, graduation\_year integer, status string, picture string, regilion string, parent\_name string, parent\_phone\_number string)

Number of records: 1000

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Description | Type | Value |
| id (key) | The ID of student | Char (8) |  |
| citizen\_identity\_number | Number of Citizen identity card | Char (10) |  |
| first\_name | Name of student | Varchar2 (25) |  |
| last\_name |  |
| gender | Gender of student | Char (1) | "M" : male,  "F" : female,  "O" : other |
| dob | Date of birth | Date |  |
| phone\_number | Phone number | Char (10) |  |
| email | Email | Char (50) |  |
| department | Department of student | Char (7) | ‘HTTT’, ‘KHMT’, ‘KTMT, ‘CNPM, ‘KH&KTTT’, ‘MMT&TT’ |
| class | Class of student | Char (15) | ‘CTTT2017 |
| nationality |  | Char (25) |  |
| address |  | Char (255) |  |
| current\_year |  | Number |  |
| status | State of learning process | Char (10) | ‘Studying’, ‘Reverse’, ‘Warning’, ‘Graduate’, ‘Canceled’ |
| picture | Link image for avatar | Char (255) |  |
| religion |  | Char (25) |  |
| parent\_name | Parent information | Varchar2 (50) |  |
| parent\_phone\_number | Char (10) |  |

*Table 2. STUDENT table description*

* **TEACHER** (id string **key**, citizen\_identity\_number string, first\_name string, last\_name string, gender string, dob date, phone\_number string, email string, department string, nationality string, address string, picture string, regilion string)

Number of records: 200

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Description | Type | Value |
| id (key) | The ID of teacher | Char (8) |  |
| citizen\_identity\_number | Number of Citizen identity card | Char (10) |  |
| first\_name | Name of teacher | Varchar2 (25) |  |
| last\_name |  |
| gender | Gender of teacher | Char (1) | "Male", "Female", "Other" |
| dob | Date of birth | Date |  |
| phone\_number | Phone number | Char (10) |  |
| email | Email | Char (50) |  |
| department | Department of teacher | Char (7) | ‘HTTT’, ‘KHMT’, ‘KTMT, ‘CNPM, ‘KH&KTTT’, ‘MMT&TT’ |
| nationality |  | Char (25) |  |
| address |  | Char (255) |  |
| picture | Link image for avatar | Char (255) |  |
| religion |  | Char (25) |  |

*Table 3. TEACHER table description*

* **SUBJECT** (id string **key**, name\_vi string, name\_en string, credit integer, department string, pre\_subject string)

Number of records: 790

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Description | Type | Value |
| id (key) | The ID of subject | Char (10) |  |
| name\_vi | Subject name in Vietnamese | Varchar2 (50) |  |
| name\_en | Subject name in English | Char (50) |  |
| credit | Number of credits | Number |  |
| department | Department which the subject belongs to | Char (7) | ‘HTTT’, ‘KHMT’, ‘KTMT, ‘CNPM, ‘KH&KTTT’, ‘MMT&TT’ |
| pre\_subject | Prerequisite subject | Char (10) |  |

*Table 4. SUBJECT table description*

* **COURSE** (id string **key**, teacher\_id string, subject\_id string, date\_start date, date\_end date, capacity integer, lesson string, time string, language string, room string, semester integer, year integer, is\_open)

Number of records: 1000

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Description | Type | Value |
| id (key) | The ID of course | Char (25) |  |
| teacher\_id | The ID of the teacher who teaches this course | Char (8) |  |
| subject\_id | The ID of subject | Char (10) |  |
| date\_start | Start date | Date |  |
| date\_end | End date | Date |  |
| capacity | Limited number of registrations for the course | Number |  |
| slot\_counter | Number of registrations | Number |  |
| lesson | Lesson | Char (5) |  |
| time | Time per week | Char (3) | ‘Mon’, …, ’Sun’ |
| language |  | Char (25) |  |
| room |  | Char (10) |  |
| semester |  | Char (1) | 1 : Semester 1  2 : Semester 2  S : Summer |
| year |  | Number |  |
| is\_open | Can enroll or not | Char (1) |  |

*Table 5. COURSE table description*

* **REGISTRATION** (id string **key**, course\_id string, student\_id string, date\_created date, date\_edited string, status string)

Number of records: 50000

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Description | Type | Value |
| id (key) | The ID of registration | String |  |
| status | Status of registration | Char (15) | ‘Processing’,  ‘Studying’,  ‘Canceled’,  ‘Complete’,  ‘Not completed’ |
| course\_id | The ID of course | Char (25) |  |
| student\_id | The ID of student who register for course | Char (8) |  |
| date\_created | Registration date | Date |  |
| date\_edited | Status update date | Date |  |

*Table 6. REGISTRATION table description*

**1.3. Fragmentation**

* **STUDENT** (id string **key**, citizen\_identity\_number string, first\_name string, last\_name string, gender string, dob date, phone\_number string, email string, department string, class string, nationality string, address string, current\_year integer, graduation\_year integer, status string, picture string, regilion string, parent\_name string, parent\_phone\_number string)

|  |  |
| --- | --- |
| Fragmentation Name | Fragmentation Condition |
| STUDENT.1 | department = ‘KHMT’ OR department = ‘HTTT’ OR department = ‘CNPM’ |
| STUDENT.2 | department = ‘KH&KTTT OR department = ‘KTMT’ OR department = ‘MMT&TT’ |

*Table 8. Horizontal Fragmentation of Table “STUDENT.2”*

* **TEACHER** (id string **key**, citizen\_identity\_number string, first\_name string, last\_name string, gender string, dob date, phone\_number string, email string, department string, nationality string, address string, picture string, regilion string)

|  |  |
| --- | --- |
| Fragmentation Name | Fragmentation Condition |
| TEACHER.1 | department = ‘KHMT’ OR department = ‘HTTT’ OR department = ‘CNPM’ |
| TEACHER.2 | department = ‘KH&KTTT OR department = ‘KTMT’ OR department = ‘MMT&TT’ |

*Table 9. Horizontal Fragmentation of Table “TEACHER”*

* **SUBJECT** (id string **key**, name\_vi string, name\_en string, credit integer, department string, pre\_subject string)

|  |  |
| --- | --- |
| Fragmentation Name | Fragmentation Condition |
| SUBJECT.1 | department = ‘KHMT’ OR department = ‘HTTT’ OR department = ‘CNPM’ |
| SUBJECT.2 | department = ‘KH&KTTT OR department = ‘KTMT’ OR department = ‘MMT&TT’ |

*Table 10. Horizontal Fragmentation of Table “SUBJECT”*

* **COURSE** (id string **key**, teacher\_id string, subject\_id string, date\_start date, date\_end date, capacity integer, lesson string, time string, language string, room string)

|  |  |
| --- | --- |
| Fragmentation Name | Fragmentation Condition |
| COURSE.1 |  |
| COURSE.2 |  |

*Table 11. Horizontal Fragmentation of Table “COURSE”*

* **REGISTRATION** (id string **key**, course\_id string, student\_id string, date\_created date, date\_edited string, status string)

|  |  |
| --- | --- |
| Fragmentation Name | Fragmentation Condition |
| REGISTRATION.1 |  |
| REGISTRATION.2 |  |

*Table 12. Horizontal Fragmentation of Table “*REGISTRATION*”*

**1.4. Allocation**

Site Configuration: 2 sites deployed at 2 computers.

|  |  |
| --- | --- |
| At Site Name | Fragmentation Name |
| DB1 at Site 1 | STUDENT.1, TEACHER.1, SUBJECT.1, COURSE.1, REGISTRATION.1 |
| DB2 at Site 2 | STUDENT.2, TEACHER.2, SUBJECT.2, COURSE.2, REGISTRATION.2 |

*Table 13. Allocation Scheme of Basic Fragmentation*

**II. IMPLEMENTATION**

2.1. List of triggers

- Update course slot counter when creating registration

- Update course status from open to close when course slot counter = capacity

2.2. List of procedures

- Teachers create course

- Students enroll for a course 🡪 create registration