Tuto#6 : NoSQL databases

Exercise 1: From relational to NoSQL models

We consider a relational database that concerns books sales. This database contains three tables as described below (Sale, Book and Author). We first consider that a book has a single author and that a sale corresponds to the sale of a single book. The values of the attributes id_sale, id_author and isbn are unique, and are primary keys of the tables.

Table Author

id_author	Last name	First name
154	Gosciny	René
987	Bruchez	Rudi

Table Book

isbn	title	id_author
2154889522	Asterix et Cléopatre	154
2154889589	NoSQL	987

Table Sale

id_sale	date	isbn
10	02/06/2017	2154889522
12	02/06/2017	2154889589
20	12/09/2017	2154889589

It is planned to migrate the database into a NoSQL database.

1. Give the E/R model related the information described above.
2. We need to know for each book, all its details. Propose a key-value oriented modeling for this use case.
3. We consider the following use case: we want to access books regarding an author (search based on a given last name). Propose a column-oriented modeling for this use case.
4. Propose a document-oriented modeling that focuses on sales, and then on books and another one on authors.
5. Indicate the impact that the used modeling can have on the database query process.
6. What are the necessary modifications that enable to manage several authors per book in the relational database and in the different structured documents .

Exercise 2: From structured document to relational

The Department ISE of the ENSIA decided to represent its data in the form of structured documents. Here is an example of documents focused on students and including the teaching unit (TU) followed by each student.

```
{
 "_id": 978,
 "Name": "ADIMI Meriem",
 "TU": [{"id": "ue:11", "title": "Java", "grade": 12},
       {"id": "ue:27", "title": "Bases de données", "grade": 17},
       {"id": "ue:37",  "title": "Réseaux", "grade": 14}
       ]
}
```

```
{
  "_id": 476,
   "Name": "BELABDI Ahmed",
   "TU": [{"id":  "ue:13",  "title": "Méthodologie", "grade": 17,
         {"id": "ue:27",  "title": "Bases de données", " grade ": 10},
         {"id":  "ue:76",   "title": "Conduite projet", " grade ": 11}
        ]
}
```


1. Since these documents are produced from a relational database, reconstruct the schema of this database and indicate the contents of the tables corresponding to the documents above.
2. Propose another representation of the same data which no longer concerns the students, but the TU.

Exercise 3: Document-oriented modeling

We want to create a document-oriented database to manage courses and students.

Given the following information:

- A course is described by the attributes code, title, description, credits and prerequisites.
- Prerequisites are other courses.
- A student is described by the attributes last name, first name and address.
- Addresses consist of: street number, street name, city and postal code.
- A student can follow several courses and the courses are followed by several students.

1. Describe the E/R model related to the information described above.
2. Discuss the different possible document-oriented modeling (for example student-centered or course-centered) by providing corresponding JSON documents.
3. If the objective of the application is to view a list of students with the courses that each follows, and to access course details only when we select its code or title, propose a solution adapted to this issue.