

**RESEARCH AND DEPLOYMENT  
OF MONGODB DATABASE MODEL FOR HANOI VIETNAM VPBANK**

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**Abstract**

MongoDB is a powerful and popular NoSQL database management system, especially in the information technology industry, MongoDB plays an important role in database deployment and management. Currently, MongoDB has initially completed the deployment of the database model for banks in Vietnam. The implementation processes for applying MongoDB to large database systems are complete, and the bank's database system is also very rich. Besides the advantages, there are also difficulties when building the system, so applying the MongoDB database model from the university training process plays an important role in developing the database system. MongoDB database in Vietnam.

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## NGHIÊN CỨU VÀ TRIỂN KHAI MÔ HÌNH CƠ SỞ DỮ LIỆU MONGODB CHO NGÂN HÀNG VPBANK HÀ NỘI VIỆT NAM

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### Thông tin bài báo

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### Từ khóa

Database NoSQL MongoDB

### Tóm tắt

MongoDB là một hệ thống quản lý cơ sở dữ liệu NoSQL mạnh mẽ và phổ biến, đặc biệt là trong ngành công nghệ thông tin. MongoDB đóng vai trò quan trọng trong việc triển khai và quản lý cơ sở dữ liệu. Hiện tại, MongoDB đã bước đầu hoàn thiện cho việc triển khai mô hình cơ sở dữ liệu cho các ngân hàng tại Việt Nam. Các quy trình triển khai áp dụng MongoDB cho các hệ thống cơ sở dữ liệu lớn đã hoàn chỉnh, hệ thống cơ sở dữ liệu của ngân hàng cũng rất phong phú. Bên cạnh các thuận lợi, còn có các khó khăn khi xây dựng hệ thống, nên việc áp dụng mô hình cơ sở dữ liệu MongoDB từ quá trình đào tạo trong trường đại học đóng vai trò quan trọng trong phát triển hệ thống cơ sở dữ liệu MongoDB ở Việt Nam.

### 1. Introduction

Teaching and learning transfer scientific knowledge, technology, and working skills to students. The application of information technology in teaching is currently an active tool in teaching and learning, which is emphasized by Resolution 29-NQ/ TW (November 4, 2013) in the application of information technology (IT) and communication in teaching and learning. Recently, Decisions 1282/ QD-BGDĐT (May 10, 2022) of the Ministry of Education and Training on Promulgating a Plan to strengthen the application of information technology and digital transformation in education and training the period

2022-2025; Decision 131/QĐ-TTg (January 25, 2022) on digital transformation of the Prime Minister; Then, Decision 4740/QĐ-BGDĐT (December 6, 2022) on the set of indicators and evaluation criteria for digital transformation in higher education institutions

This shows that the application of information technology in teaching at the university level is a necessary trend and requirement for education and training development and integration in the 4.0 revolution. At Hanoi University of Architecture, in the Information Technology Engineer training program, the database subject (4th year) requires

students to apply the knowledge they have learned to design mechanical systems database

Meanwhile, the installation and configuration of the database system are expressed in command form, making it difficult for students to visualize the characteristics of the system architecture. In particular, the database design between tables, and columns... is very complicated and cannot be expressed clearly, leading to difficulty for students to understand.

and accessibility of the subject to actual construction, construction management is reduced Besides, the MongoDB database model helps design and build database systems visually, how to preserve data is clearly shown while building the system.

Currently, the MongoDB database model is applied by many banks to deploy their database systems (Table 1). In Vietnam, the MongoDB database model is often used to serve project design. Currently, students majoring in information technology at Hanoi University of Architecture have been instructed to apply the MongoDB database model to the design of database systems in their subjects and graduation thesis.

## **2. Applying the MongoDB database model for Banks**

### ***2.1. Banks use the MongoDB database model***

Banks for using the MongoDB database model can be listed as follows:

VPBank uses MongoDB for data management and application development in the financial and investment banking sectors.

MBBank uses the MongoDB application to optimize data storage and query processes in the banking system.

BIDV uses MongoDB to build applications to manage customer information and online banking services.

Techcombank integrates MongoDB into several projects to improve data management and enhance scalability.

VietinBank uses MongoDB to store and manage data about financial transactions and customer information.

VietcomBank uses MongoDB to store customer information and optimize transaction processes.

DongA Bank uses MongoDB to store customer information and optimize transaction processes.

ACB deploy MongoDB to improve data management and increase agility in digital banking projects.

### ***2.2. Reality factors of applying MongoDB at universities***

Applying the MongoDB database model to database system construction projects by current development trends, especially the 4.0 technology revolution in the information technology industry. The MongoDB database model helps banks ensure data integrity, clearly demonstrating system architecture and equipment for system design, construction and operation, and management database.

Minimize errors/conflicts between system design and construction, reduce investment costs, and be transparent in project management.

A common recruitment criterion in information technology engineering companies is whether they can use the MongoDB database system.

The trend between training and approach to real work of fresh graduates.

## **3. Properties of MongoDB**

MongoDB is a NoSQL database management system, designed to store and process unstructured data. MongoDB was developed with the desire to integrate into effective database design and

construction management systems based on the MongoDB database model.

In the VMware software system, including the Linux CentOS 7 operating system for installation and configuration, the MongoDB database system is built entirely on commands, commonly used in projects, projects and systems with large databases.

In the MongoDB database model, each system architecture and component are represented by the database we collect and store.

Working with databases, MongoDB stores customer information that banks collect daily.

Changing MongoDB parameters will help reduce data querying capacity, optimize recovery time, and store data.

#### **4. Process of using Revit/MEP**

- Step 1: Determine investor requirements for the system
- Step 2: Analyze requirements and design the appropriate system
- Step 3: Install and configure the system
- Step 4: Deploy system design: Data - Table - Database - Server
- Step 5: Analyze the database system, check for system conflicts, and secure the database.

#### **5. Build a database system with MongoDB**

##### ***5.1. Computer configuration***

Requirements of computers using MongoDB are shown in Table 2.

##### ***5.2. MongoDB database models***

The MongoDB database model includes the following basic elements:

A database is a collection of Collections and is the basic unit for data organization in MongoDB.

Collection is a collection of Documents (records) in MongoDB. Each Collection corresponds to a table in a relational database.

The document is the basic record in MongoDB and is represented as JSON-like BSON. Each Document is an independent record and can contain structured or unstructured fields.

Field is a key-value pair in the Document, corresponding to a field in the relational table. Values can be simple data types or nested Documents.

Index is a mechanism to speed up queries by sorting and storing data according to a specific field in a Document.

The actual MongoDB database system architecture is shown in Figure 1.

#### **6. Advantages and disadvantages using BIM**

##### ***6.1. Advantages***

The 4.0 technology revolution is taking place strongly in Vietnam, all industries have plans and visions to apply information technology to 2030.

The information technology standard of officials, engineers, experts and managers has been improved, qualified and able to access new technology to solve current works.

The investment of large banks in the MongoDB database system is very strong, and policies are favorable for projects applying the MongoDB database system.

Universities have included the MongoDB database model in training from main courses to external expansion. Competitions for students about MongoDB are also very exciting, stimulating students' spirit and love for researching MongoDB.

The MongoDB database system is a step in preparing new graduates to be accepted into professional jobs with good salaries.

For Hanoi University of Architecture, a roadmap to bring the MongoDB database model into mainstream teaching has been proposed and plans to develop database majors have been established.

**6.2. Disadvantages**

The initial cost for MongoDB technology is very high, especially the cost of technological equipment, human resources training costs, and changes in design and construction concepts from the perspective of the database model. MongoDB.

The application and control of processes according to the MongoDB database model still has many limitations, especially changes in working methods, system management thinking, and synchronization in database control. MongoDB data from banks and state management units is not synchronized.

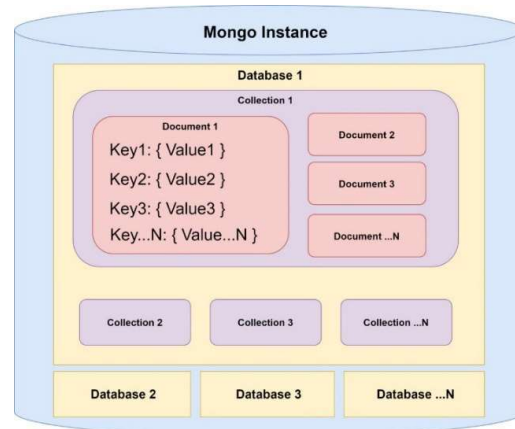
For Hanoi University of Architecture, the application of the MongoDB database is still limited, the use of MongoDB in course design, teaching and graduation projects is only at the encouragement stage, with no mandatory requirements. Therefore, the development of MongoDB database system in specialized fields is still limited.

**Table 1. Some software in MongoDB used for banking**

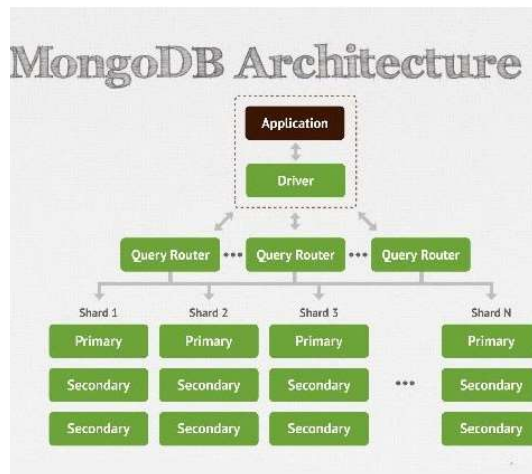
Number	Software	Company
1	MongoDB Community, MongoDB Enterprise	VPBANK
2	MongoDB Community, MongoDB Enterprise	MBBANK
3	MongoDB Community, MongoDB Atlas	OCB
4	MongoDB Community, MongoDB Enterprise	VIETCOMBANK
5	MongoDB Community, MongoDB Atlas	TECHCOMBANK

**Table 2 High-performance PC configuration for MongoDB**

Operating system	Windows 7 SP1 64-bit
	Windows 8.1 64-bit
	Windows 10 64-bit
CPU	Intel Core i, Xeon, AMD
	Multi-Core processors are preferred
RAM	16GB RAM
	Revit with 700 MB
Monitor	Ultra high definition
HDD	5GB
	Support Point Cloud data
Web browser	Internet Explorer 7.0 (Or higher version)



**Figure 1 Architecture MongoDB database Model**



**Figure 2 MongoDB Architecture**

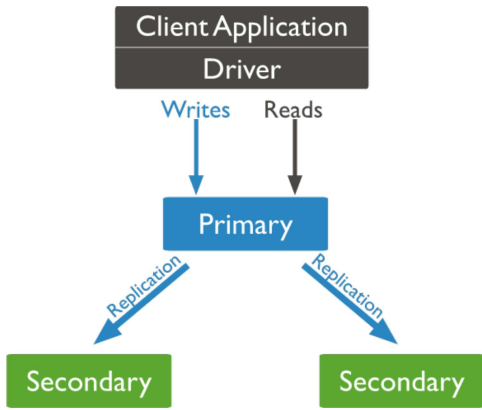


Figure 3 The architecture of mongodb uses replica set

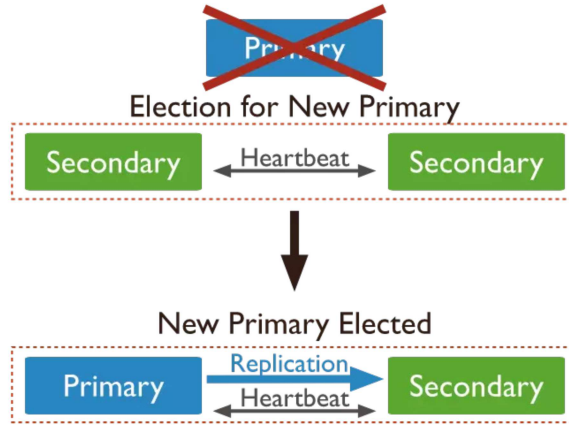


Figure 4 Automatic Failover

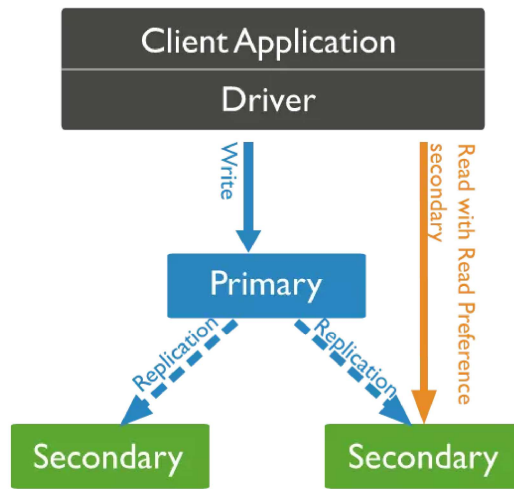


Figure 5 Read data from secondary node

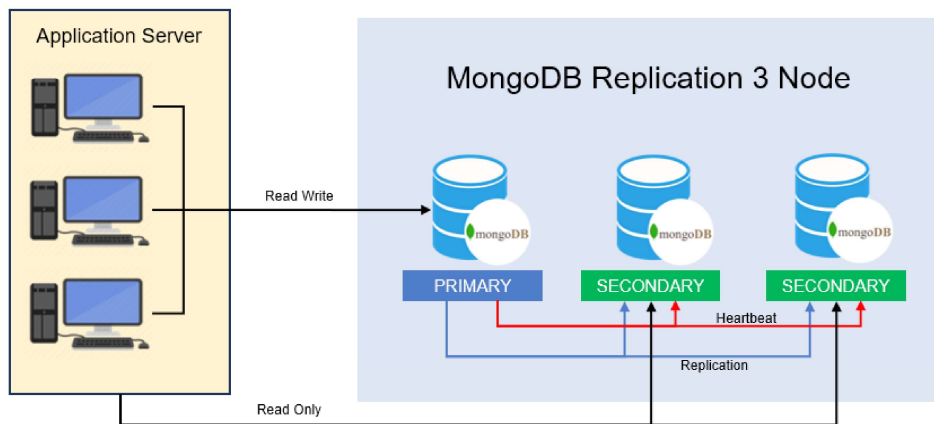


Figure 6 MongoDB Replication 3 Node database model

```

[root@mongod01 ~]# mongo -u dbadmin -p oracle_4u --authenticationDatabase admin
MongoDB shell version v4.4.22
connecting to: mongodb://127.0.0.1:27017/?authSource=admin&compressors=disabled&gssapiServiceName=mongodb
Implicit session: session { "id" : UUID("dd6fb073-21ae-4246-b5ec-68b6adcb6abb") }
MongoDB server version: 4.4.22
--
The server generated these startup warnings when booting:
2024-01-17T11:23:57.769+07:00: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
2024-01-17T11:24:01.089+07:00: /sys/kernel/mm/transparent_hugepage/madvise is 'always'. We suggest setting it to 'never'
2024-01-17T11:24:01.089+07:00: /sys/kernel/mm/transparent_hugepage/defrag is 'always'. We suggest setting it to 'never'
--
MongoDB Enterprise > show dbs
admin                0.000GB
agentlogs            0.000GB
autoindexing         0.000GB
automationagentlog  0.000GB
automatonscore       0.000GB
automationstatus    0.000GB
backpagentlogs       0.001GB
backpagentstatus    0.000GB
backpalerts          0.000GB
backpbilling         0.000GB
backpconfig          0.000GB
backpjobs            0.000GB
backplogs            0.000GB
backpmapshot         0.000GB
backpurl             0.000GB
backpurlstats        0.006GB
cloudconf            0.007GB
config               0.000GB
dataexplorer         0.000GB
feedback             0.000GB
local                0.000GB
mmsdb                0.002GB
mmsdbanalytics       0.000GB
mmsdbautomation     0.000GB
mmsdbbilling         0.001GB
mmsdbcollectedindexes 0.000GB
mmsdbconfig          0.003GB
mmsdbcrashlogs      0.000GB
mmsdbjobs            0.002GB
mmsdblogcollection  0.000GB
mmsdbmetering        0.000GB
mmsdbpings           0.006GB
mmsdbqueues          0.000GB
    
```

Figure 7 Interface to access the database

```

MongoDB shell version v4.4.22
Enter password:
connecting to: mongodb://127.0.0.1:27017/?authSource=admin&compressors=disabled&gssapiServiceName=mongodb
Implicit session: session { "id" : UUID("b71ce520-63a9-44c8-b375-9078fd088a54") }
MongoDB server version: 4.4.22
MongoDB Enterprise rs01:PRIMARY> show dbs
admin                0.000GB
config              0.000GB
local               0.032GB
qlkh                 0.027GB
MongoDB Enterprise rs01:PRIMARY> use qlkh
switched to db qlkh
MongoDB Enterprise rs01:PRIMARY> show collections
account
customer
MongoDB Enterprise rs01:PRIMARY> db.account.count()
200000
MongoDB Enterprise rs01:PRIMARY> db.customer.count()
200000
MongoDB Enterprise rs01:PRIMARY> █
    
```

Figure 8 400000 lines of data

Source: HMT company

## 7. Conclusions

MongoDB database system is an inevitable trend, the integration of Vietnam’s information technology industry with the world, the application of MongoDB database model plays a huge role in the development of the industry. construction in Vietnam.

The MongoDB database model brings speed and convenience in storing, managing and securing user information.

The MongoDB database system is increasingly perfected and helps the application of the MongoDB database model become more popular for high-tech projects.

For education and training, the MongoDB database model has become a widely used model and is included in project implementation in almost all businesses, large banks, etc.

It is necessary to introduce the MongoDB database model into official teaching at universities with majors in information technology, computer science, software technology and other infrastructure industries.

## REFERENCES

Central Executive Committee (2013). *Resolution No. 29-NQ/TW dated November 4, 2013 on fundamental and comprehensive innovation of education and training, meeting the*

- requirements of industrialization and modernization in the context of a socially oriented market economy internationalism and integration.*
- Decision No. 131/QD-TTg of the Prime Minister: Approving the Project “*Strengthening the application of information technology and digital transformation in education and training in the period 2022 - 2025, oriented to 2030*”.
- Decision No. 4740/QD-BGDDT dated December 30, 2022 *Promulgating a set of indicators and criteria for evaluating digital transformation of higher education institutions.*
- Decision No. 17/NQ-CP on *a number of key tasks and solutions for e-government development in the 2019-2020 period, orientation to 2025.*
- Decision No. 749/QD-TTg on Approving the “*National digital transformation program to 2025, orientation to 2030*”.
- Khoa Nguyen, *Advantages and disadvantages of MongoDB*, 2019.
- Khoa Nguyen, *Thinks you need to know about MongoDB*, 2019.
- Kiên Nguyen, *How to create VMware Workstation virtual machine on Windows*, 2022
- LANIT JSC, *Instructions for Installing LINUX Operating System on PC and Virtual Machine*, 2023.
- MongoDB, Inc., *What Is MongoDB? NoSQL database system*, 2023.
- MongoDB, Inc., *MongoDB Architecture, Database model*, 2023.
- MongoDB, Inc., *Install and Config MongoDB*, 2023.
- MongoDB, Inc., *Convert a Standalone mongod to a Replica Set, Install and Config Standalone for MongoDB Model*, 2023.
- MongoDB, Inc., *Add Members to a Replica Set, Set Priority*, 2023.
- Nguyen Hong Tan, *Setup Replica set in MongoDB, Replication Model, Failover Model*, 2019.
- Nguyen Van Hien, *MongoDB Overview, Advantages of MongoDB over relational databases (RDBMS)*, 2016.
- Nguyen Quoc Viet, *Instructions for installing and using MongoDB, Basic MongoDB commands*, 2023.
- Trinh Quoc Viet, *System architecture of mongodb, Replication, Failover, Architecture Sharding*, 2023.