NOSQL DATABASES

Introduction to NoSQL Data Models & MongoDB

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NoSQL Databases

NoSQL databases are <u>non-relational</u> databases designed for <u>flexible</u>, <u>scalable</u> storage of structured, semi-structured, or unstructured data.

NOSQL TYPES

Q1
Document Store

(e.g., MongoDB, CouchDB):
Stores data as JSON-like documents. Good for flexible and nested data.

Q2
Key-Value Store

(e.g., Redis, DynamoDB):
Very simple: a key and its value. Super fast lookups.

Q3
Column Store

(e.g., Cassandra, HBase):
Data stored in columns instead of rows. Great for analytics on big datasets.

Q4
Graph Database

(e.g., Neo4j, ArangoDB):
Stores nodes and relationships. Best for complex relationships (like social networks).

WHAT IS MONGODB?

WHAT DIFFERENTIATES?

Data Format	Documents are stored in ***BSON*** (Binary JSON) format. BSON takes the same structure as JSON but converts it into binary, making it faster for computers to parse and store.
Collections	Documents are grouped into collections (like tables in SQL).
Flexible Schema	Fields can vary across documents; ***no need to predefine a structure.***

DATATYPES

TYPE	DESCRIPTION	EXAMPLE
String	Text data	"name": "Alice"
Integer	Whole numbers (32-bit or 64-bit)	"age": 25
Double	Decimal numbers (floating point)	"price": 19.99
Boolean	True or false values	"isActive": true

DATATYPES

TYPE	DESCRIPTION	EXAMPLE
Array	List of values	"skills": ["JS", "Python"]
Embedded Document	A nested document (JSON inside JSON)	"address": { "city": "NY" }
Null	Represents no value	"middleName": null
ObjectId	A unique ID generated automatically for each document	"_id": ObjectId("507f...")
Date	Date and time	"createdAt": ISODate("2024-04-26T12:00:00Z")

DATA MODELING

MongoDB is schema-less (flexible), you choose how to organize the data depending on what your application needs.

1. Embedding (Denormalization)

- Put related data inside the same document.
- Best when the related data is mostly read together.

✅ Faster reads
✅ Fewer queries
❌ Document size limit (16MB)

Users Collection

```
{
 "name": "Alice",
 "orders": [
  { "product": "Laptop", "price": 1200 },
  { "product": "Phone", "price": 700 }
 ]
}
```

DATA MODELING

MongoDB is schema-less (flexible), you choose how to organize the data depending on what your application needs.

2. Referencing (Normalization)

- Store related data in different documents and link them using IDs.
- Best when related data changes often or is very large.

✅ Smaller documents
✅ Better for complex, growing data
❌ Requires extra queries (joins)

Users Collection

```
{ "_id": ObjectId("user1"), "name": "Alice" }
```

Products Collection

```
{ "userId": ObjectId("user1"), "product":
"Laptop", "price": 1200 }
```

DATABASE QUERIES

Create / Switch Database	Show all Databases	Drop Database
use databaseName	**show databases**	**db.dropDatabase()**

COLLECTION CRUD

Create Collection (manually)	Show Collections	Drop Collection
db.createCollection(“C1”)	**show collections**	**db.collectionName.drop()**

DOCUMENT (OBJECT) CRUD

Insert One Document

```
db.collName.insertOne({
field: value
})
```

Insert Many Documents

```
db.collectionName.insert
Many([{...}, {...}])
```

Find All Documents

```
db.collectionName.find()
```

Find with Condition

```
db.collectionName.find({
field: value })
```

Update One Document

```
db.cName.updateOne(
{ filter },
{$set: { field: newValue }}
)
```

Update Many Document

```
db.cName.updateMany(
{ filter },
{$set: { field: newValue
}} )
```

Delete One Document

```
db.cName.deleteOne(
{ filter }
)
```

Delete Many Document

```
db.cName.deleteMany(
{ filter }
)
```