

MongoDB



mongoDB®

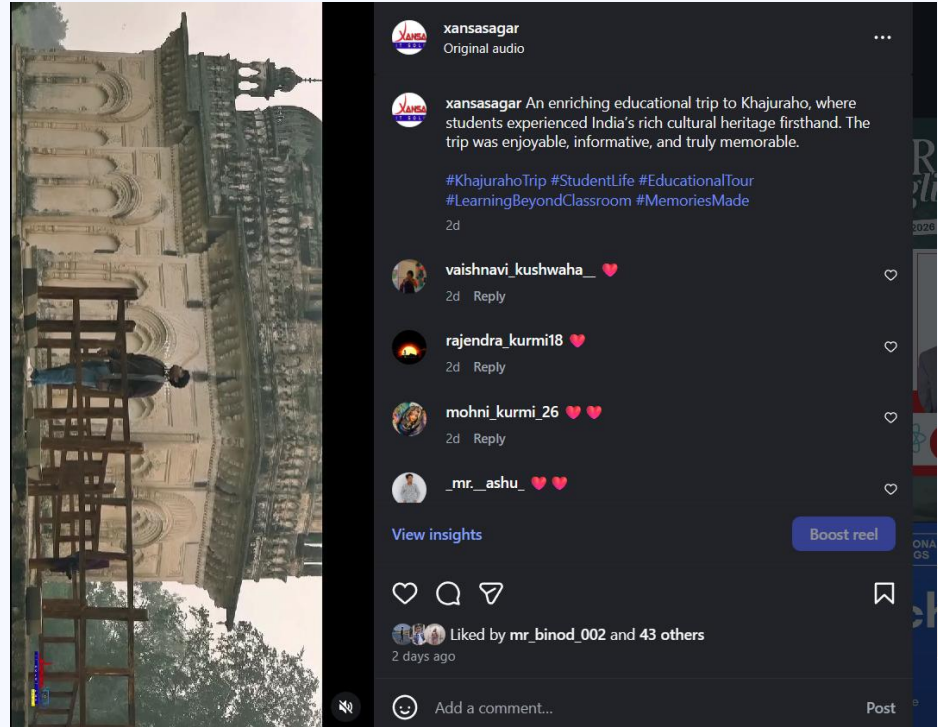
Session I – MongoDB Architecture & Core Concepts



Understanding How MongoDB Stores and Manages Data

The use case

Consider this post



How RDBMS reads it?

```
CREATE TABLE users (  
    user_id INT PRIMARY KEY AUTO_INCREMENT,  
    username VARCHAR(50) UNIQUE NOT NULL,  
    display_name VARCHAR(100),  
    profile_image VARCHAR(255)  
);
```

```
CREATE TABLE media (  
    media_id INT PRIMARY KEY AUTO_INCREMENT,  
    post_id INT,  
    media_type VARCHAR(20),  
    media_url VARCHAR(255),  
    audio VARCHAR(100),  
    orientation VARCHAR(20),  
    FOREIGN KEY (post_id) REFERENCES posts(post_id)  
);
```

```
post_id INT,  
hashtag_id INT,  
PRIMARY KEY (post_id, hashtag_id),  
FOREIGN KEY (post_id) REFERENCES posts(post_id),  
FOREIGN KEY (hashtag_id) REFERENCES hashtags(hashtag_id)
```

```
CREATE TABLE posts (  
    post_id INT PRIMARY KEY AUTO_INCREMENT,  
    user_id INT,  
    platform VARCHAR(20),  
    post_type VARCHAR(20),  
    caption TEXT,  
    visibility VARCHAR(20),  
    created_at DATETIME,  
    updated_at DATETIME,  
    FOREIGN KEY (user_id) REFERENCES users(user_id)  
);
```

```
CREATE TABLE hashtags (  
    hashtag_id INT PRIMARY KEY AUTO_INCREMENT,  
    hashtag VARCHAR(50) UNIQUE  
);
```

How RDBMS reads it?

```
SELECT
  p.post_id,
  p.platform,
  p.post_type,
  p.visibility,
  p.created_at,

  -- Post Owner
  u.username
  u.display_name,

  -- Caption
  p.caption,

  -- Media
  m.media_type,
  m.media_url,
  m.audio,
  m.orientation,

  -- Hashtags
  h.hashtag,

  -- Likes
  l.username
  l.liked_at,

  -- Comments
  c.comment_id,
  c.username
  c.comment,
  c.comment_at
```

```
JOIN users u
  ON p.user_id = u.user_id

-- Media attached to post
JOIN media m
  ON p.post_id = m.post_id

-- Hashtags (many-to-many)
LEFT JOIN post_hashtags ph
  ON p.post_id = ph.post_id

LEFT JOIN hashtags h
  ON ph.hashtag_id = h.hashtag_id

-- Likes (one-to-many)
LEFT JOIN likes l
  ON p.post_id = l.post_id

-- Comments (one-to-many)
LEFT JOIN comments c
  ON p.post_id = c.post_id

WHERE p.post_id = 1

ORDER BY
  p.created_at DESC,
  c.comment_at ASC;
```

NSA



IT SOLUTIONS

simolifuina IT

Enter MongoDB

How MongoDB reads it?

```
{
  "_id": ObjectId("65b8f2c9e1a9a00123abcd01"),

  "platform": "Instagram",
  "postType": "reel",

  "author": {
    "username": "xansasagar",
    "displayName": "Xansa IT Solutions",
    "profileImage": "xansa_logo.png"
  },

  "caption": "An enriching educational trip to Khajuraho, where students experienced India's rich

  "hashtags": [
    "KhajurahoTrip",
    "StudentLife",
    "EducationalTour",
    "LearningBeyondClassroom",
    "MemoriesMade"
  ],

  "media": {
    "type": "video",
    "url": "khajuraho_reel.mp4",
    "audio": "Original audio",
    "orientation": "vertical"
  },
}
```


MongoDB Ecosystem

- MongoDB Server
 - Core database engine responsible for storing, retrieving, and managing data securely
- MongoDB Shell (mongosh)
 - Command-line interface used to execute queries, manage databases, and perform administrative tasks
- MongoDB Compass
 - Graphical tool that allows users to visually explore databases, collections, documents, and indexes

MongoDB Ecosystem

- MongoDB Atlas
 - Fully managed cloud MongoDB service providing scalability, security, backups, and global access
- MongoDB Drivers
 - Language-specific libraries (Java, Node.js, PHP, Python, etc.) that enable applications to communicate with MongoDB

Database in MongoDB

- A database is a logical container used to organize collections.
- Each MongoDB server can host multiple databases.
- A database groups related data for a specific application.
- Databases do not store data directly
- Data is stored inside collections within a database

Collection in MongoDB

- A collection is a group of related documents
- Collections are similar to tables in relational databases
- A collection exists inside a database
- Collections do not require a fixed structure or predefined schema
- Documents within a collection can have different fields

Document in MongoDB

- A document is the basic unit of data in MongoDB
- Documents are stored in BSON format
- Data is represented as key-value pairs
- Each document represents a single record
- Documents within the same collection can have different structures

```
{  
  "_id": ObjectId("..."),  
  "name": "Rahul",  
  "course": "MongoDB",  
  "fees": 4000  
}
```

Example of a document:

Fields and `_id`

- Fields are individual data elements within a document
- Each field consists of a key and a value
- The `_id` field is a unique identifier for every document
- MongoDB automatically generates the `_id` field if not provided
- The `_id` field acts as the primary key of a document
- No two documents in a collection can have the same `_id`

Schema Flexibility in MongoDB

- MongoDB is schema-less, which means documents in a collection can have different structures
- Fields can be added, removed, or modified without affecting other documents
- This flexibility allows easy adaptation to changing requirements
- Example:
 - Student A \rightarrow { "name", "course" }
 - Student B \rightarrow { "name", "course", "email", "phone" }
- Flexible schema eliminates the need for complex ALTER TABLE operations
- Ideal for applications where data structure evolves over time

Embedded Documents and Arrays

- Documents in MongoDB can contain nested documents (embedded documents) and arrays
- Embedded documents allow storing related data within a single document
- Arrays can store multiple values for a single field

Embedded Documents and Arrays

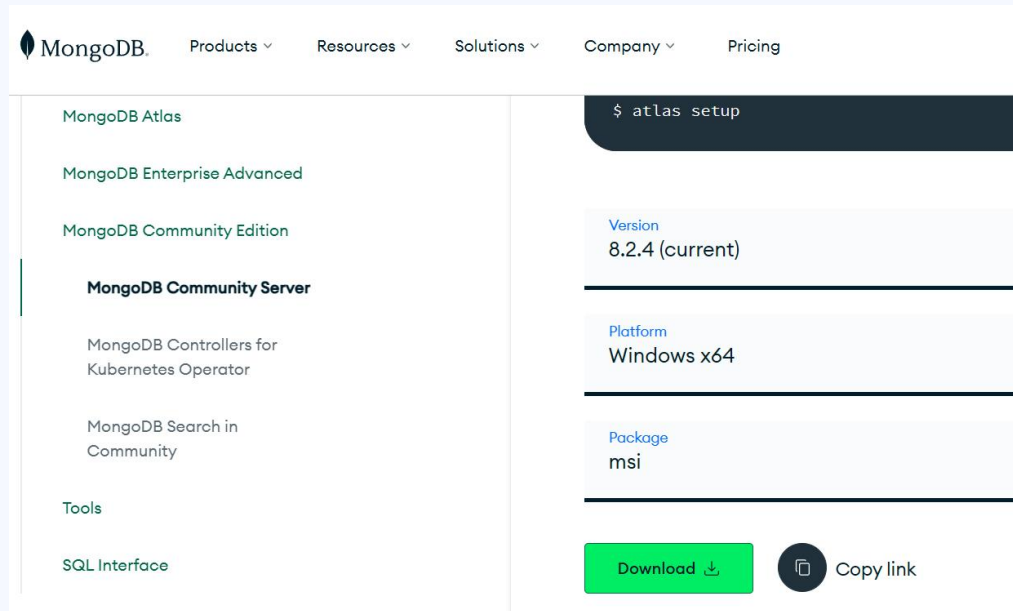
- Example:
- Benefits
 - Related data is stored together
 - Reduces the need for joins
 - Improves read performance

```
{  
  "name": "Rahul",  
  "courses": ["MongoDB", "Java", "Python"],  
  "address": {  
    "city": "Delhi",  
    "zip": "110001"  
  }  
}
```

Installation

Download & Install MongoDB Community Edition

- 1. Open <https://www.mongodb.com/try/download/community>



Download & Install MongoDB Community Edition

MongoDB 8.2.4 2008R2Plus SSL (64 bit) Service Customizati...

Service Configuration

Specify optional settings to configure MongoDB as a service.

☒ Install MongoDB as a Service

☒ Run service as Network Service user

☐ Run service as a local or domain user:

Account Domain:

Account Name:

Account Password:

Service Name:

Data Directory:

Log Directory:


< Back Next > Cancel

MongoDB 8.2.4 2008R2Plus SSL (64 bit) Setup

Installing MongoDB 8.2.4 2008R2Plus SSL (64 bit)

Please wait while the Setup Wizard installs MongoDB 8.2.4 2008R2Plus SSL (64 bit).

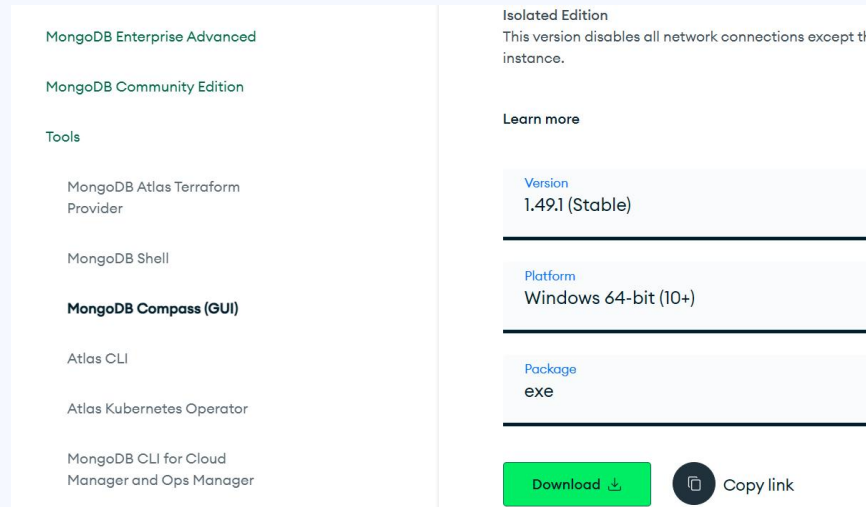
Status: Installing MongoDB Compass... (this may take a few minutes)



Back Next Cancel

Download & Install MongoDB Compass (If Required)

- 1. Open <https://www.mongodb.com/try/download/compass>



The screenshot shows the MongoDB download page for Compass. On the left, there is a sidebar with links to 'MongoDB Enterprise Advanced', 'MongoDB Community Edition', 'Tools', and a list of products including 'MongoDB Atlas Terraform Provider', 'MongoDB Shell', 'MongoDB Compass (GUI)', 'Atlas CLI', 'Atlas Kubernetes Operator', and 'MongoDB CLI for Cloud Manager and Ops Manager'. The main content area on the right is titled 'Isolated Edition' and states 'This version disables all network connections except the instance.' Below this, there is a 'Learn more' link. The download details are presented in three sections: 'Version' (1.49.1 (Stable)), 'Platform' (Windows 64-bit (10+)), and 'Package' (exe). At the bottom of the details section, there are two buttons: a green 'Download' button with a download icon and a dark grey 'Copy link' button with a copy icon.

MongoDB Enterprise Advanced

MongoDB Community Edition

Tools

MongoDB Atlas Terraform Provider

MongoDB Shell

MongoDB Compass (GUI)

Atlas CLI

Atlas Kubernetes Operator

MongoDB CLI for Cloud Manager and Ops Manager


Isolated Edition
This version disables all network connections except the instance.


Learn more

Version
1.49.1 (Stable)

Platform
Windows 64-bit (10+)

Package
exe

Download 

 Copy link

Compass

- *Create a new connection*



Compass



{ } My Queries

🔗 Data Modeling

CONNECTIONS



Search connections



You have not connected to any deployments.

+ Add new connection

Create a connection

mongodb:// → MongoDB protocol

localhost → MongoDB is running on your own computer

27017 → Default MongoDB port



Connection name



New Connection

Manage your connection settings

URI ⓘ Edit Connection String ☒

mongodb://localhost:27017/

Name

MyConnection

Color

No Color ▼

☐ **Favorite this connection**
Favoriting a connection will pin it to the top of your list of connections

Inbuilt/Default Databases

- *admin*
 - Authentication & authorization
 - User and role management
 - Administrative commands
- *local*
 - Stores instance-specific data
 - Data is NOT replicated
- *config*
 - Stores sharding and cluster metadata
 - Used mainly in sharded clusters

These databases:

- Are created automatically
- Should NOT be modified manually
- Are managed internally by MongoDB

CONNECTIONS (1)

Search connections

▼ MyConnection

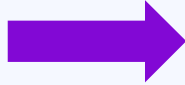
- ▶  admin
- ▶  config
- ▶  local

Create Database

- Name of the database



- Name of the collection



(MongoDB requires at least one collection to create a database)

Create Database

Database Name

db1

Collection Name

products

☐ Time-Series

Time-series collections efficiently store sequences of measurements over a period of time. [Learn More](#)

Cancel

Create Database

Thank You
