

Unit 1: Introduction to Databases

1.1 Introduction to Databases

- **What is a Database?**

- A database is a collection of organized data that can be easily accessed, managed, and updated.
- • Example: Library catalog.

- **Why use a Database?**

- - Efficient data storage.
- - Easy retrieval and updates.
- - Ensures consistency and security.



1.2 Overview of DBMS

- **What is a DBMS?**

- Software to create, manage, and use databases.
- Examples: MySQL, MongoDB, Oracle DB.

- **Key Functions:**

- - Store, retrieve, and update data.
- - Handle multiple users.
- Real-life Example: Banking systems for account tracking.

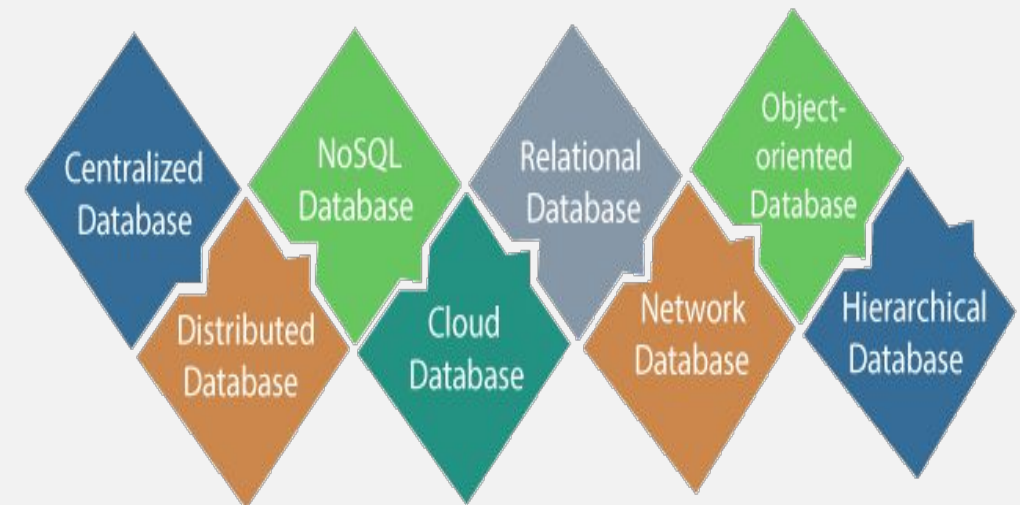
1.3 Types of Databases: RDBMS

- **Relational Databases:**

- - Data stored in tables (rows and columns).
- - Use SQL (Structured Query Language).
- Example: MySQL, PostgreSQL.

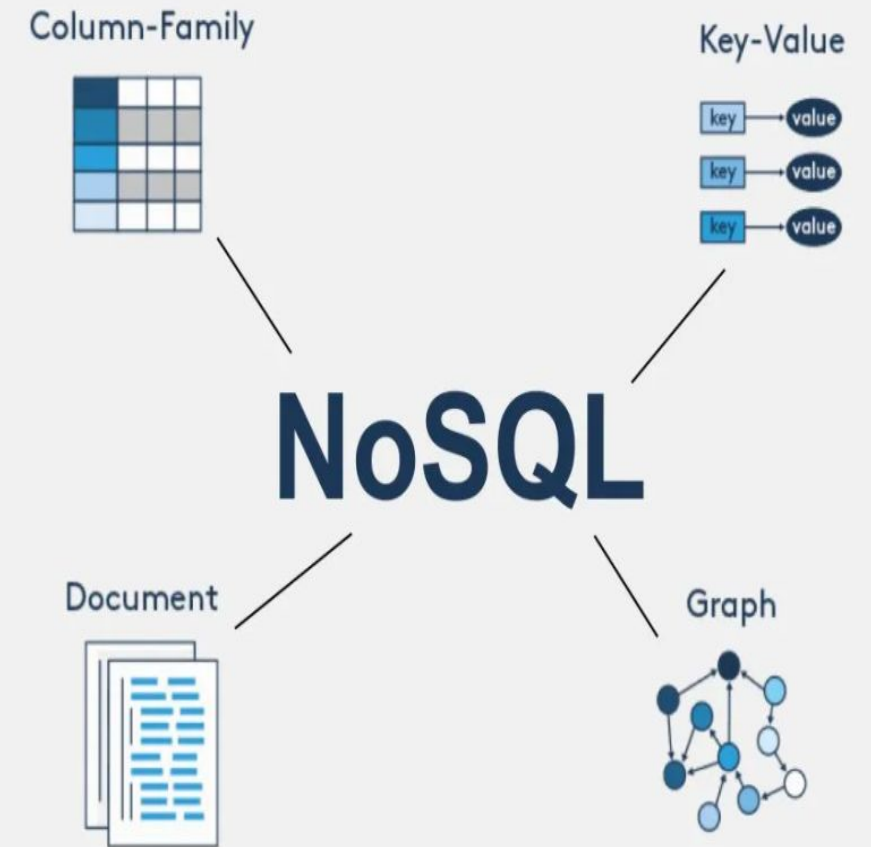
- **Simple Example:**

- | ID | Name | Age |
- |----|-----|-----|
- | 1 | Alice | 20 |
- | 2 | Bob | 22 |

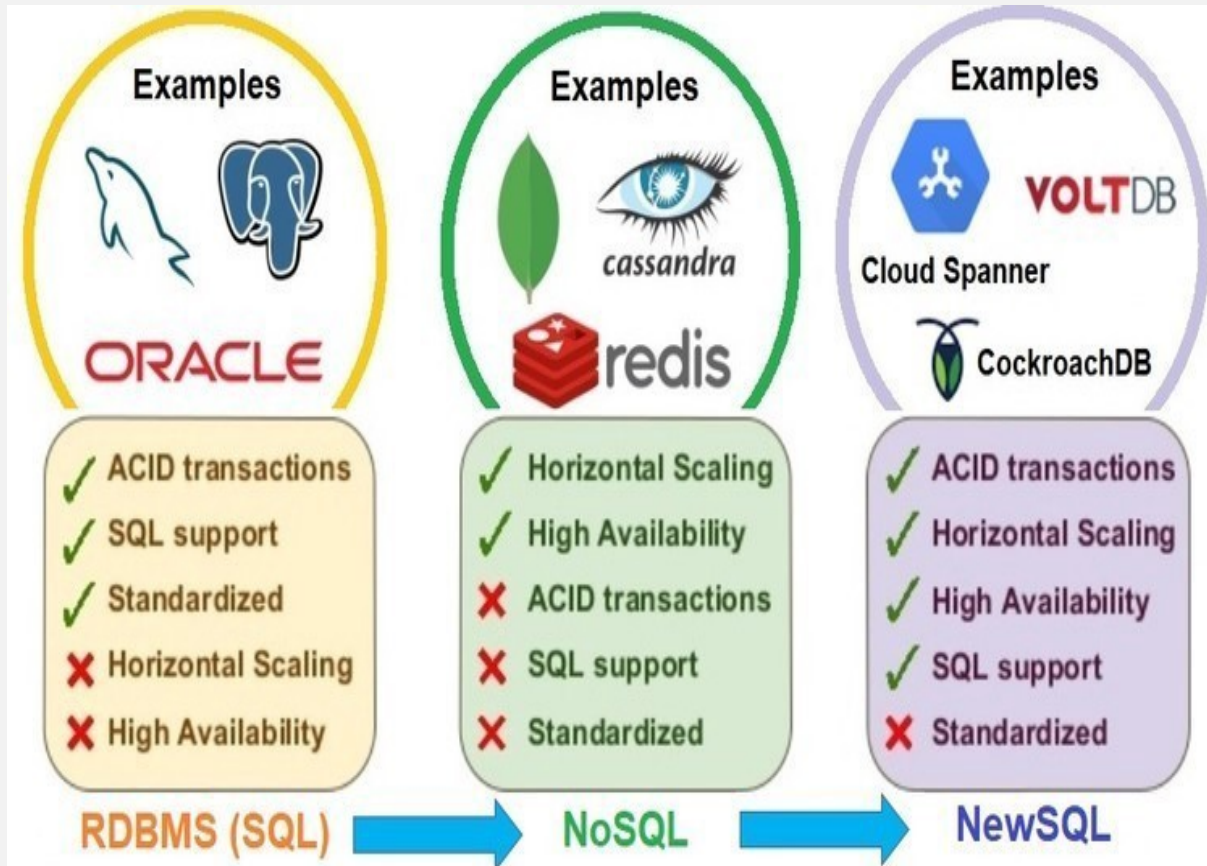


1.4 NoSQL Databases

- Handles unstructured/semi-structured data.
- Types: Key-value, document, graph.
- **Example (MongoDB Document):**
 - {
 - "ID": 1,
 - "Name": "Alice",
 - "Age": 20
 - }



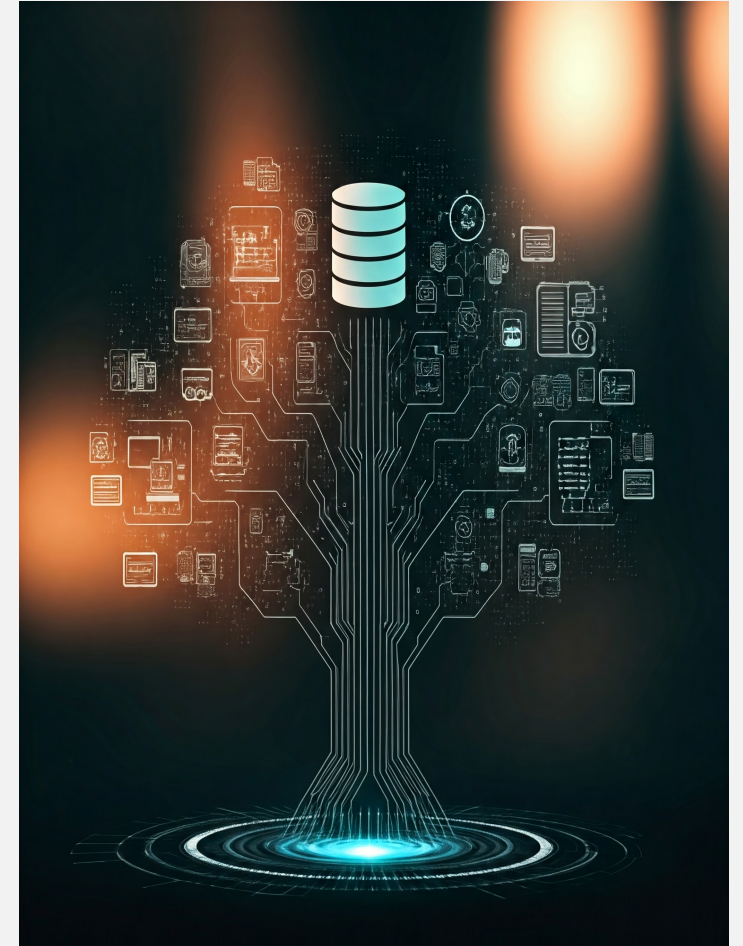
1.5 NewSQL Databases



- Combines RDBMS and NoSQL features.
- Scalable and consistent.
- Example: CockroachDB.

2.1 Evolution and Trends

- **Evolution:**
 - - 1970s: Relational databases emerged.
 - - 2000s: NoSQL for Big Data.
 - - 2010s: NewSQL introduced.
- **Trends:**
 - - Cloud-based databases.
 - - AI and ML for optimization.
 - - Multi-model databases.



3.1 Foundations of MongoDB

- A NoSQL database storing JSON-like documents.
- Flexible and scalable.

- **Key Features:**

- Schema-less (no fixed structure).
- Handles unstructured data.

- **Example:**

```
{  
  "Name": "Alice",  
  "Email": "alice@example.com",  
  "Interests": ["Reading", "Travel"]  
}
```


3.1 MongoDB Architecture and Components

- Database > Collections > Documents.
- Example:
 - Database: School
 - Collection: Students
 - Document: { "Name": "Alice", "Age": 20 }
- Replication: Multiple copies for high availability.
- Sharding: Distributes data across servers.

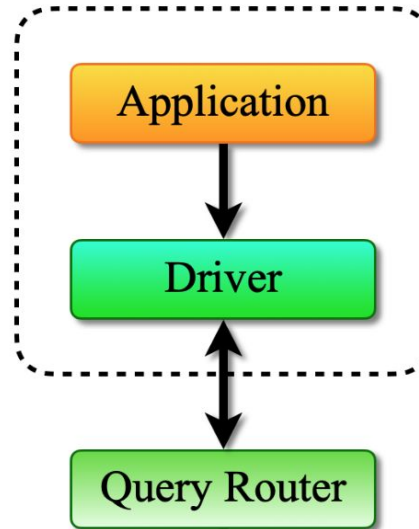


2. Native language drivers

```
db.customer.insert({...})
db.customer.find({
  name: "Raj Kumar"})
```

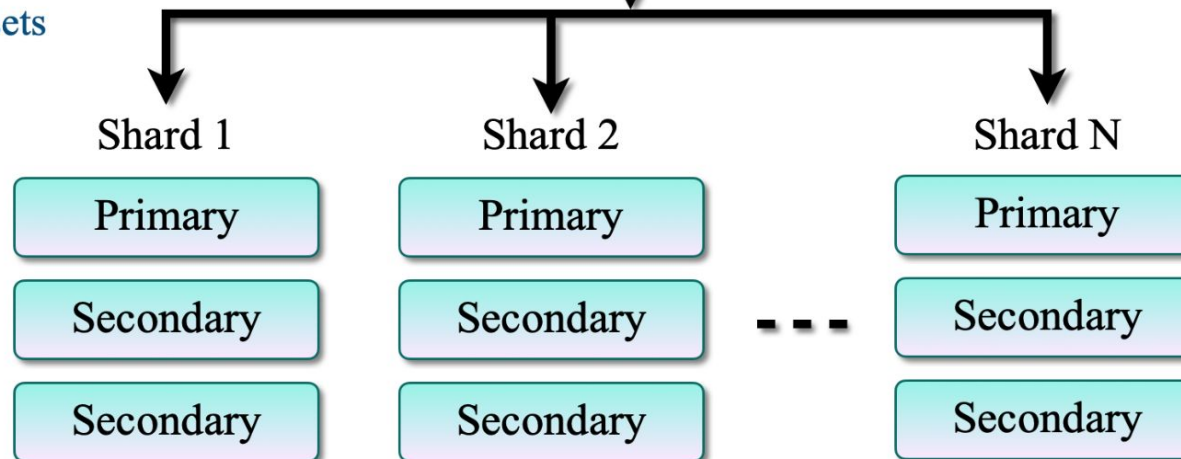
1. Dynamic Document Schema

```
{ name: "Raj Kumar",
  date: "2011-07-18",
  address: "2nd Floor.",
  phone: [
    { home: 1234567890},
    { mobile: 1234567890} ]
}
```



3. High availability

- Replica sets



4. High Performance

- Data locality
- Rich Indexes
- RAM

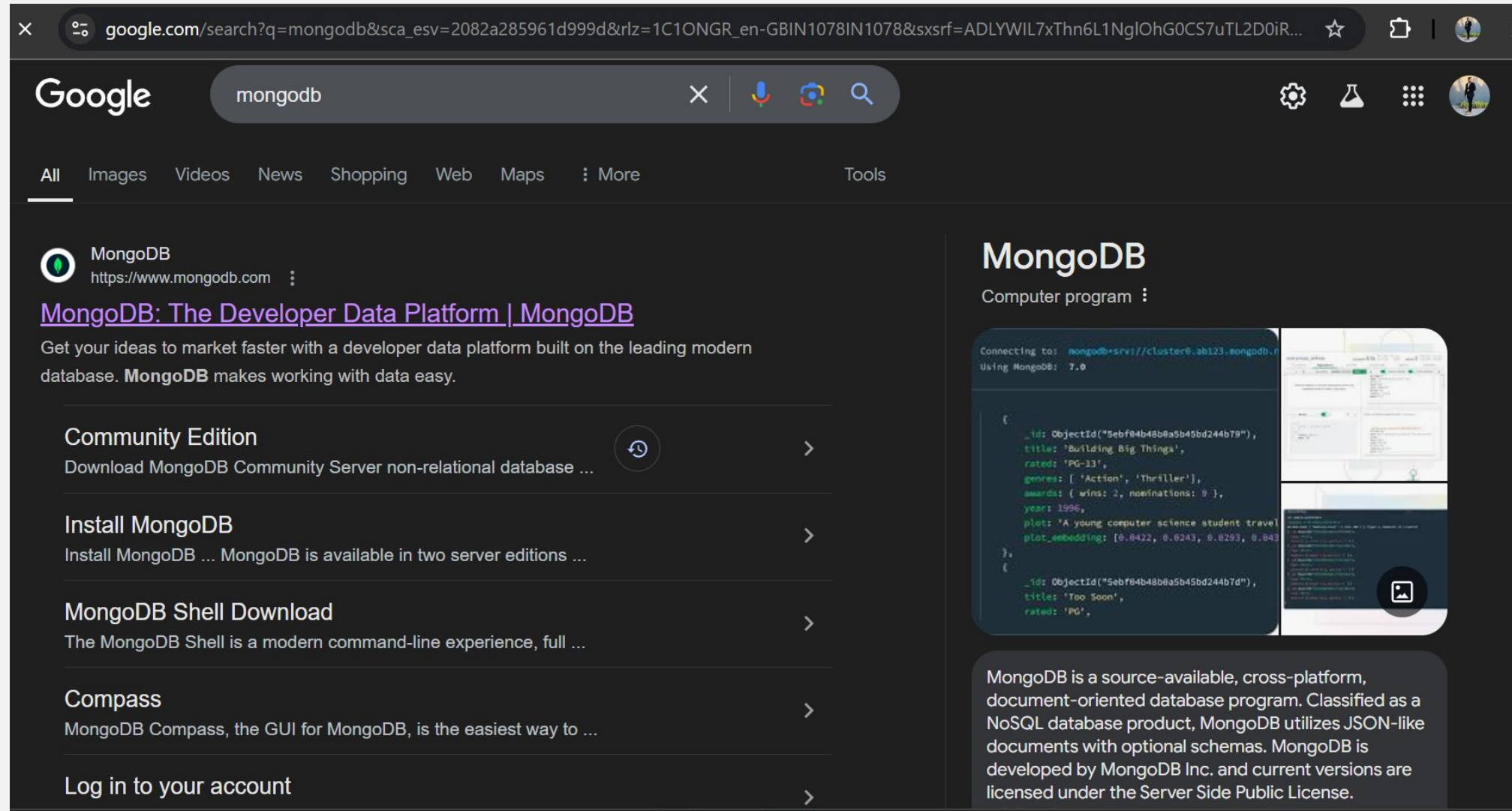
5. Horizontal Scalability

- Sharding

4.1 Installation and Setup of MongoDB

- **Steps:**
 1. Download MongoDB.
 2. Install the package.
 3. Start server: ``mongod``.
 4. Use shell: ``mongo``.
- **Example Commands:**
 - Start server: ``mongod``
 - Insert data: `db.students.insert({...})`
 - Retrieve data: `db.students.find()`

4.1 Installation and Setup of MongoDB



The screenshot shows a Google search for 'mongodb'. The search results page is displayed with a dark theme. The top navigation bar includes the Google logo, the search bar with 'mongodb' entered, and various icons for settings, voice search, and more. Below the navigation bar, there are tabs for 'All', 'Images', 'Videos', 'News', 'Shopping', 'Web', 'Maps', and 'More'. The search results for 'MongoDB' are shown, including the official MongoDB website link, a description of MongoDB as a developer data platform, and several links to download MongoDB, install MongoDB, download the MongoDB Shell, and download MongoDB Compass. On the right side of the search results, there is a 'MongoDB Computer program' section with a preview image showing a code editor with MongoDB connection details and a JSON document.

google.com/search?q=mongodb&sca_esv=2082a285961d999d&rlz=1C1ONGR_en-GBIN1078IN1078&sxsrf=ADLYWIL7xThn6L1NgIOhG0CS7uTL2D0iR...

Google mongodb

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MongoDB
https://www.mongodb.com

[MongoDB: The Developer Data Platform | MongoDB](#)

Get your ideas to market faster with a developer data platform built on the leading modern database. **MongoDB** makes working with data easy.

Community Edition
Download MongoDB Community Server non-relational database ...

Install MongoDB
Install MongoDB ... MongoDB is available in two server editions ...

MongoDB Shell Download
The MongoDB Shell is a modern command-line experience, full ...

Compass
MongoDB Compass, the GUI for MongoDB, is the easiest way to ...

Log in to your account

MongoDB
Computer program

Connecting to: mongodb+srv://cluster0.ab123.mongodb.net
Using MongoDB: 7.0

```
{
  "_id": ObjectId("5ebf84b48b8a5b45bd244b79"),
  "title": "Building Big Things",
  "rated": "PG-13",
  "genres": [ "Action", "Thriller" ],
  "awards": { wins: 2, nominations: 0 },
  "year": 1996,
  "plot": "A young computer science student travel",
  "plot_embedding": [ 0.8422, 0.8243, 0.8293, 0.843
},
{
  "_id": ObjectId("5ebf84b48b8a5b45bd244b7d"),
  "title": "Too Soon",
  "rated": "PG",
```

MongoDB is a source-available, cross-platform, document-oriented database program. Classified as a NoSQL database product, MongoDB utilizes JSON-like documents with optional schemas. MongoDB is developed by MongoDB Inc. and current versions are licensed under the Server Side Public License.

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 **Stream Processing**
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 **Community Edition**
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TOOLS

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Integrations with third-party services

 **Relational Migrator**
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MongoDB Enterprise Advanced

MongoDB Community Edition

MongoDB Community Server

MongoDB Community

Kubernetes Operator

Tools

Atlas SQL Interface

Mobile & Edge

The database is also offered as a fully-managed service with **MongoDB Atlas**. Get access to advanced functionality such as auto-scaling, serverless instances, full-text search, and data distribution across regions and clouds. Deploy in minutes on AWS, Google Cloud, and/or Azure, with no downloads necessary.

Give it a try with a **free, highly-available 512 MB cluster**, or get started from your terminal with the following two commands:

```
$ brew install mongodb-atlas  
$ atlas setup
```

Version

8.0.3 (current)

Platform

Windows x64

Package

msi

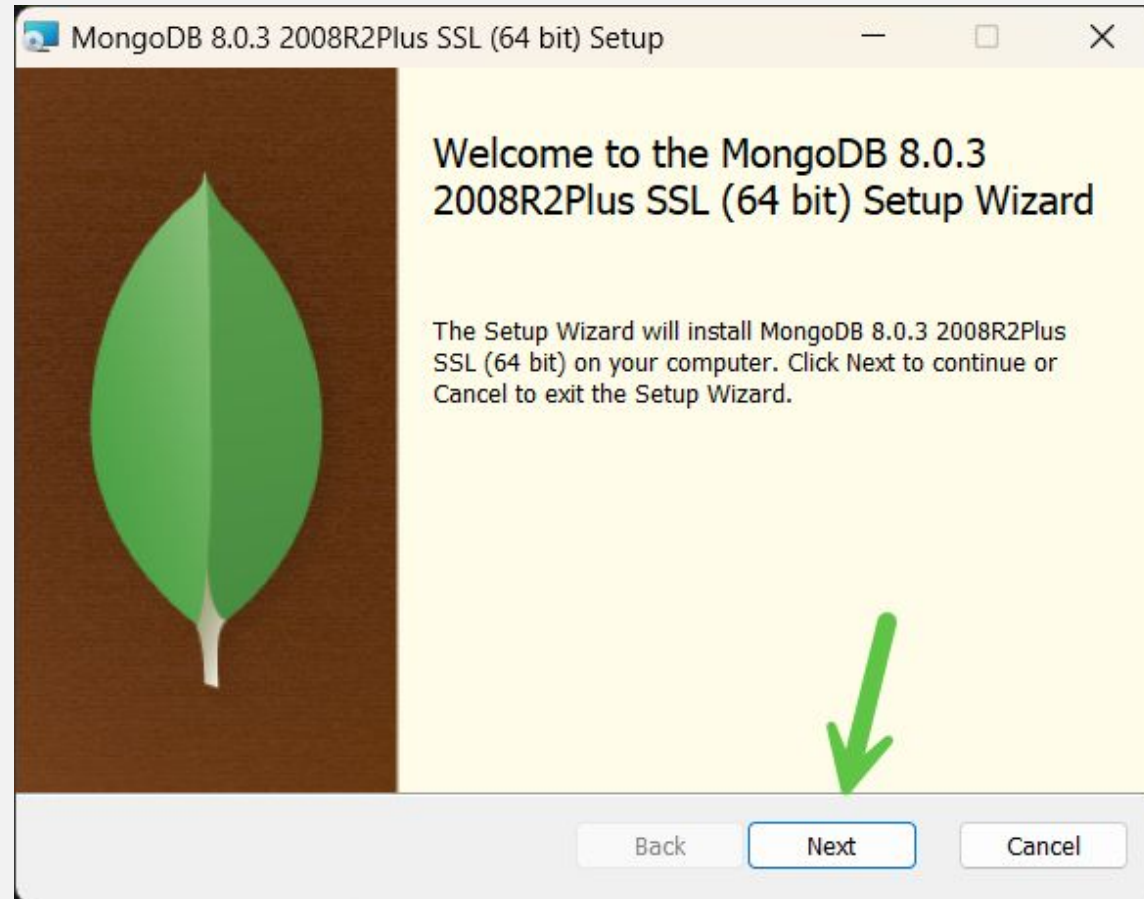
Download

Copy link

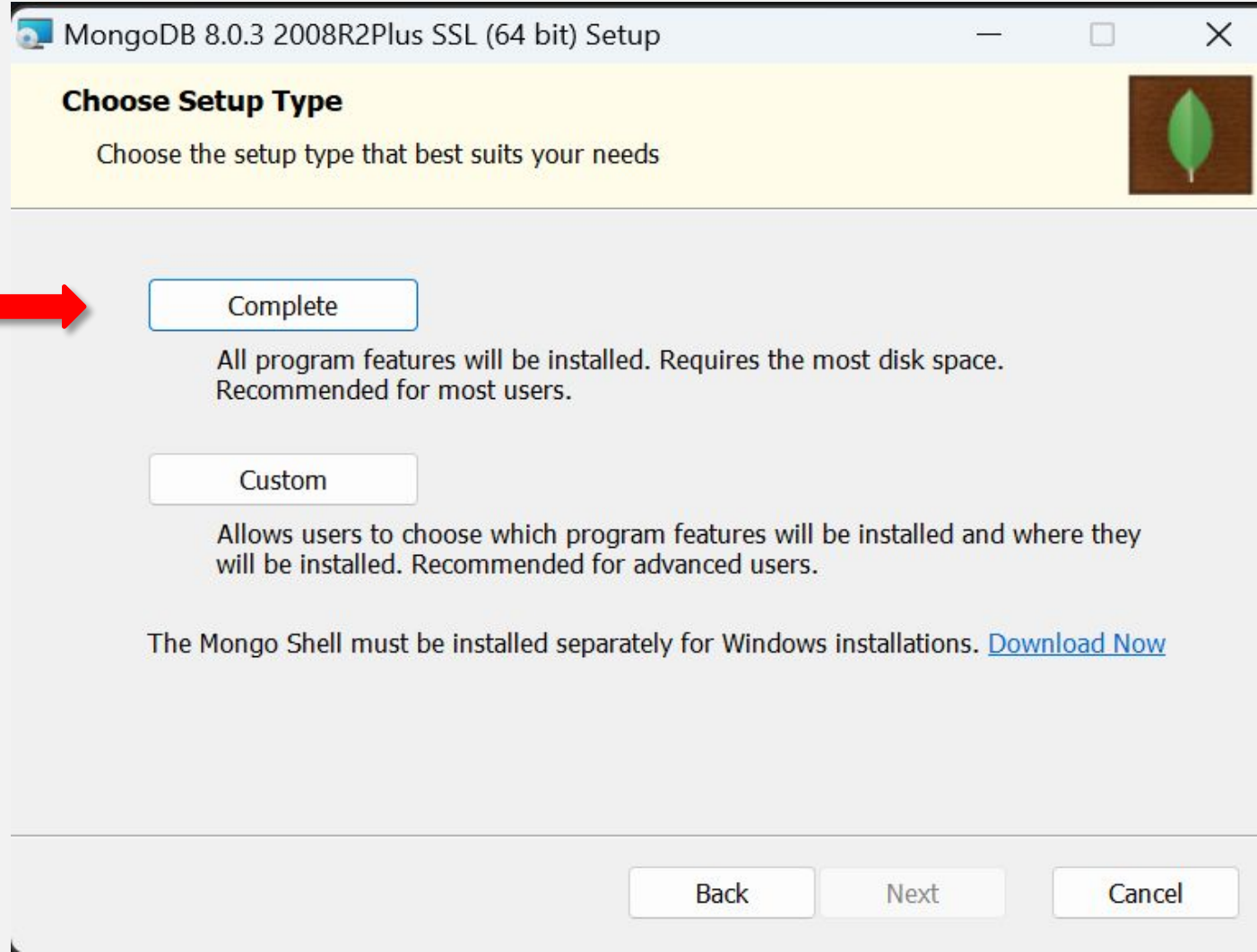
More Options



Downloaded



Let's Install MongoDB



Let's Install MongoDB

Service Configuration

Specify optional settings to configure MongoDB as a service.

☒ Install MongoD 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:

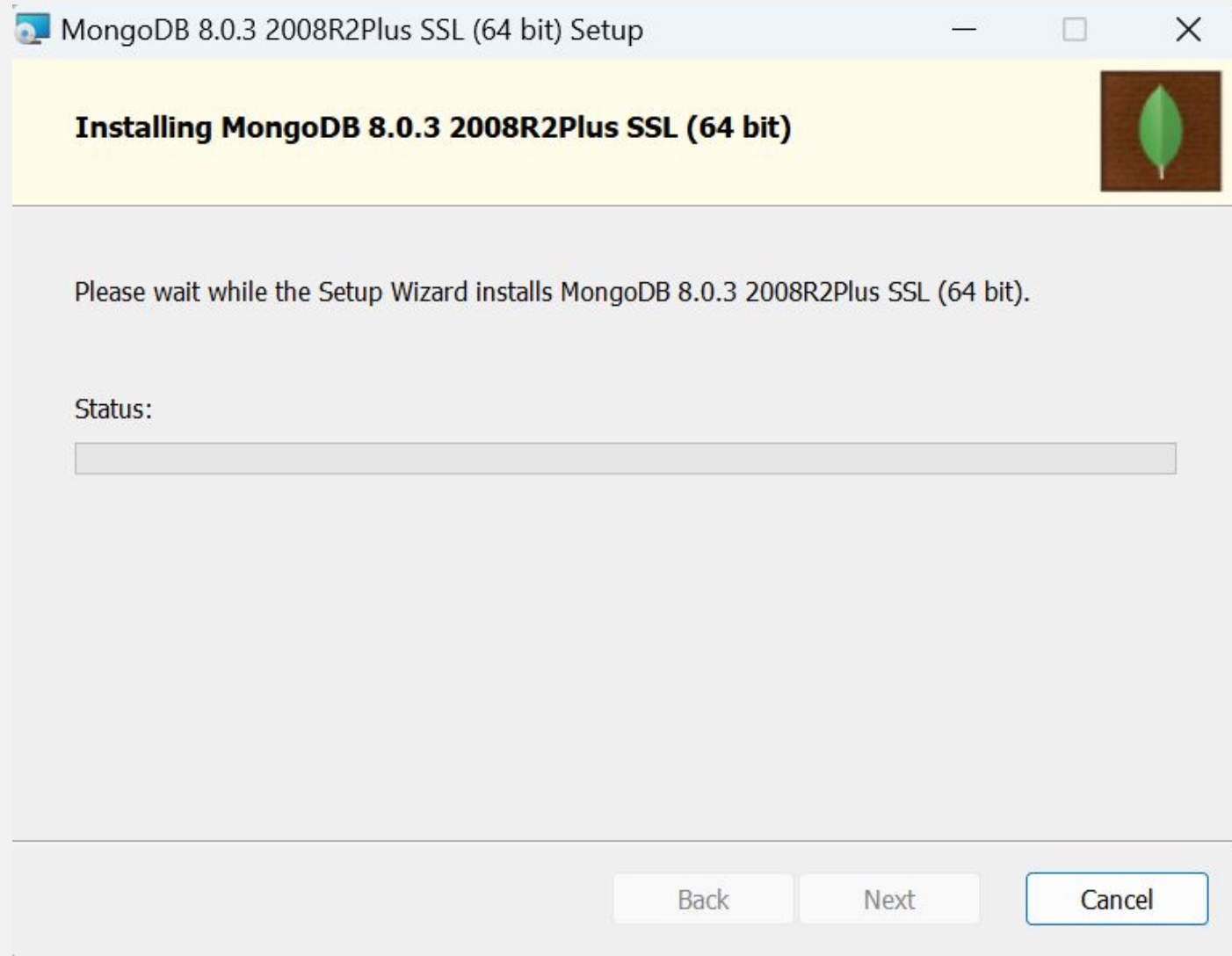
< Back

Next >

Cancel

Click next and then install

Check
Path



Let's open

Clipbo

12

13

14


15

16


17

Slide 16


Best match


 **MongoDBCompass**
App


Apps


 **mongodb-windows-x86_64-4.4.6-signed.msi** >


Search the web

 mongo - See web results >


 mongodb >

 mongodb atlas >

 mongodb download >


 mongodb compass >

Command


 **mongo** >


Documents (1+)


Photos (1+)





MongoDBCompass
App


 Open


 Run as administrator

 Open file location

 Pin to Start

 Pin to taskbar

 Uninstall

 mongo|

Compass

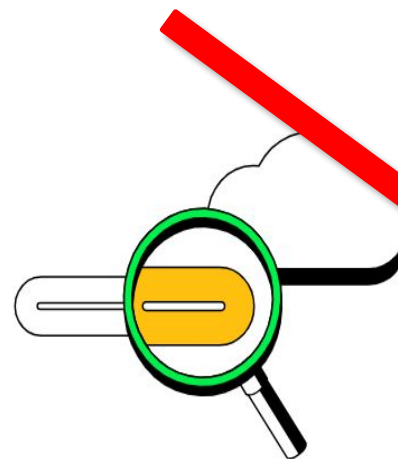
{ } My Queries

CONNECTIONS

You have not connected to any
deployments.

+ Add new connection

Welcome



Welcome to MongoDB Compass

To get started, connect to an existing server or

+ Add new connection**New to Compass and don't have a cluster?**

If you don't already have a cluster, you can create one for free
using [MongoDB Atlas](#)

CREATE FREE CLUSTER

MongoDB Compass

Connect View Help

Compass

New connection +

★ Saved connections

🔄 Recents

localhost:27017
Dec 23, 2022, 10:53 AM

New Connection

Connect to a MongoDB deployment



FAVORITE

URI ⓘ

Edit Connection String ☒

mongodb://localhost:27017

> Advanced Connection Options

Save

Save & Connect

Connect

New to Compass and don't have a cluster?

If you don't already have a cluster, you can create one for free using [MongoDB Atlas](#)

Compass



Welcome



My Queries

CONNECTIONS (1)

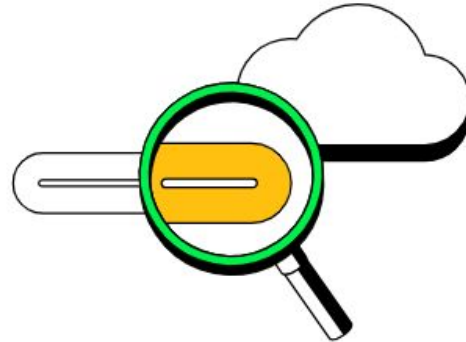


▼ myconn

▶ admin

▶ config

▶ local



Welcome to MongoDB Compass

To get started, connect to an existing server or

[+ Add new connection](#)

New to Compass and don't have a cluster?

If you don't already have a cluster, you can create one for free using [MongoDB Atlas](#)

[CREATE FREE CLUSTER](#)

Compass



Welcome

{ } My Queries

CONNECTIONS (1)



Search connections

▼ myconn



▶ admin

▶ config

▶ local

Create database



CONNECTIONS (1)



Search connections

- myconn
 - admin
 - config
 - local

Create Database



Database Name

Collection Name



Time-Series

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

> Additional preferences (e.g. Custom collation, Capped, Clustered collections)



Before MongoDB can save your new database, a collection name must also be specified at the time of creation. [More Information](#)

Cancel

Create Database



Compass is ready to update to 1.44.7!

RESTART



Create Database ×

Database Name

dbreliance

Collection Name

emp

☐ **Time-Series**

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

➤ **Additional preferences** (e.g. Custom collation, Capped, Clustered collections)

Cancel

Create Database

Compass

{ } My Queries

CONNECTIONS (1)

Search connections

- ▼ myconn
 - ▶ admin
 - ▶ config
 - ▼ dbreliance
 - ▶ emp
 - ▶ local

Welcome

emp

+

myconn > dbreliance > emp

Documents 0

Aggregations

Schema

Indexes 1

Validation



Type a query: { field: 'value' } or [Generate query](#) ✨

+ ADD DATA ▼

EXPORT DATA ▼

UPDATE

DELETE



This collection has no documents

It only takes a few seconds to import data from a CSV file.

Import Data

References

- <https://www.cloudduggu.com/mongodb/introduction/>
- <https://www.geeksforgeeks.org/mongodb-architecture/>
- <https://www.w3schools.com/mongodb/>
- <https://www.techtarget.com/searchdatamanagement/definition/MongoDB>