SESSION 10
MONGODB TOOLS

Learning Objectives

In this session, students will learn to:

- Explain the method to connect MongoDB Compass with MongoDB deployment
- Describe how to use MongoDB Compass to perform the create, insert, update, select, and drop operations in a database
- Explain how to install MongoDB BI Connector
- Describe the process for integrating the MongoDB BI Connector with the MongoDB deployment
- Describe how to connect MongoDB database to BI tools using ODBC drivers

Mongo shell is a command-line interface that can be used to work with MongoDB databases, On the same lines, MongoDB provides MongoDB Compass, a Graphical User Interface (GUI)-based interface to work with databases. Compass can be used to perform all the functions that users can perform using mongo shell.

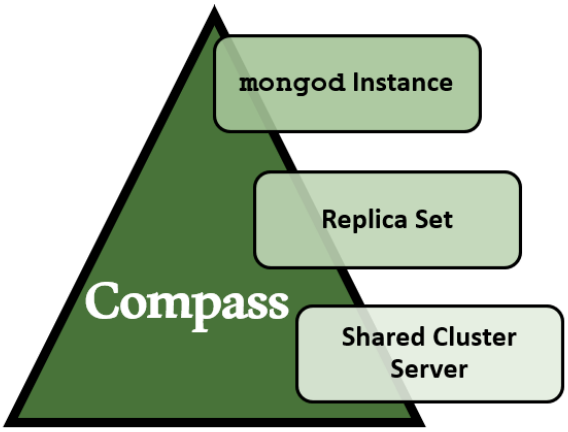
Data in MongoDB databases is often unstructured and expands faster. Consider a social networking application. The number of users and their posts (text, images, and videos) increase manifold in a short span of time. Data

analysts analyze data from these databases and create various reports. Tools used for such analysis can be traditional or modern. To share the data stored in the database to these tools, MongoDB uses Business Intelligence Connector (BI Connector) and Open Database Connectivity (ODBC) drivers.

This session will provide an overview of how to connect Compass with MongoDB deployment. It will explore the methods provided by Compass to perform the create, insert, update, select, and drop operations on database collections. The session will then explain how to install MongoDB BI Connector and connect it with MongoDB deployment. It will also explain how to create a system Data Source Name (DSN) and access MongoDB collection data from within Microsoft Excel.

10.1 Connect MongoDB Compass with MongoDB Deployment

MongoDB Compass is a visual interactive tool that helps the user to manage the documents in the database efficiently. Large volumes of data in MongoDB databases can be grouped and analyzed using Compass. Users can connect to Compass from:



Compass is a free-to-use tool that can run on Linux, Mac, or Windows. To connect Compass with a `mongod` instance:

1. Open the command prompt window.
2. Start the `mongod` instance using the command:

```
mongod
```

Figure 10.1 shows the output of the command.

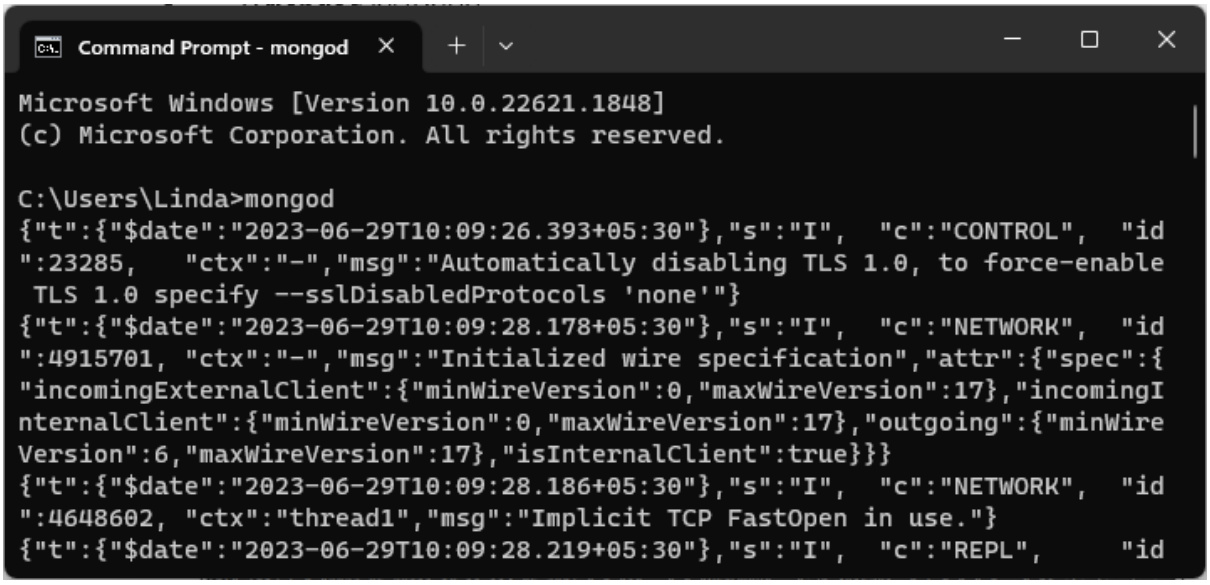


Figure 10.1: Starting a `mongod` Instance

3. To open Compass, click **Start** → **All apps** →.
4. In the list of apps, scroll down and double-click **MongoDBCompass**.

The MongoDB Compass Setup wizard opens as shown in Figure 10.2.

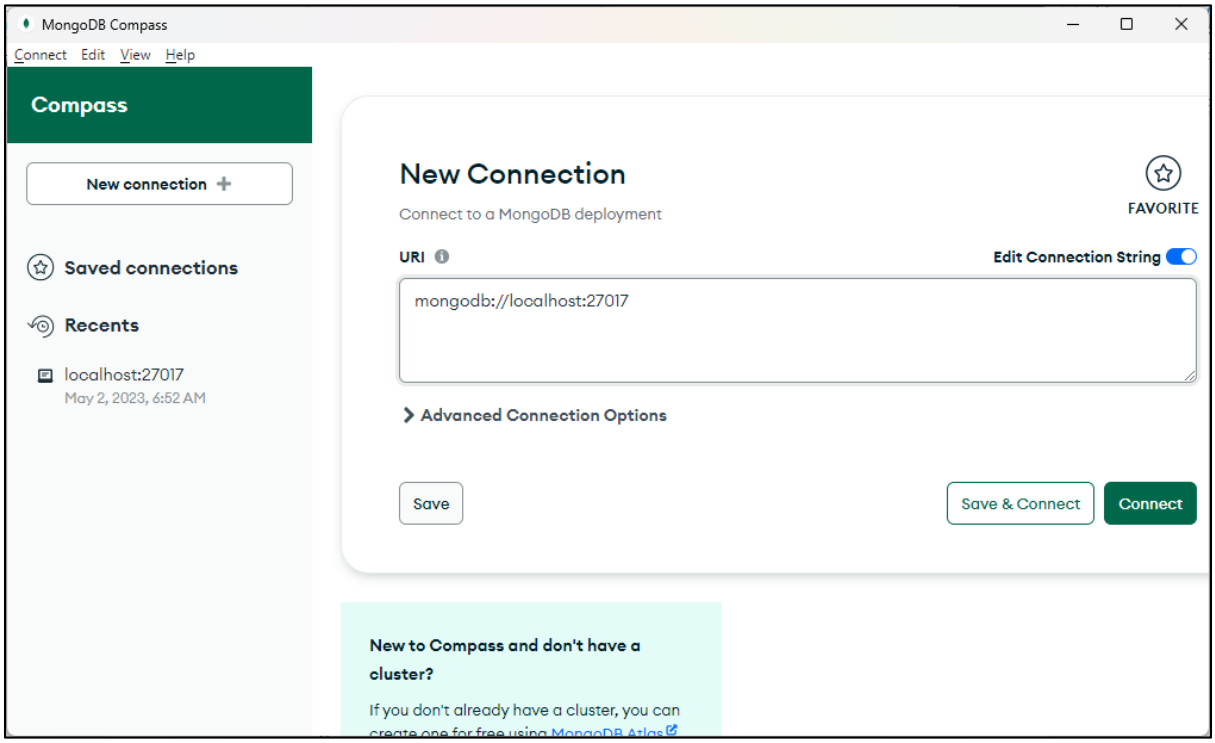


Figure 10.2: MongoDB Compass Setup

5. Click **Connect** or **Save and Connect** option.

On clicking this option, the user is redirected to the home page of Compass.

As shown in Figure 10.3, Compass is now connected to MongoDB that is listening to port 27017.

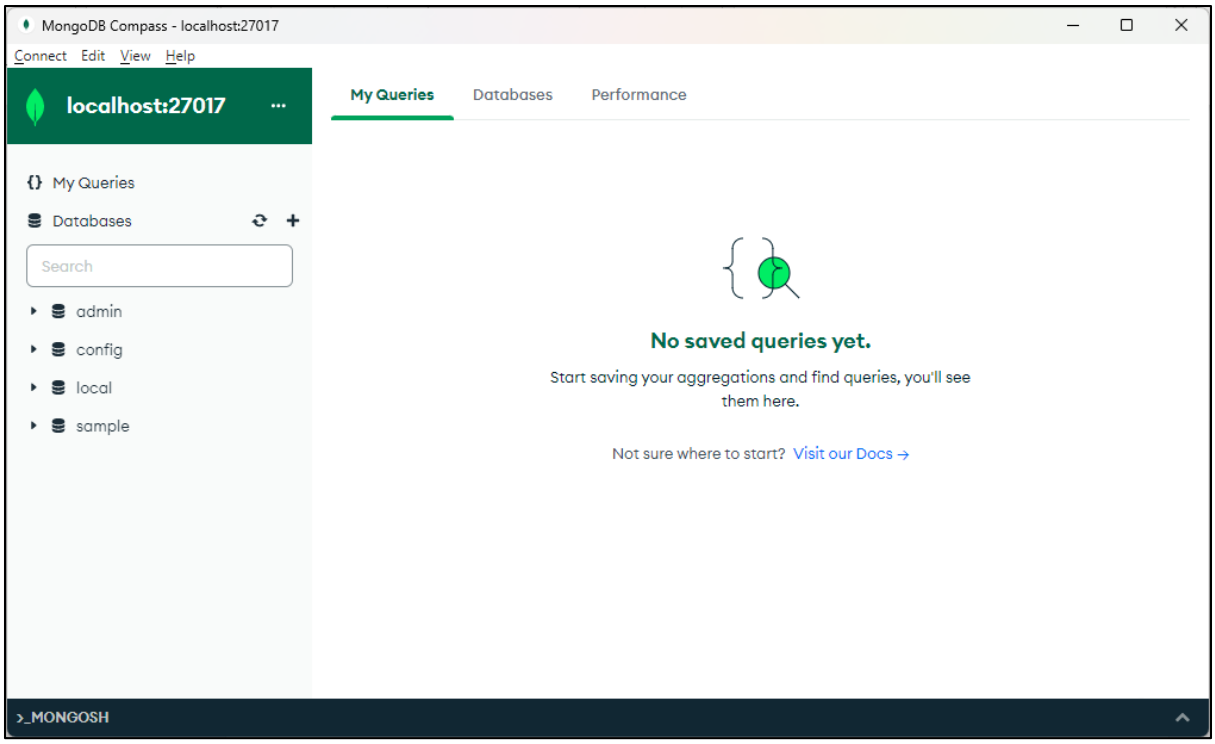


Figure 10.3: Compass Connected to MongoDB

10.2 Manage Database Using Compass

MongoDB makes it easier to create, manage, and optimize databases and collections to meet specific user requirements. Despite the size of the datasets, the user must be able to:

- Create collections
- Insert documents
- Update documents
- Query documents
- Delete documents
- Drop collections

All these operations can be easily done using Compass. To manage databases using Compass:

1. Open the **MongoDB Compass** home page.

2. Click the **Databases** tab.
   The **Databases** tab lists the existing databases in your MongoDB deployment as shown in Figure 10.4.

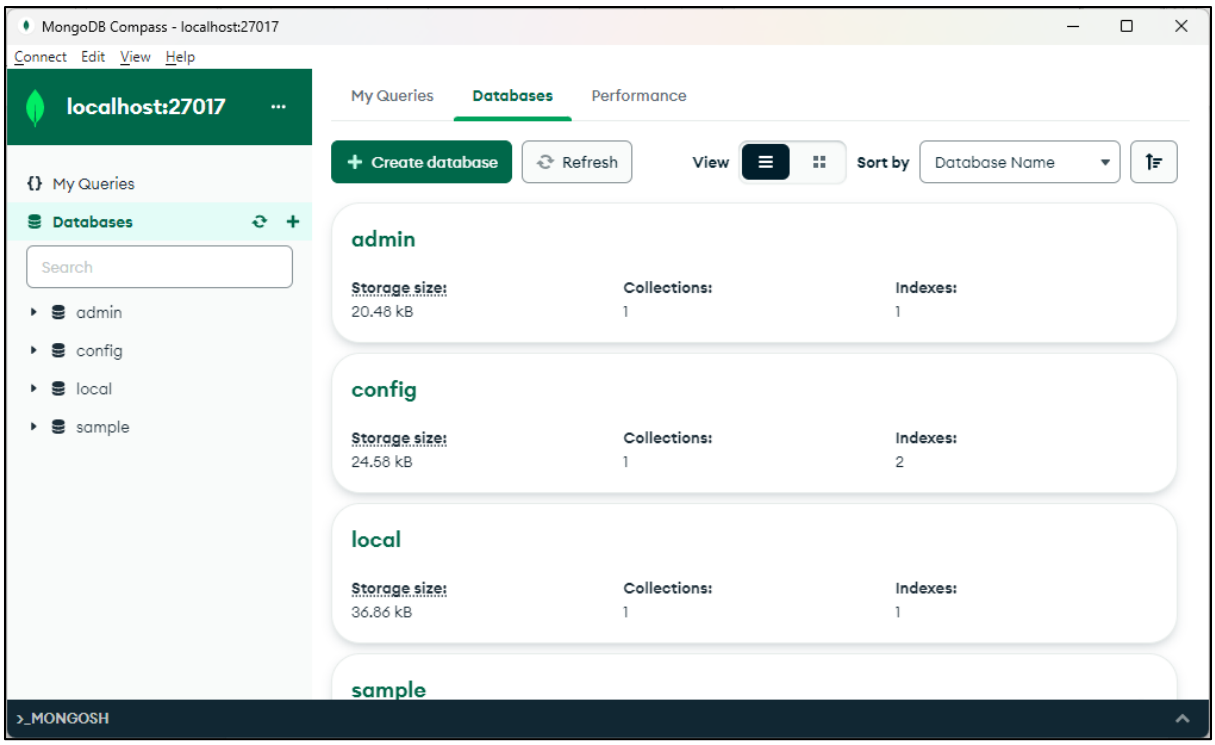


Figure 10.4: Database Tab in Compass

To view information about the existing databases:

1. Click the database name.
2. Click the collection name to view the documents in that collection.
3. Click **Databases** on the left pane to go back to the **Databases** tab page.

Let us now explore the various functions used to manage databases using Compass.

10.2.1 Create Database

To create a new database:

1. On the **Database** tab, click **Create database**.

The **Create Database** dialogue box appears as shown in Figure 10.5.

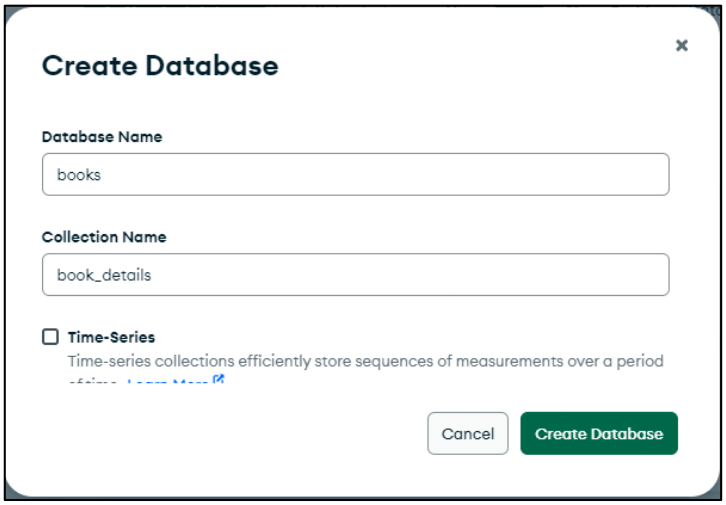


Figure 10.5: Create Database Dialogue Box

2. Type the database name as `books` and the collection name as `book_details`.

3. Click **Create Database**.

   The database details appear as shown in Figure 10.6.

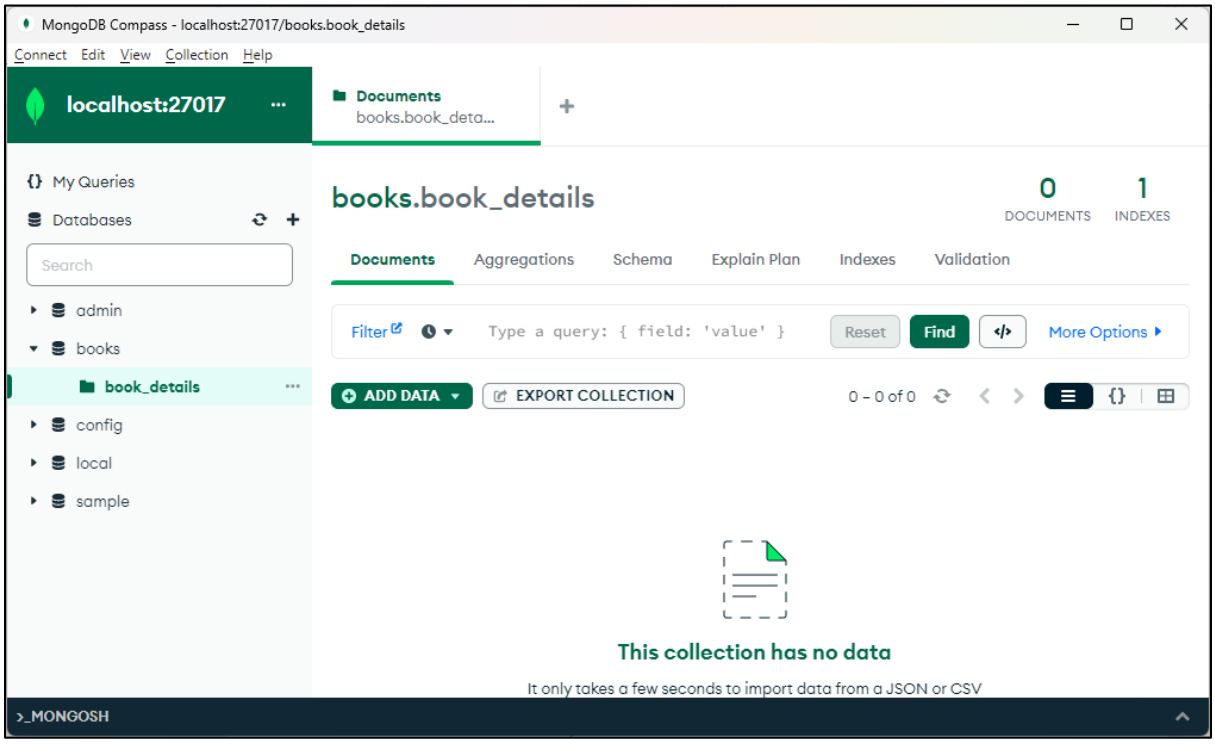


Figure 10.6: `books` Database

10.2.2 Insert Documents

To insert documents into the `books_details` collection:

1. Click the **Add Data** drop-down and select **Insert document** as shown in Figure 10.7.

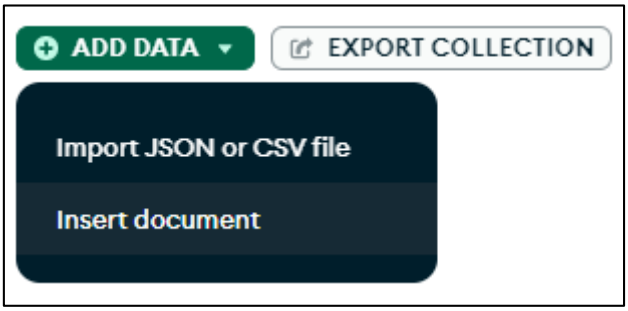


Figure 10.7: Add Data

The default view for inserting documents in a database appears as shown in Figure 10.8.

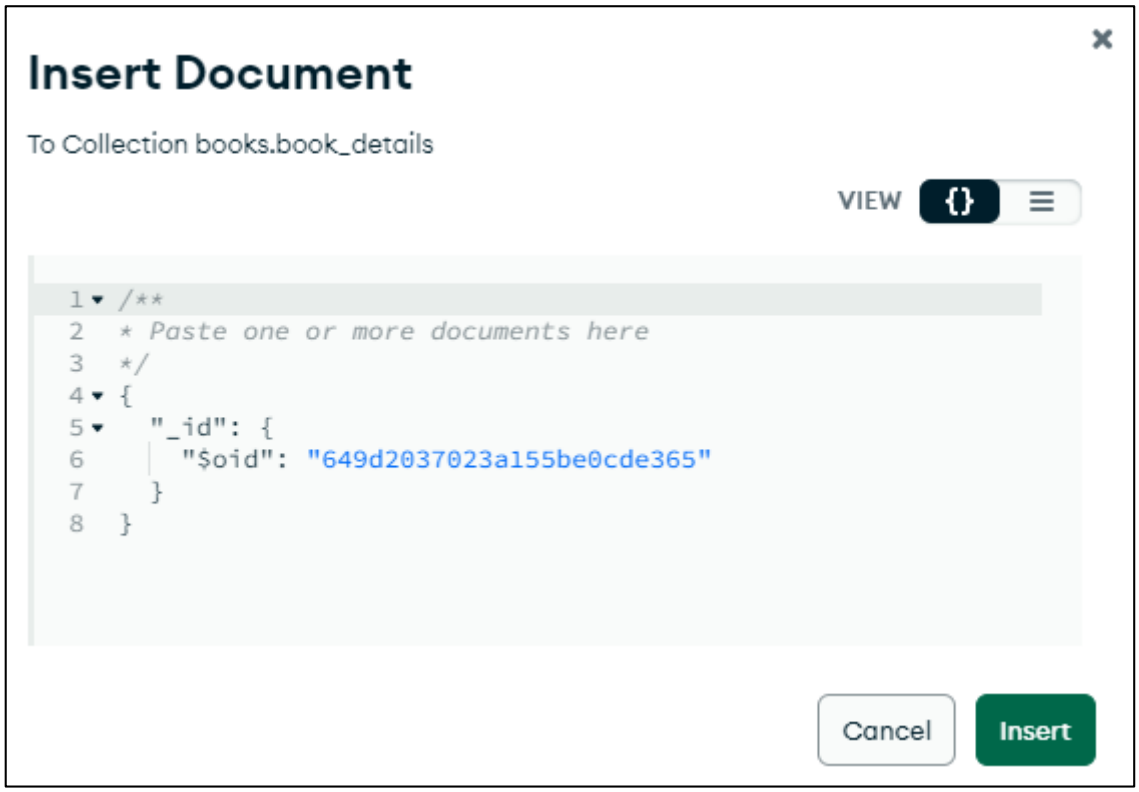


Figure 10.8: Default View for Inserting Documents in a Database

2. To import JSON files, ensure that the **{ }** brackets on the top-right is selected and delete the existing command.

3. To insert four documents into the `book_details` collection in the `books` database, enter the command as:

```
[{"_id" : 101,"book_title":"NoSQL
Distilled","book_description": "A Brief Guide to the
Emerging World of Polyglot
Persistence","author":"Martin Fowler","edition":2},
{"_id" : 102,"book_title":"Python Crash
Course","book_description":"A Hands-On, Project-Based
Introduction to Programming","author":"Eric
Matthes","edition":1},
{"_id" : 103,"book_title": "Seven Databases in Seven
Weeks","book_description": "A Guide to Modern Databases
and the NOSQL Movement","author":"Luc
Perkins","edition":4},
{"_id" : 104,"book_title": "Next Generation
Databases","book_description": "NoSQL and Big
Data","author":"Harrison","edition":3}]
```

Figure 10.9 shows the command window for inserting four documents into the collection, book_details.

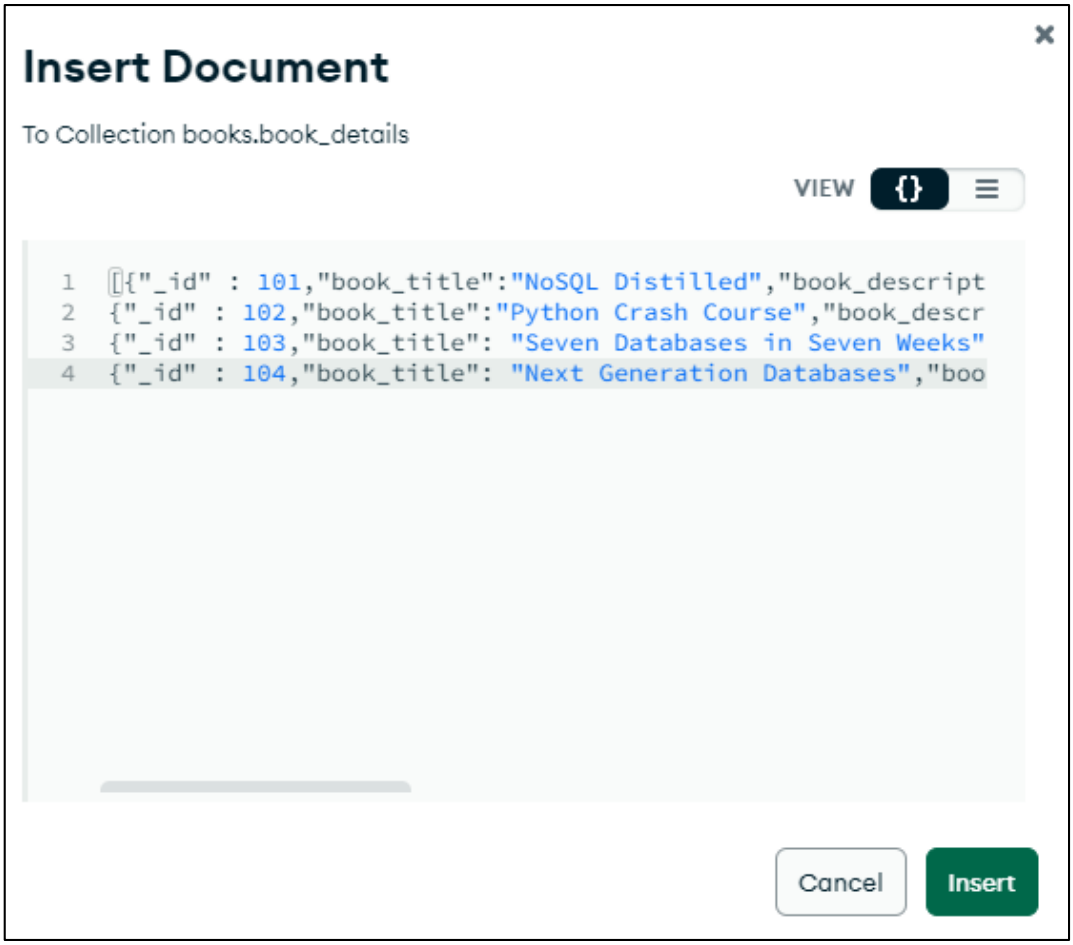


Figure 10.9: Inserting Four Documents

4. Click **Insert**. Figure 10.10 shows the four documents inserted into the collection.

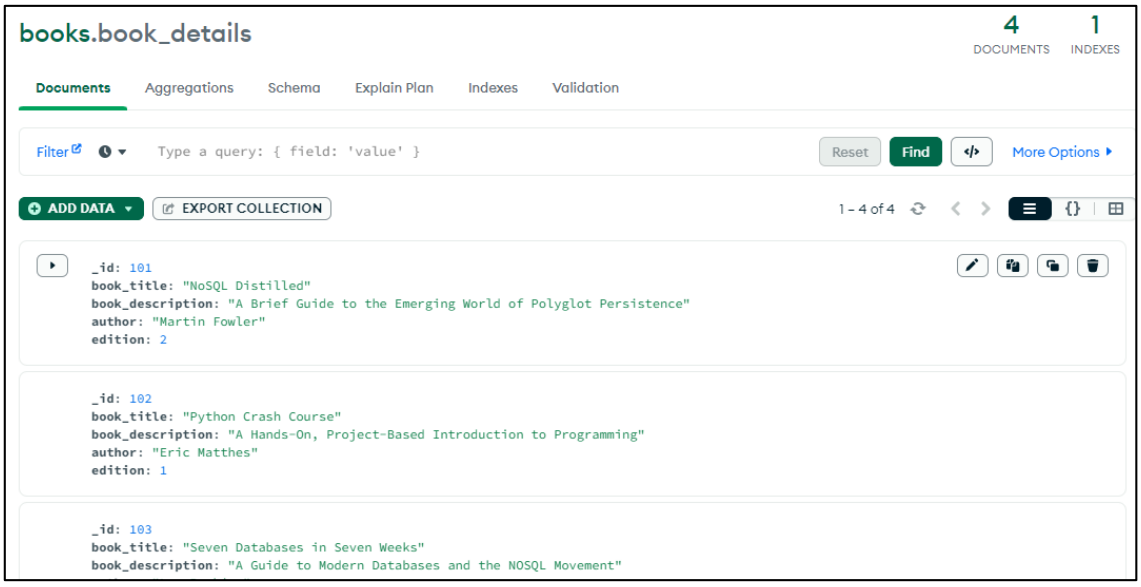


Figure 10.10: Inserted Documents

10.2.3 Modify Documents

After adding the documents to the database collection, the user can edit and modify specific documents in Compass. Existing fields can be removed or edited, and new fields can be added. Changes made to the collection can also be reverted back by the user.

Let us edit the document with `_id` as `101`. To modify the document:

1. Hover the cursor over the document to be modified.

2. Select the **pencil icon** that appears on the right top side of the document as shown Figure 10.11.

Figure 10.11: Document Showing Pencil Icon

Change the `edition` of document to `3` as shown in Figure 10.12.

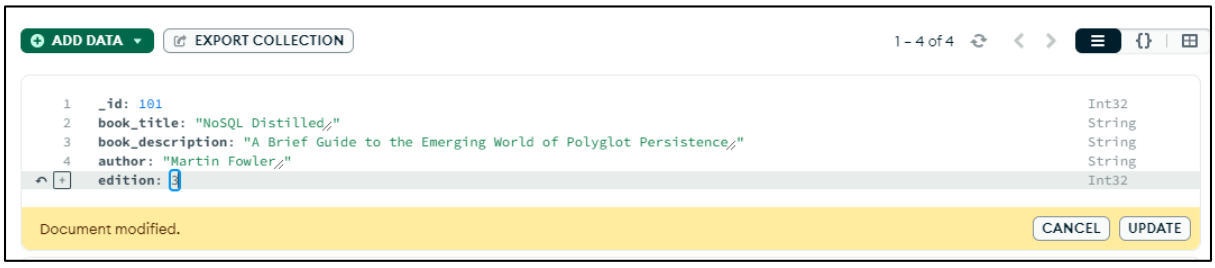


Figure 10.12: Editing the `edition` of Document with `_id` as `101`

3. Click **UPDATE.** The value for the `edition` field is updated.

10.2.4 Query Data

The user can query documents using the filter option. To find a document with `book_title` as "`NoSQL Distilled`":

1. To filter the documents, in the **Filter** box, enter the command as:

```
{book_title: "NoSQL Distilled"}
```

2. Click **Find**. Figure 10.13 shows the filtered document.

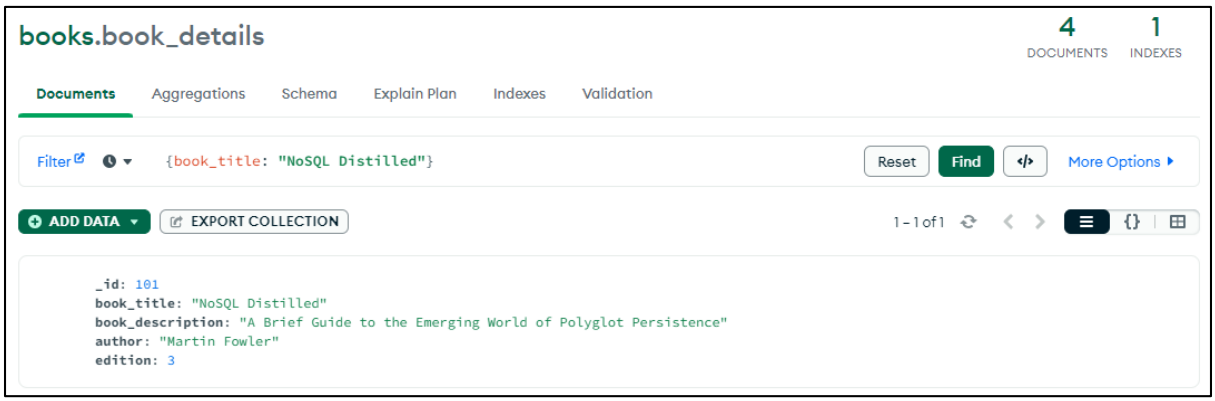


Figure 10.13: Filtered Document

In the filter, users can use all of the MongoDB query operators except the `$text` and `$expr` operators.

3. To view the query aggregation pipeline stages, expand **More Options** drop-down at the top-right section of the document window. Figure 10.14 shows all the query aggregation pipeline stages available for the user:
   - **Project** the fields in the document
   - **Sort** the documents
   - **Skip** the number of documents
   - **Limit** the number of documents

Figure 10.14: More Options

4. To reset the filter, click **Reset**.

5. Click **Find**. The collection shows all the documents.

10.2.5 Drop a Document

Users can drop or delete documents from the collections using Compass. To

drop a document with `_id` as `102`:

1. Hover the cursor over the document to be dropped.

2. Click the **Remove** icon as shown in Figure 10.15.

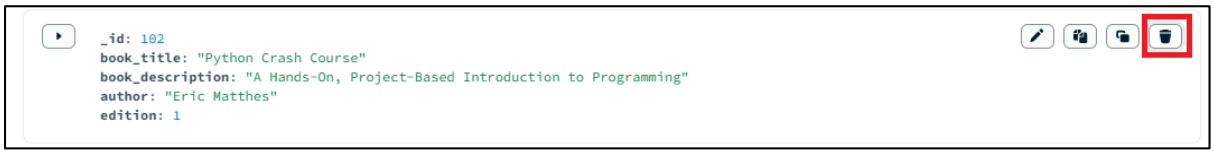


Figure 10.15: Remove Icon

A dialog box appears as shown in Figure 10.16.

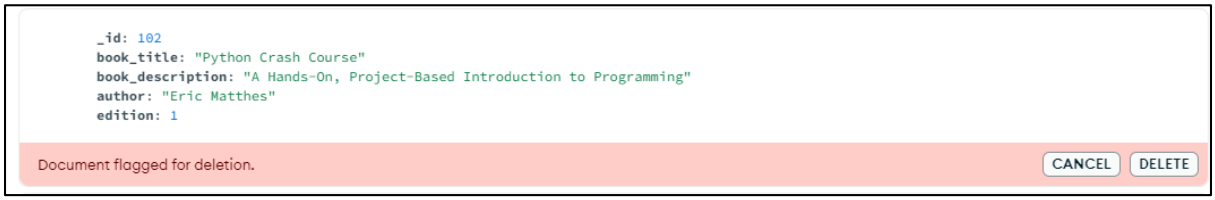


Figure 10.16: Removing the Document with `_id` as `102`

3. Click **DELETE**.

Figure 10.17 shows the documents window after deletion of the document.

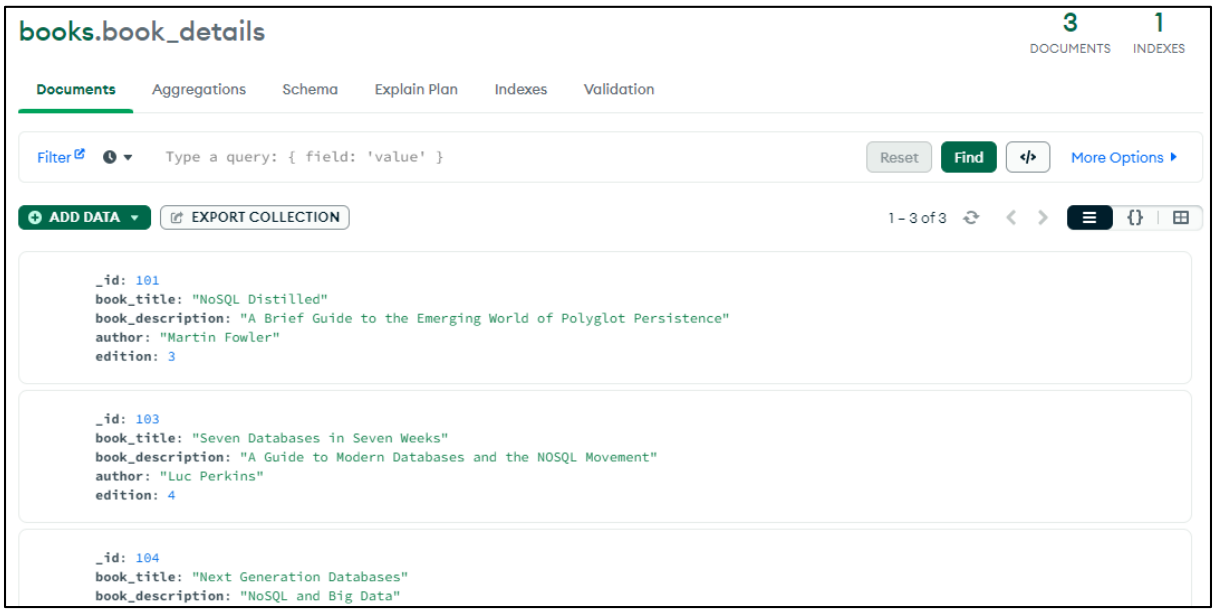


Figure 10.17: Collection After Document Deletion

Thus, Compass can be used to manage MongoDB databases easily. Next, the user would want to analyze the data in the databases to get insights into the data, such as trends, what customers like, what they do not like, and so on. For this analysis, users can use any traditional or modern Business Intelligence (BI) tools. However, the tools must be able to connect with MongoDB to access the data in the databases. This is where MongoDB BI Connector will be useful.

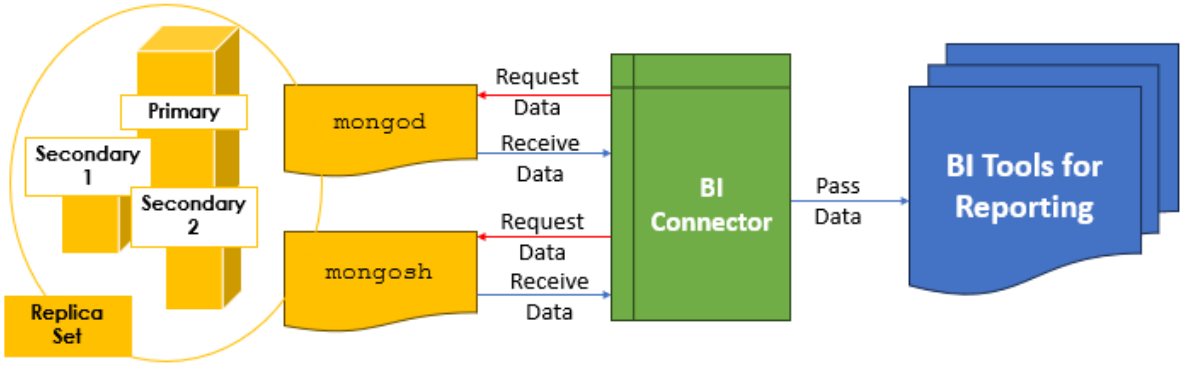
10.3 Install MongoDB BI Connector

MongoDB databases store large volumes of three-dimensional data. Traditional business intelligence tools that deal with two-dimensional data are not equipped to handle the data stored in MongoDB databases.

The BI Connector tool offered by MongoDB allows the user to create SQL queries based on the data stored in MongoDB databases. The queried data can then be used to visualize and report through graphs and charts using powerful relational BI tools such as Tableau and Power BI.

Alternatively, users can use MongoDB Charts to visualize data directly from the MongoDB collections.

BI Connector acts as a layer between the MongoDB data clusters and the BI tools.



BI Connector does not store data. It only facilitates the BI tools to query data residing in the MongoDB databases.

The BI Connector deployment comprises four components:

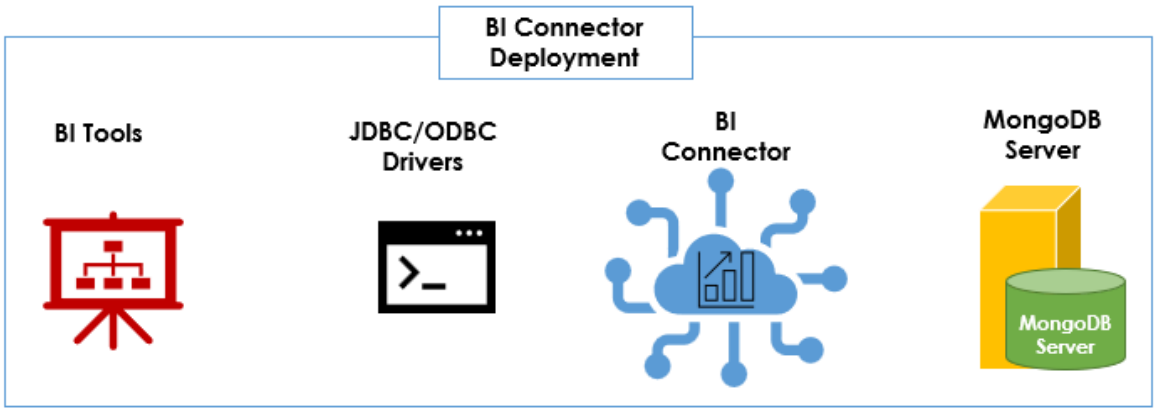


Table 10.1 describes some of the components included in the BI Connector deployment.

System Component	Description
BI Tool	It is a visualization and reporting tool, such as Tableau, PowerBI, or Microsoft Excel.
JDBC or ODBC driver	They provide methods to help the BI tools to connect the MongoDB instances through the BI Connector.
BI Connector	It is a tool that provides a relational schema for MongoDB databases. It translates SQL queries between the BI tool and the MongoDB instances.
MongoDB Database	It may be a self-managed MongoDB server with replica sets or a MongoDB Atlas cluster.

Table 10.1: BI Connector System Components

To install MongoDB BI Connector for Windows:

1. Open the browser and visit the URL: https://www.mongodb.com/download-center/bi-connector/releases
2. On this page, under **2.14.7**, scroll down to the **Windows x64** section and download the file mongodb-bi-win32-x86_64-v2.14.7.msi
3. After the download is complete, run the installer. The **MongoDB BI Connector Setup** wizard opens as shown in Figure 10.18.

Figure 10.18: MongoDB BI Connector Setup wizard

2. Click **Next**.
   The **End-User License Agreement** page opens.

3. Select **I accept the terms in the License Agreement** check box as shown in Figure 10.19.

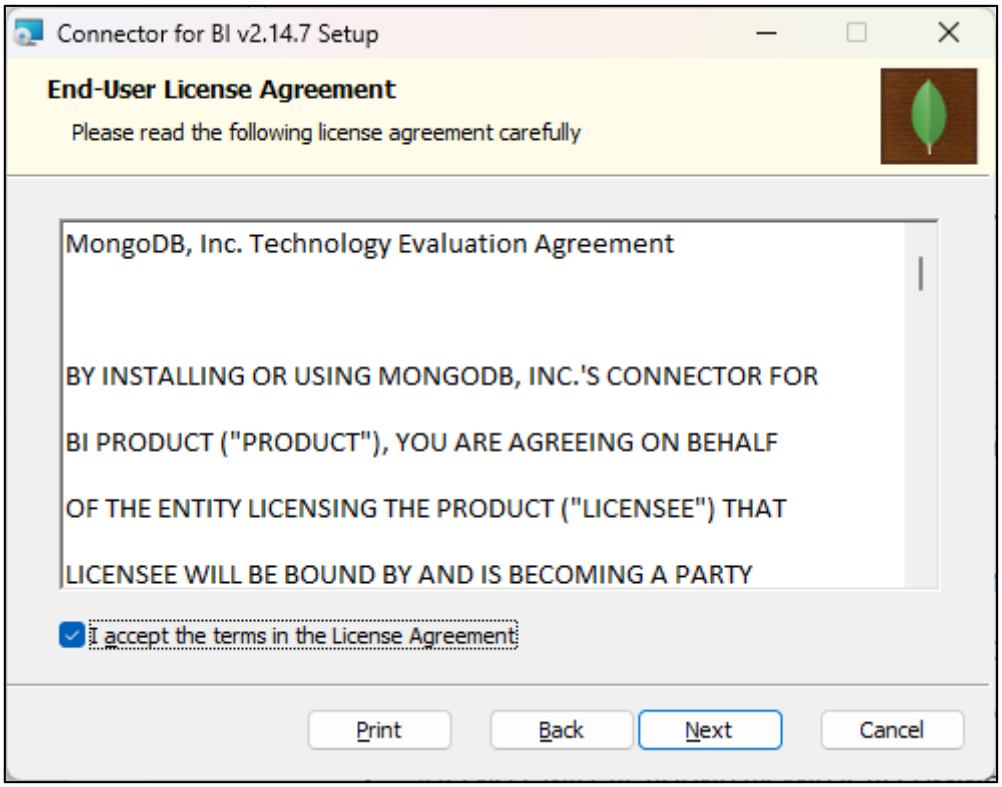


Figure 10.19: End-User License Agreement

4. Click **Next**.

The **Custom Setup** page opens as shown in Figure 10.20.

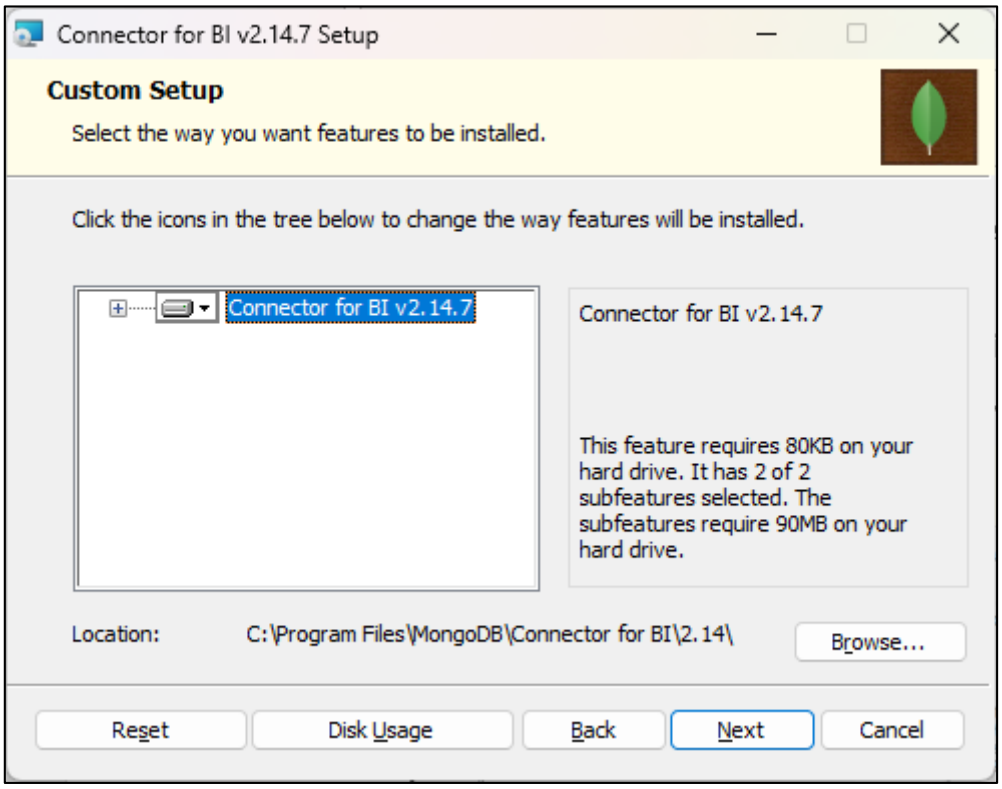


Figure 10.20: Custom Setup Page

5. Click **Next**.

The **Ready to Install Connector for BI** page opens as shown in Figure 10.21.

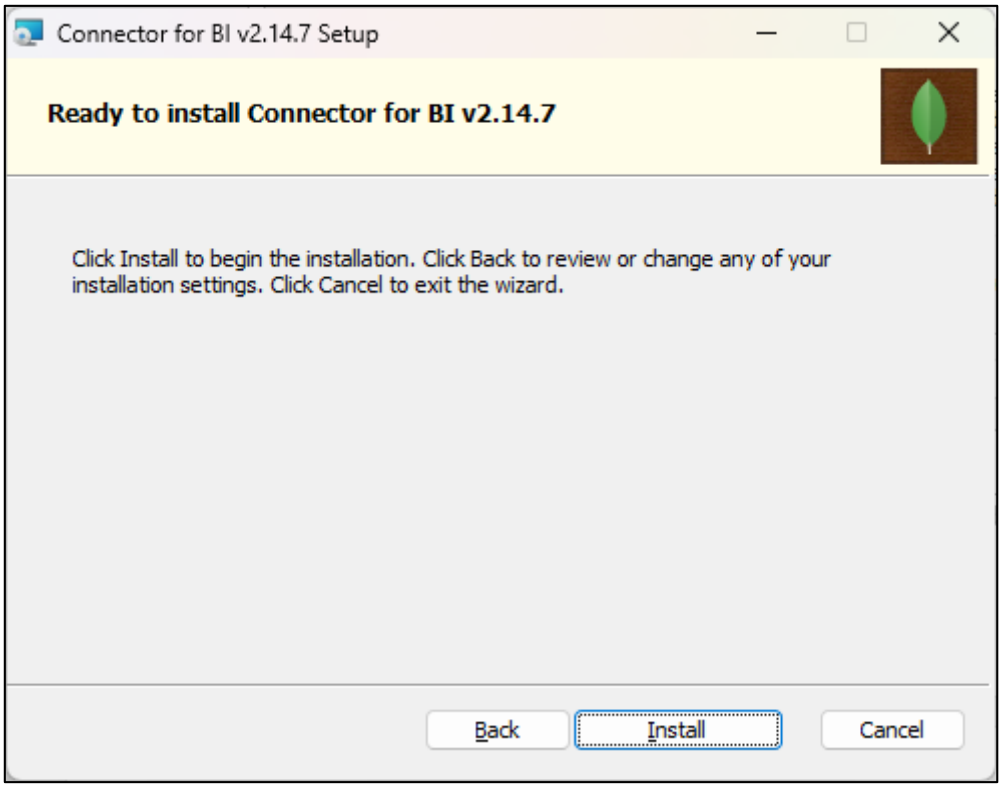


Figure 10.21: Ready to Install Connector for BI

6. Click **Install**.

After the installation is complete, the **Completed the Connector for BI** page opens as shown in Figure 10.22.

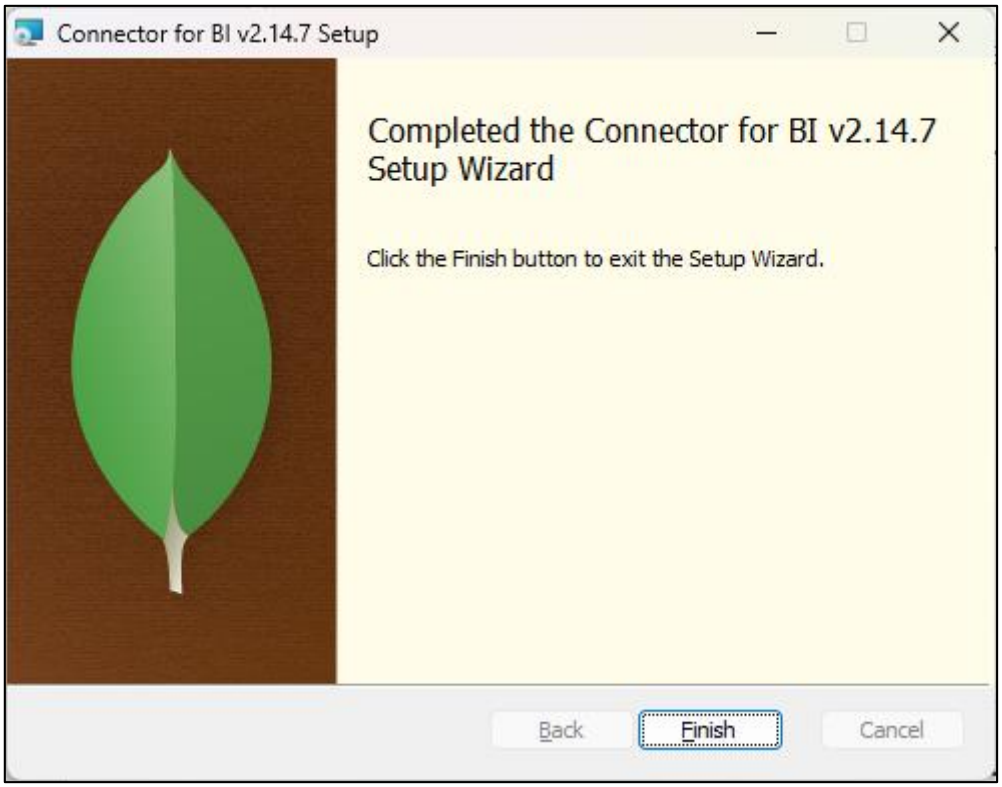


Figure 10.22: Completed the Connector for BI Setup Wizard

7. Click **Finish**.

Now, MongoDB BI Connector is installed.

10.4 Connect MongoDB BI Connector with MongoDB Deployment

A MongoDB instance can be connected to the BI tool using the BI Connector program, `mongosqld`. BI tools require a database schema to map the MongoDB databases and collections in the current `mongod` instance to a relational data model. Therefore, the user must either specify a schema file using `--schema` option or create a database schema by directly launching the `mongosqld` program.

To launch `mongosqld`:

1. Open the command prompt.
2. Change the drive to the path specified in the command:

```
cd C:\Program Files\MongoDB\Connector for BI\2.14\bin
```

3. Start `mongosqld` from the command line using the command:

```
mongosqld.exe
```

Figure 10.23 shows the output of this command.

```
C:\Program Files\MongoDB\Connector for BI\2.14\bin>mongosqld.exe
2023-06-29T14:35:25.470+0530 I CONTROL    [initandlisten] mongosqld starting: version=v2.14.7 p
id=10080 host=LAPTOP-KGV0C49M
2023-06-29T14:35:25.471+0530 I CONTROL    [initandlisten] git version: 3eb4fd411c7a1dc1776da62e
6a2d30e48b9366ab
2023-06-29T14:35:25.471+0530 I CONTROL    [initandlisten] OpenSSL version OpenSSL 1.0.2n-fips
7 Dec 2017 (built with OpenSSL 1.0.2s  28 May 2019)
2023-06-29T14:35:25.471+0530 I CONTROL    [initandlisten] options: {}
2023-06-29T14:35:25.471+0530 I CONTROL    [initandlisten] ** WARNING: Access control is not ena
bled for mongosqld.
2023-06-29T14:35:25.471+0530 I CONTROL    [initandlisten]
2023-06-29T14:35:25.652+0530 I NETWORK    [initandlisten] waiting for connections at 127.0.0.1:
3307
2023-06-29T14:35:26.131+0530 I SCHEMA     [sampler] sampling MongoDB for schema...
2023-06-29T14:35:26.164+0530 I SCHEMA     [sampler] mapped schema for 3 namespaces: "books" (1)
: ["book_details"]; "empl_det" (1): ["empl"]; "sample" (1): ["emp"]
```

Figure 10.23: `mongosqld` program

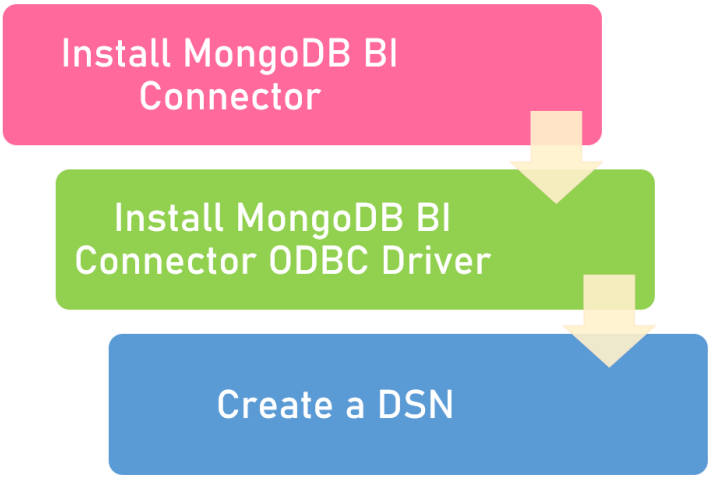
Now that the MongoDB databases are mapped to a schema using the `mongosqld` program, users can use the drivers to connect to the BI tool.

10.5 Connect MongoDB Database to BI Tools Using ODBC

Data from various databases can be exported from MongoDB by establishing a connection between MongoDB and those databases. The MongoDB BI Connector ODBC driver facilitates SQL clients to connect to MongoDB Connector for BI.

A DSN is a file that stores details about the database to which a connection must be established using the ODBC driver.

Steps required to establish a connection with an external database are:



MongoDB BI Connector is already installed (Refer Section 10.3).

For installing MongoDB BI Connector ODBC driver:

1. Open the browser and navigate to the URL:

   https://github.com/mongodb/mongo-bi-connector-odbc-driver/releases/

2. To download the MongoDB BI Connector ODBC driver, scroll down and select:

   mongodb-connector-odbc-1.4.3-win-64-bit.msi

Figure 10.24 shows the **MongoDB BI ODBC** driver download page.

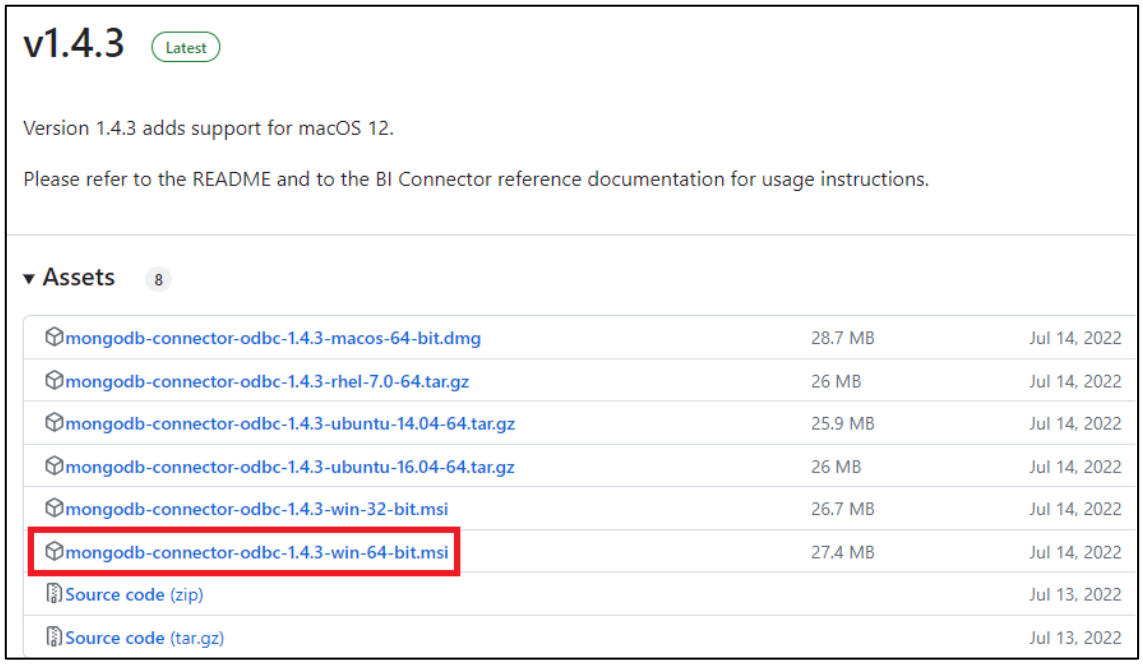


Figure 10.24: MongoDB BI ODBC Driver Download

3. After the download is complete, run the installer.
   The **MongoDB ODBC 1.4.3 Setup** wizard opens as shown in Figure 10.25.

Figure 10.25: MongoDB ODBC Setup wizard

4. Click **Next**.
   The **End-User License Agreement** page opens.
5. Select **I accept the terms in the License Agreement** check box as shown in Figure 10.26.

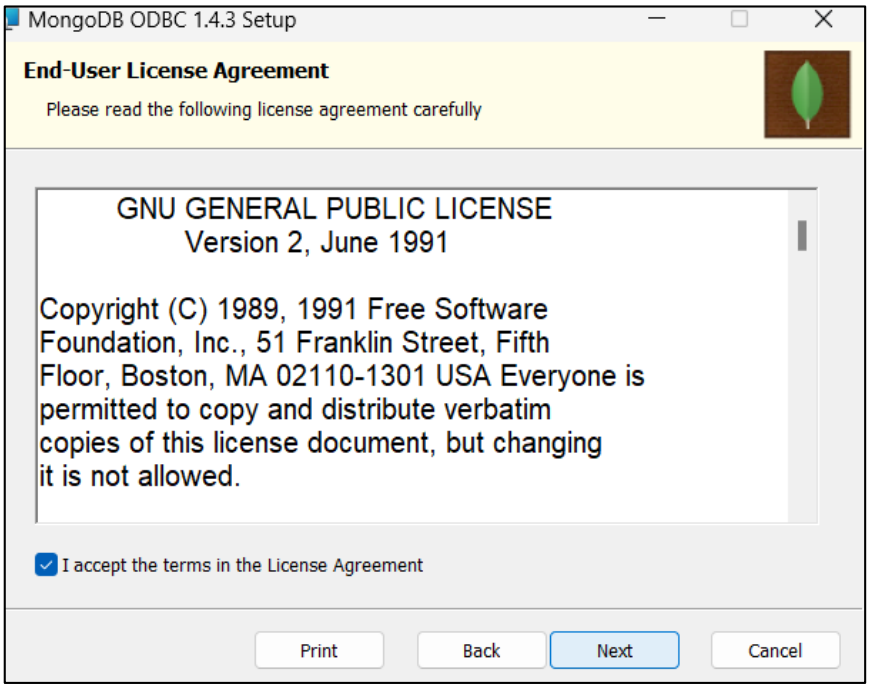


Figure 10.26: End-User License Agreement

6. Click **Next**.
   The **Custom Setup** page opens as shown in Figure 10.27.

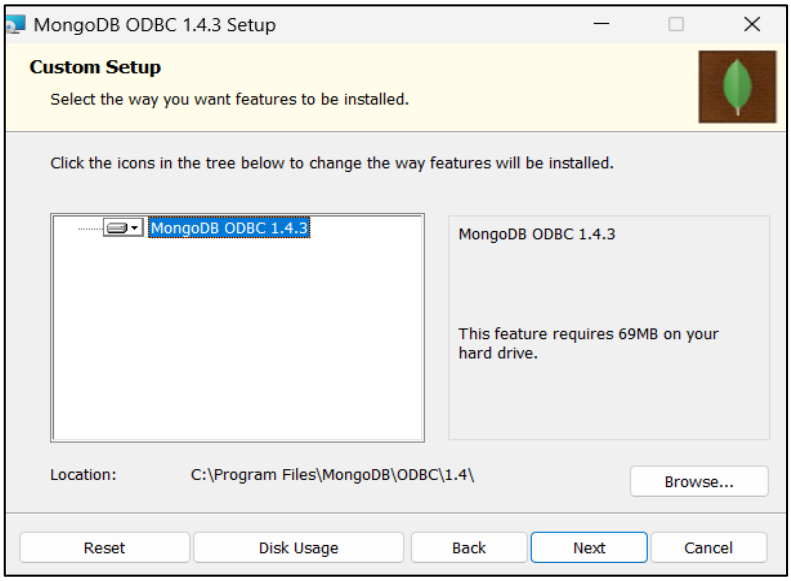


Figure 10.27: Custom Setup Page

7. Click **Next**.
   The **Ready to Install MongoDB ODBC** page opens as shown in Figure 10.28.

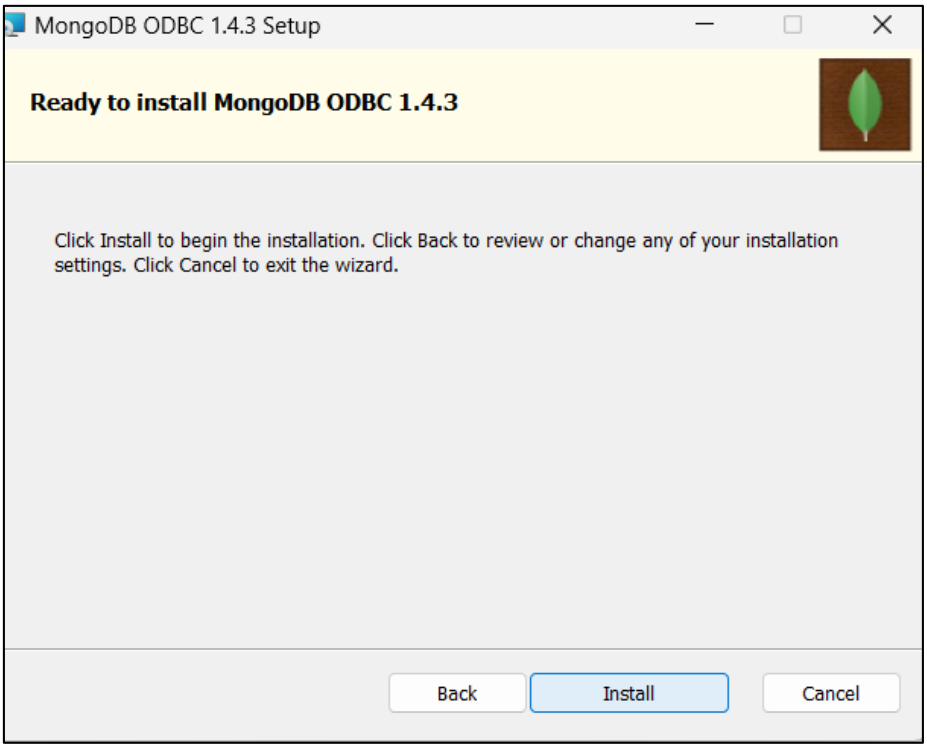


Figure 10.28: Ready to Install MongoDB ODBC

8. Click **Install**.
   After the installation is complete, the **Completed the MongoDB ODBC** page opens as shown in Figure 10.29.

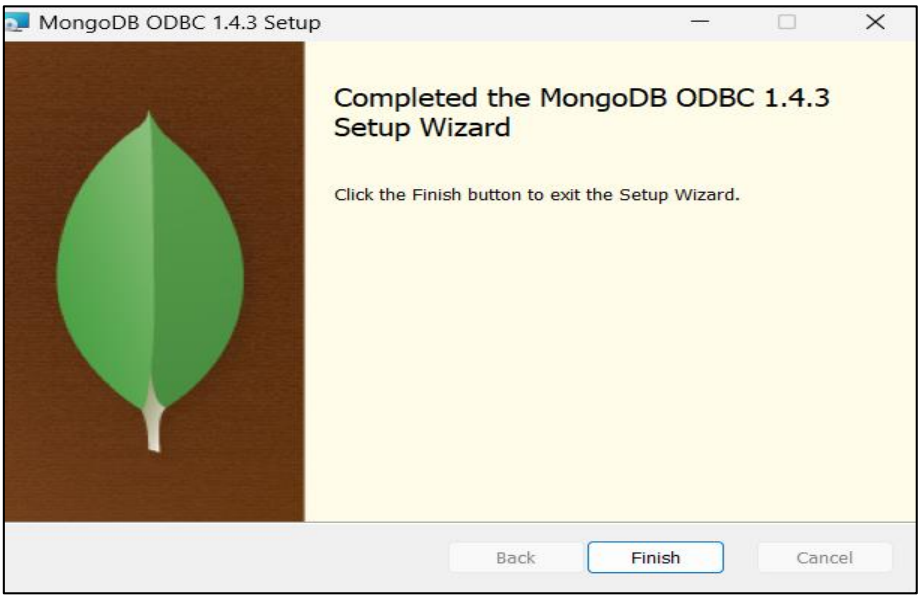


Figure 10.29: Completed the MongoDB ODBC Setup Wizard

9. Click **Finish**.

The MongoDB BI Connector ODBC driver is installed.

10.5.1 Create a Data Source Name (DSN)

The ODBC driver must know the database to which it must connect and the credentials to connect to the database. A DSN provides this required information to the ODBC driver. To create a DSN for Windows:

1. Open a command prompt window.
2. Start the `mongod` instance using the command:

```
mongod
```

3. Start `mongosqld` from the command line using the command:

```
mongosqld.exe
```

4. To open the **Microsoft ODBC Data Sources** Program:
   - Open the **Control Panel** window.
   - Select the **System and Security** option.
   - Select the **Windows Tools** option as shown in Figure 10.30.

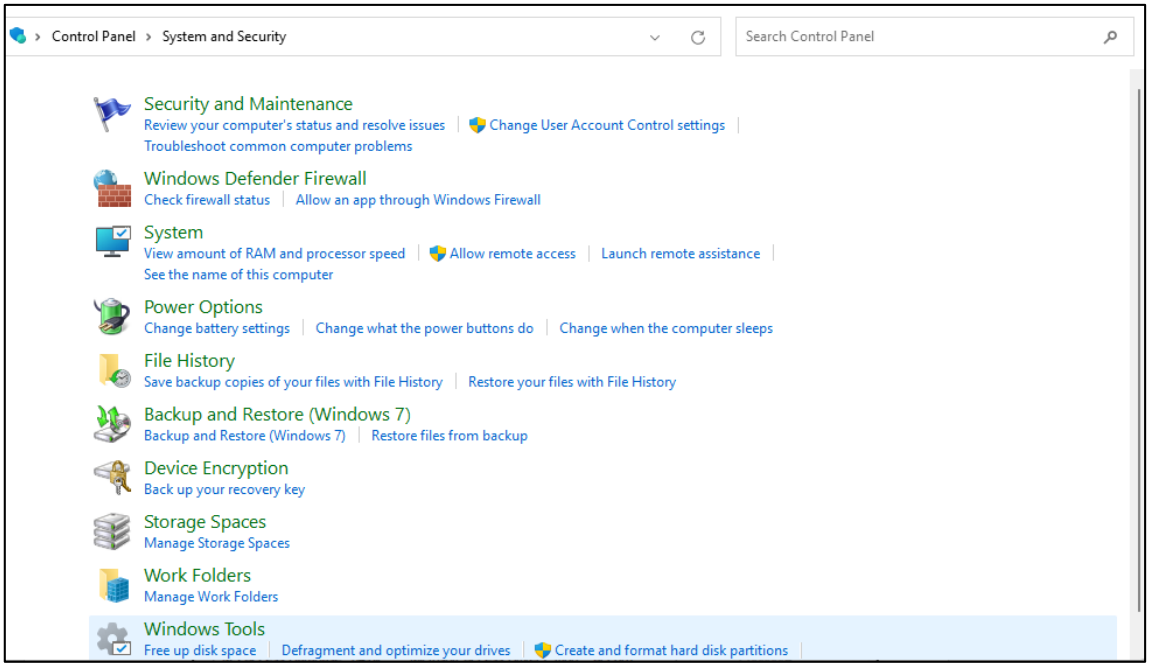


Figure 10.30: Select Windows Tools

- Choose the Program Version **(64-bit or 32-bit)** that is appropriate for the system and ODBC driver version. For the demonstration purpose, the program version is selected as 64-bit.

The **ODBC Data Source Administrator (64 bit)** wizard opens.

5. On this page, click the **System DSN** tab.
   Click the **Add** button as shown in Figure 10.31.

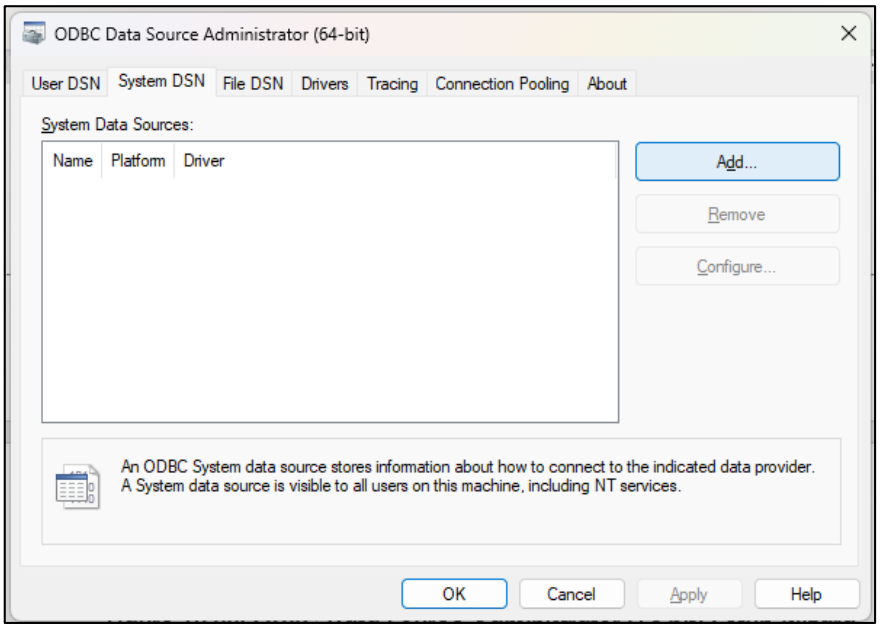


Figure 10.31: ODBC Data Source Administrator (64 bit) Setup Wizard

The **Create New Data Source** window opens.

6. Select either the **MongoDB ODBC ANSI Driver** or the **MongoDB ODBC Unicode Driver** from the list of available drivers as shown in Figure 10.32. For the demonstration purpose, the MongoDB ODBC Unicode Driver is selected.

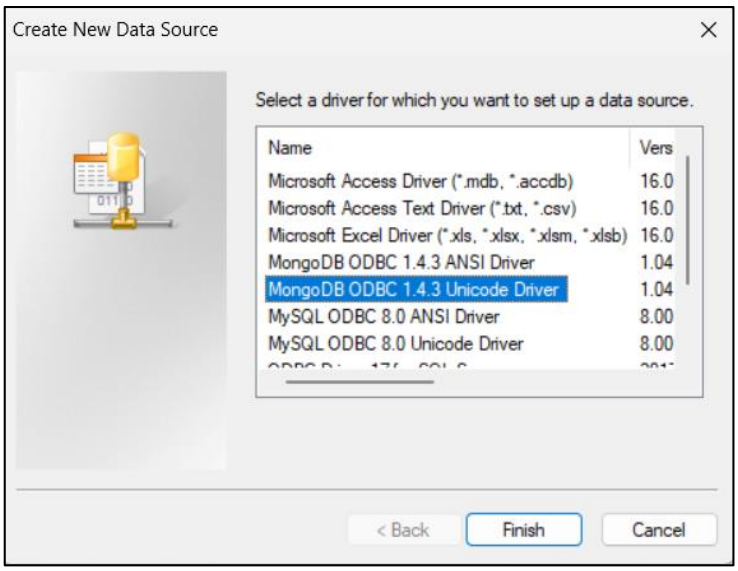


Figure 10.32: Create New Data Source

7. Click **Finish**.
   The **MongoDB ODBC Data Source Configuration** dialog box opens.
8. In the dialog box:
   - In the **Data Source Name** box, enter the name for the data source. For example, `excelBIconnector`.
   - In the Port box, specify the port to be used to connect to the data source. For example, **3307**.
   - In the **Database** drop-down, select the database to connect to. For example, `books`.
   - Click **Test**.

   The **Test Result** message box appears as shown in Figure 10.33.

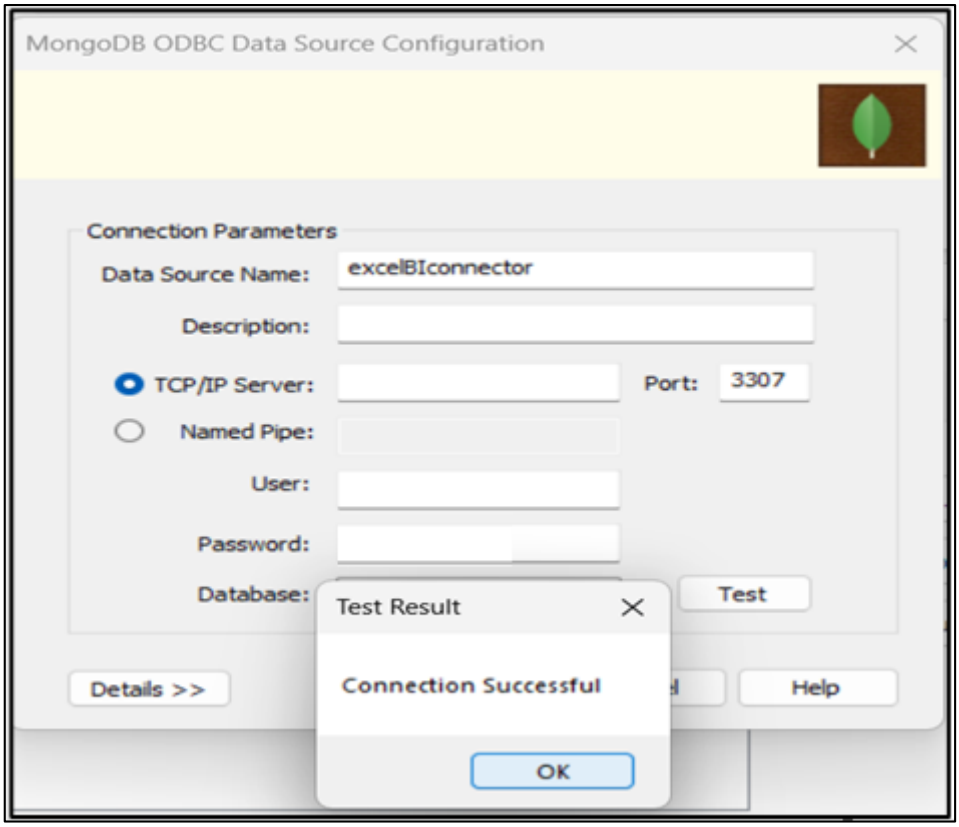


Figure 10.33: MongoDB ODBC Data Source Configuration dialogue box

9. Click **OK.**
   The connection is successfully established.

   After creating the DSN, the users can use it to import data from MongoDB into various BI tools.

10.5.2 Import Data from MongoDB to Microsoft Excel

To import data from the `book_details` collection into Microsoft Excel:

1. Open a command prompt window.
2. Start the `mongod` instance using the command:

```
mongod
```

3. Start `mongosqld` from the command line using the command:

```
mongosqld.exe
```

4. Open an Excel workbook into which data from the `book_details` MongoDB collection must be imported.
5. In the Excel workbook, on the **Data** tab, in the **Get & Transform** group,

select the **Get Data** option as shown in Figure 10.34.

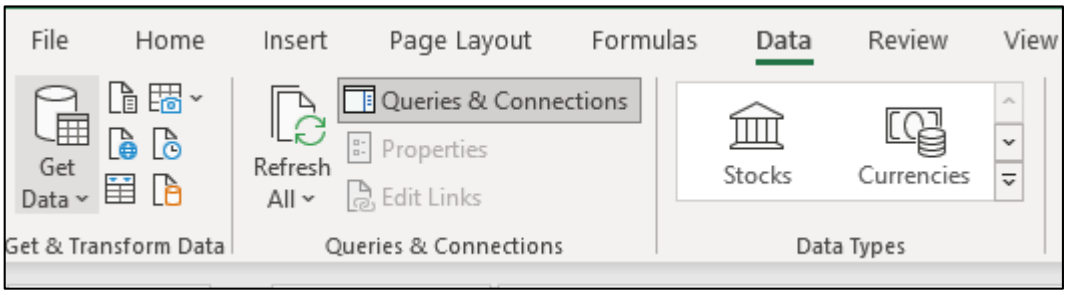


Figure 10.34 Get Data Option

6. In the drop-down menu that appears, select **From Other Sources**, and in the context menu that appears, select **From ODBC** as shown in Figure 10.35.

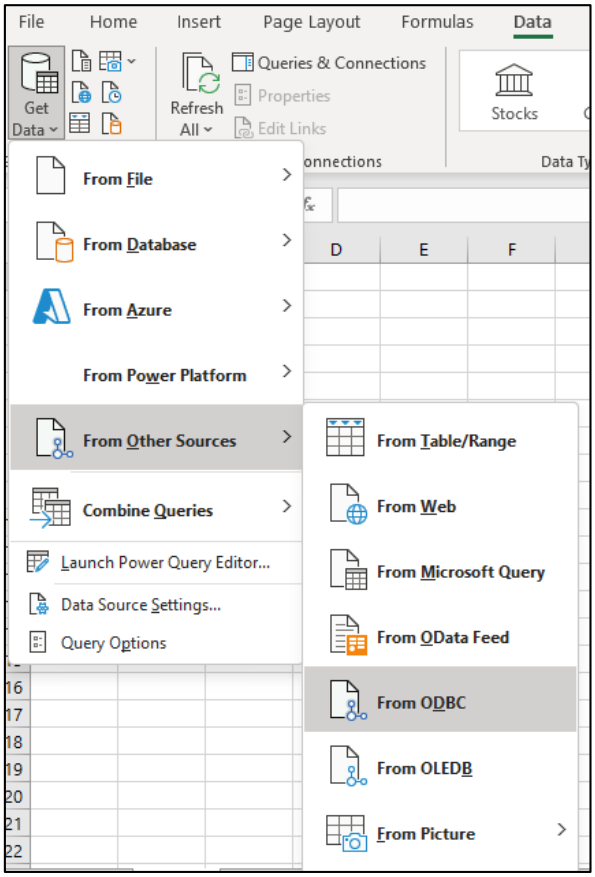


Figure 10.35: Select From ODBC option

The **From ODBC** window appears.

7. In the **Data source name (DSN)** drop-down menu, select `excelBIconnector` as shown in Figure 10.36.

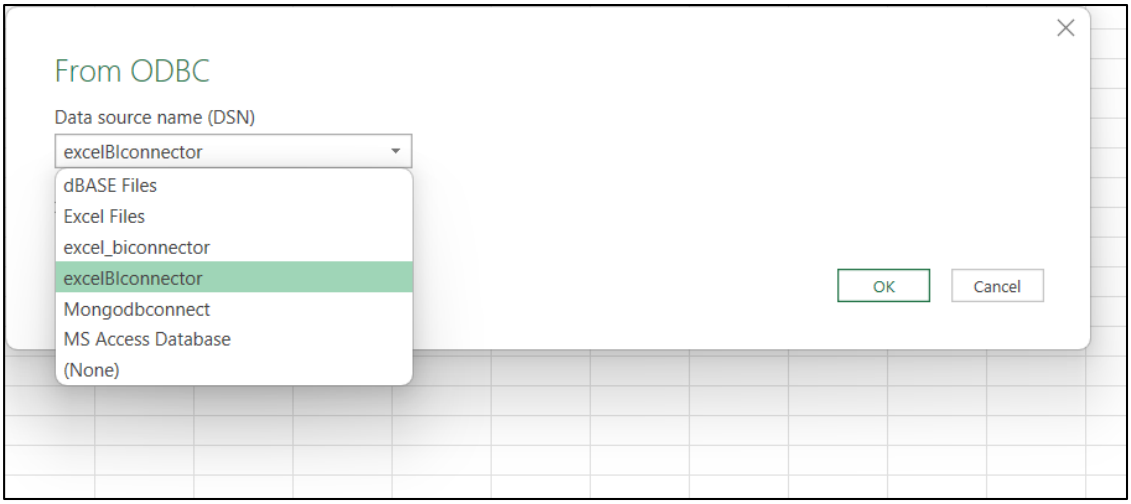


Figure 10.36: Local BI Connector mongosqld Setup Wizard

3. Click **OK**.
   The **Navigator** window opens as shown in Figure 10.37.

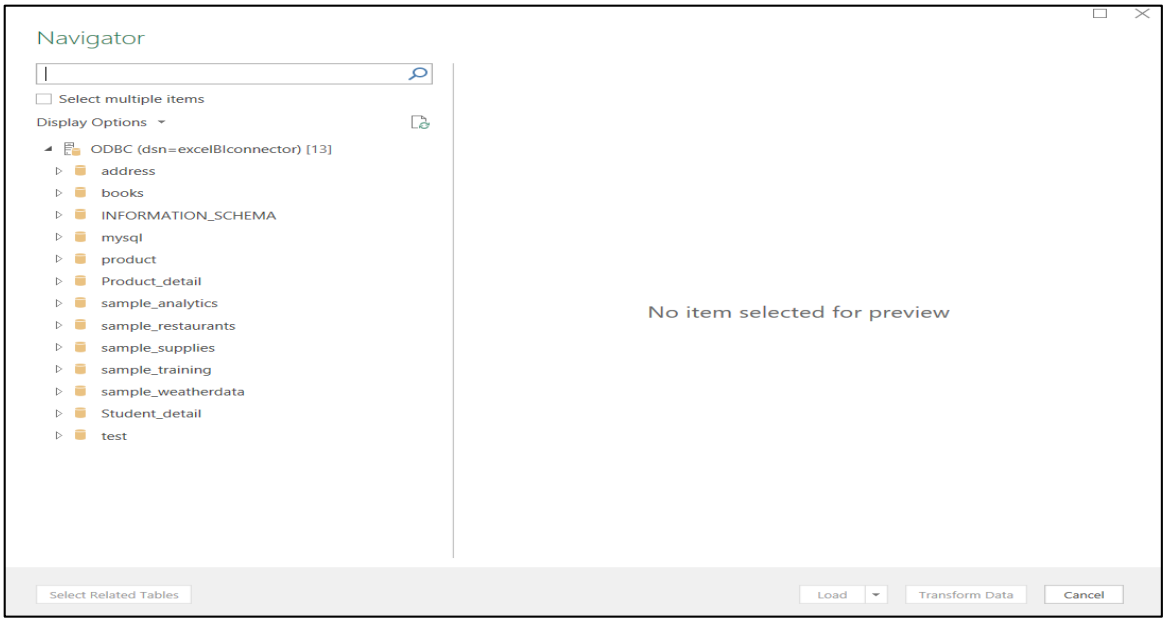


Figure 10.37: Navigator Window

4. In the **Navigator** window, under **books** select **book_details** as shown in Figure 10.38.

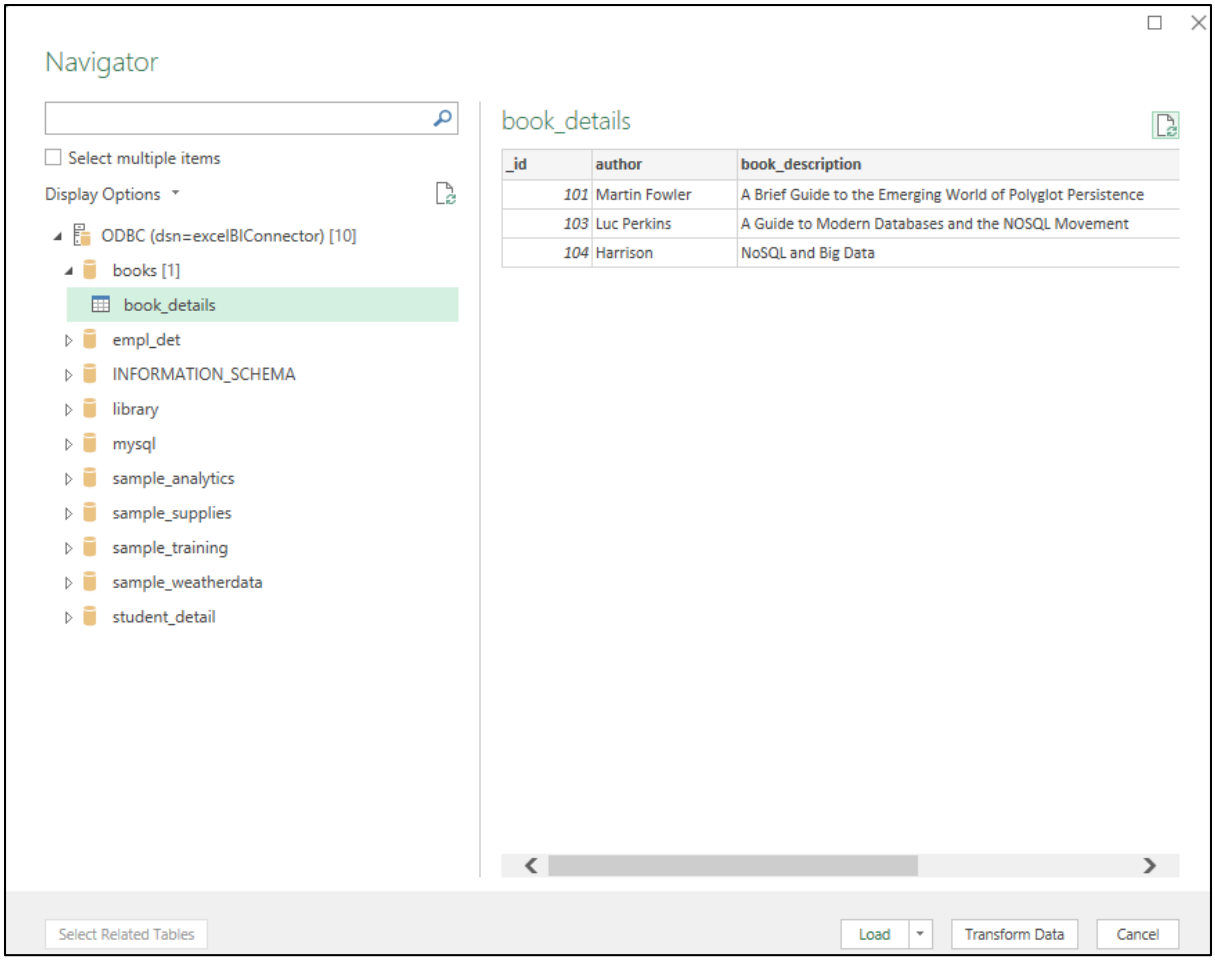


Figure 10.38: Navigator Window

5. Click **Load**.

The data from the `book_details` MongoDB collection is now imported into the Microsoft Excel spreadsheet.

The imported data is shown in Figure 10.39.

	A	B	C	D	E	F
1	id	author	book_description	book_title	edition	
2	101	Martin Fowler	A Brief Guide to the Emerging World of Polyglot Persistence	NoSQL Distilled	3	
3	103	Luc Perkins	A Guide to Modern Databases and the NOSQL Movement	Seven Databases in Seven Weeks	4	
4	104	Harrison	NoSQL and Big Data	Next Generation Databases	3	
5						

Figure 10.39: Imported Data from book_details

10.6 Summary

- MongoDB Compass is a visual interactive tool that helps users to manage documents in the database efficiently.
- Users can connect to Compass from a `mongod` instance, any of the replica set, or any of the sharded cluster servers.
- Relational business intelligence tools such as Tableau and Power BI can be used to envision, chart, and review three-dimensional MongoDB data by connecting them with the help of the MongoDB BI Connector.
- A `mongod` instance and BI tool are connected by the BI Connector program, `mongosqld`. MongoDB collections and databases must be mapped to a data schema by `mongosqld`.
- The MongoDB BI Connector ODBC driver allows SQL clients to connect to MongoDB Connector for BI.

Test Your Knowledge

1. Which of the query operators of MongoDB given here cannot be used in the `Filter` field of MongoDB Compass?

   a. `$text`
   b. `$slice`
   c. `$expr`
   d. `$all`

2. Which of the options when used in the query bar of MongoDB Compass specify the fields to return in the resulting data?

   a. Match
   b. Project
   c. Collation
   d. Limit

3. Which of the statement given here is not true about the BI connector?

   a. It provides a relational schema.
   b. It only acts as a conduit between the MongoDB cluster and business intelligence tools.
   c. It stores data in the form of documents.
   d. It translates SQL queries between the BI tool and MongoDB.

4. From the given options, which BI Connector program connects `mongod` instance to BI tool?

   a. `mongostat`
   b. `mongodump`
   c. `mongodrdl`
   d. `mongosqld`

5. Consider a file, `stud.csv`, has been saved in the location, `C:\stud_det`. Which command imports `stud.csv` into MongoDB?

   a. `mongoimport --db stud_det --collection stud --type=csv --headerline --file C:\stud_det\stud.csv`
   b. `mongoimport --db stud_det --collection stud --type=csv --file C:\stud_det\stud.csv`
   c. `mongoimport --db stud_det --collection stud --type=json --headerline --file C:\stud_det\stud.csv`
   d. `mongoimport --db stud_det --collection stud --type csv --headerline --file C:\stud_det\stud.csv`

Answers to Test Your Knowledge

1	a, c
2	b
3	c
4	d
5	a

Try it Yourself

1. Connect Mongodb Compass with the `mongod` instance which is listening to port `27017`.
2. Create a database named `Student_detail`, and a collection named `Stud_personal` using MongoDB Compass.
3. Insert the given three documents into the `Stud_personal` collection using MongoDB Compass.

```
[
    {
      stud_id:10401
      name: "Adam",
      gender:"M",
      hobbies:["Singing","Gardening","Playing Chess"],
      blood_group:"AB+ve"
    },
    {
      stud_id:10405
      name: "Franklin",
      gender:"M",
      hobbies:["Dancing","Cooking"],
      blood_group:"B+ve"
  },
    {
      stud_id:10408
      name: "Michael",
      gender:"M",
      hobbies:["Photography"],
      Blood_group:"B+ve"
    }
]
```

   Using the collection `stud_personal`, perform the tasks:
   a. Filter the details of the students who have the `"B+ve"` blood group.
   b. Exclude the `_id` field and display the first two documents of the `stud_personal` collection which includes only the fields `stud_id`, `name`, and `hobbies`.
   c. Remove a document having `stud_id = 10405` from the `stud_personal` collection.
4. Install MongoDB BI Connector for Windows.
5. Install MongoDB BI Connector ODBC driver.
6. Connect MongoDB BI Connector with MongoDB.

7. Create a Data Source Name (DSN) for Windows.
8. Connect MongoDB to Microsoft Excel and import the `stud_personal` collection into Microsoft Excel using the MongoDB Connector for BI.