Introduction to MongoDB

Content from https://docs.mongodb.com/manual/introduction/,
https://www.guru99.com/create-read-update-operations-mongodb.html,
and https://www.codeproject.com/Articles/1037052/Introduction-to-MongoDB

What is MongoDB

- MongoDB is an open-source **document** oriented database that provides high performance, high availability, and automatic scaling

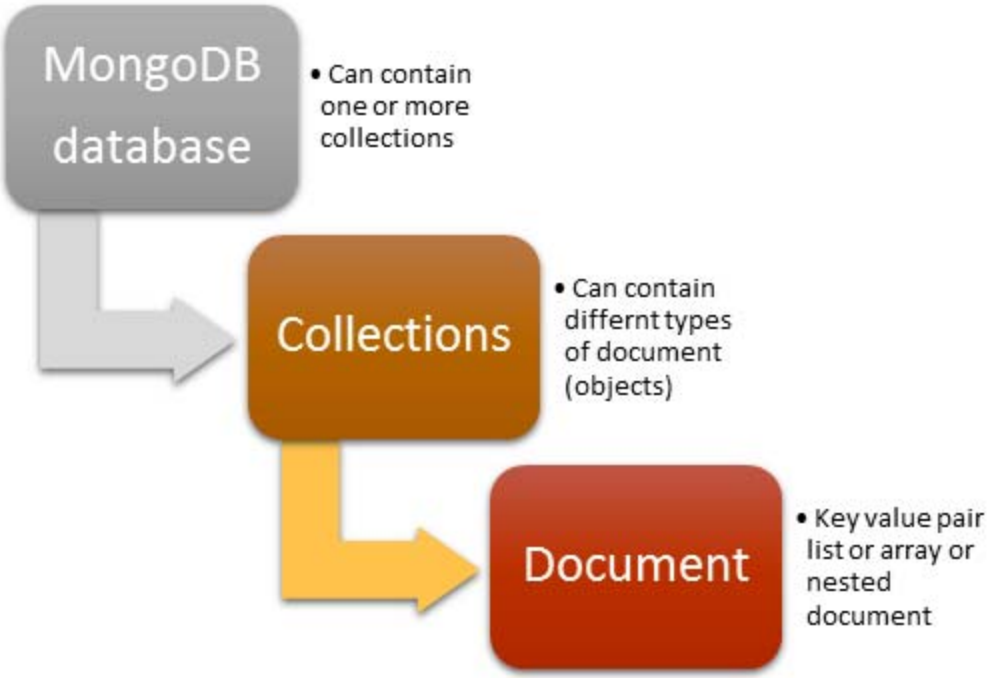
- MongoDB falls in the category of the NoSQL – Database which means it doesn't follow fixed schema structure like in relational databases

- NoSQL
  - Originally referring to "non SQL" or "non relational"
  - Sometimes called "Not only SQL" to emphasize that they may support SQL-like query languages

Document Database

- The MongoDB database consists of a set of databases
  - Each database contains multiple **collections**. Every collection can contain different types of object
  - Every object is also called **document**, which is a data structure composed of field and value pairs. The values of fields may include other documents, arrays, and arrays of documents.
  - A record in MongoDB is a document

RDBMS and MongoDB



Relational Database	MongoDB
• Database	• Database
• Table	• Collection
• Row	• Document
• Column	• Field

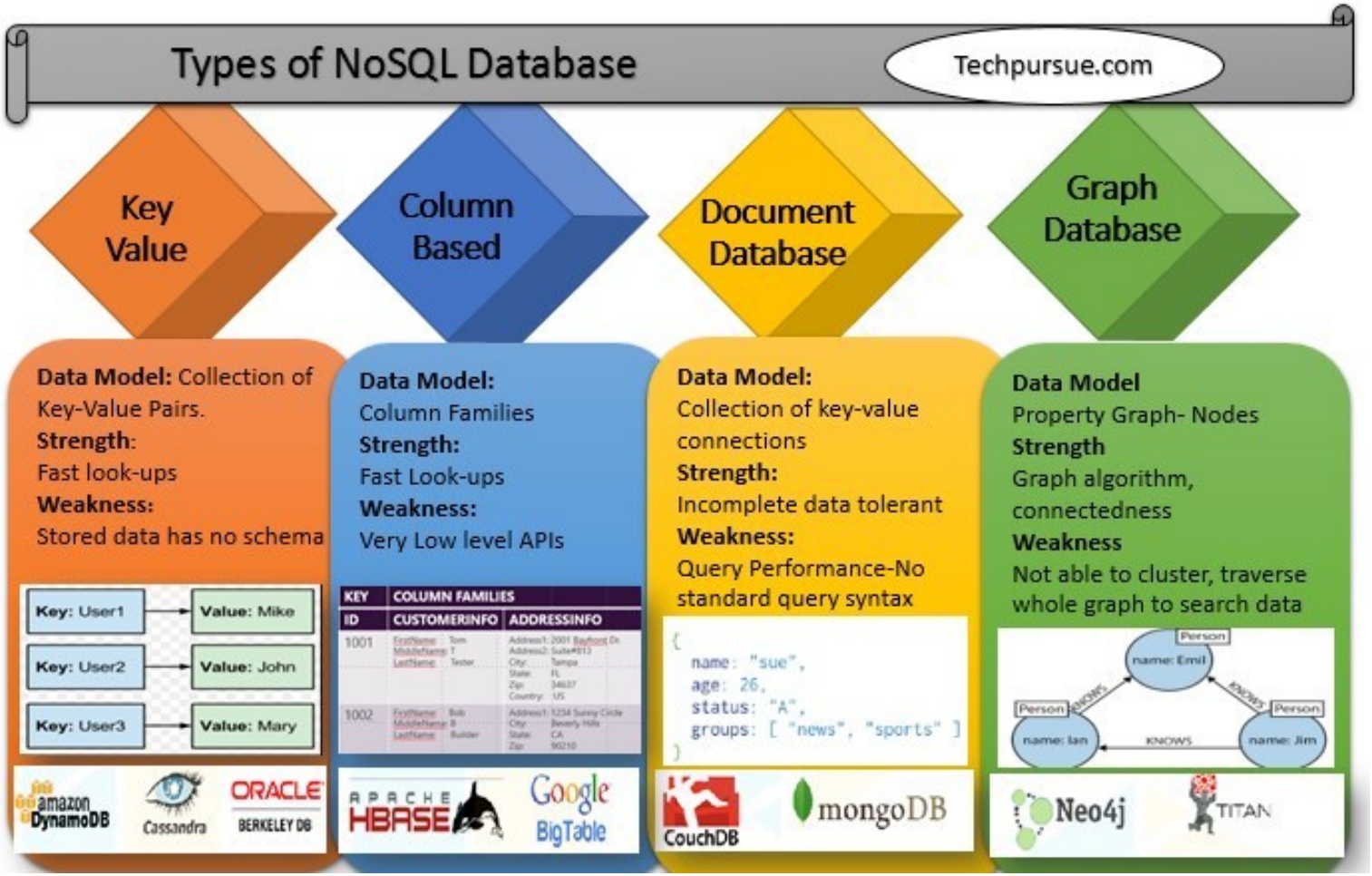
Advantages of using documents

- Documents (i.e. objects) correspond to native data types in many programming languages
- Embedded documents and arrays reduce need for expensive joins
- Dynamic schema supports fluent polymorphism

SQL vs Mongo

	SQL	Mongo
Focus	Data Storage	Data usage
Design	• Everything predesigned • Rigid schema • One value / column	• Easy to evolve as needed • Each record can have different fields* • Can contain an array of values
Terminology	• DB • Table • Row (Record) • Column (Attribute)	• DB • Collection • Document • Field
Functionality	• Rich but very rigid. • Difficult to scale	• Basic but very flexible • Built it scalability

Different Types of NoSQL Databases



mongo Shell

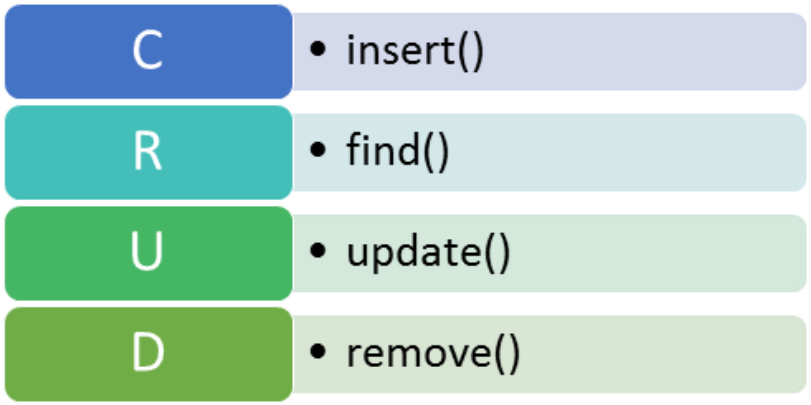
- The mongo shell is an interactive JavaScript interface to MongoDB
- You can use the mongo shell to query and update data as well as perform administrative operations
- Ensure that MongoDB is running before attempting to start the mongo shell

  sudo service mongod start
- Start the mongo shell

  mongo --host 127.0.0.1:27017
- Available online at https://docs.mongodb.com/manual/tutorial/insert-documents/

Mongo CRUD Operations

- CRUD (Create Read Update Delete)
- Create a database
  - Type use [database name] and press enter if the database exists the MongoDB will switch to database else it will create a brand new database for you
  - type use inventory to create a database named inventory



Start

- To display the database you are using, type db
- To switch databases, type use <database>
- To list the databases available to the user, type show dbs

Create a Database

- You can switch to non-existing databases. When you first store data in the database, such as by creating a collection, MongoDB creates the database. For example, the following creates both the database myNewDatabase and the collection myCollection during the insertOne() operation:

```
use myNewDatabase
db.myCollection.insertOne( { x: 1 } );
```

- Print a list of all collections for current database
  - show collections

Drop a collection/Database

- Removes a collection or view from the database

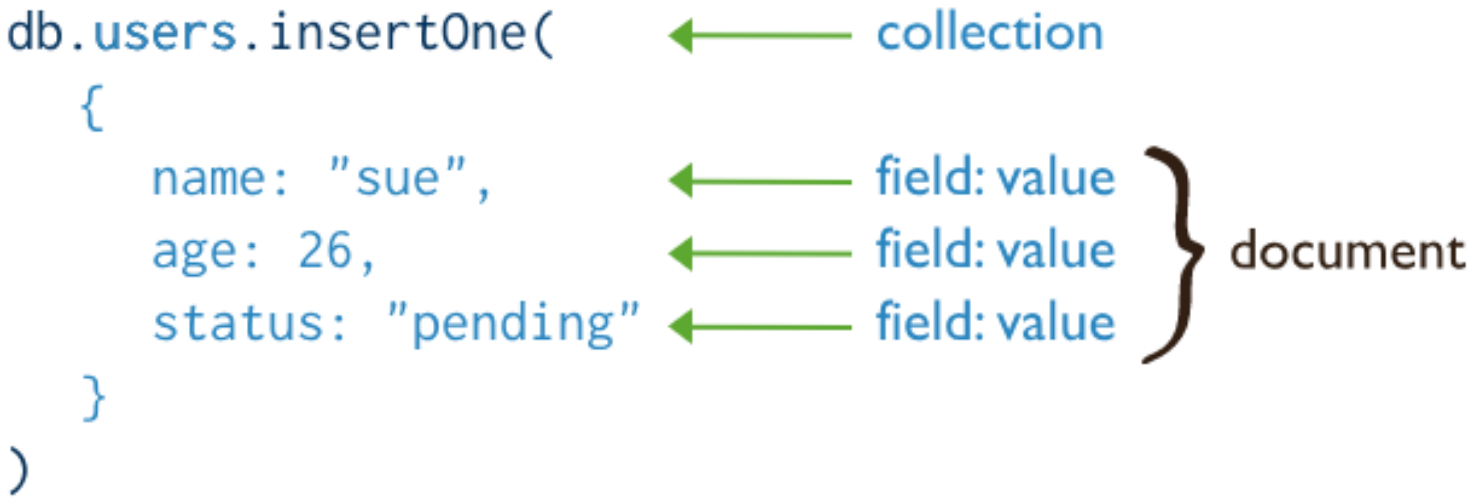
  db.collection.drop()

- Removes the current database, deleting the associated data files

  db.dropDatabase()

Insert

- In MongoDB, insert operations target a single collection. All write operations in MongoDB are atomic on the level of a single document



- If the collection does not currently exist, insert operations will create the collection

Insert a Single Document

- db.collection.insertOne() inserts a single document into a collection

```
db.inventory.insertOne(
  { item: "canvas", qty: 100, tags: ["cotton"], size: { h: 28, w: 35.5, uom: "cm" } }
)
```

- If the document does not specify an _id field, MongoDB adds the _id field with an ObjectId value to the new document.
  - _id Field: In MongoDB, each document stored in a collection requires a unique _id field that acts as a primary key. If an inserted document omits the _id field, the MongoDB driver automatically generates an ObjectId for the _id field
- To retrieve the document that you just inserted, query the collection:

```
db.inventory.find( { item: "canvas" } )
```

Insert Multiple Documents

- db.collection.insertMany() can insert multiple documents into a collection. Pass an array of documents to the method.

```
db.inventory.insertMany([
  { item: "journal", qty: 25, tags: ["blank", "red"], size: { h: 14, w: 21, uom: "cm" } },
  { item: "mat", qty: 85, tags: ["gray"], size: { h: 27.9, w: 35.5, uom: "cm" } },
  { item: "mousepad", qty: 25, tags: ["gel", "blue"], size: { h: 19, w: 22.85, uom: "cm" } }
])
```

- To retrieve the inserted documents

```
db.inventory.find( {} )
```

Query Documents

- First let's populate the database *demoDB*

```
db.inventory.insertMany( [
  { item: "canvas", qty: 100, size: { h: 28, w: 35.5, uom: "cm" }, status: "A" },
  { item: "journal", qty: 25, size: { h: 14, w: 21, uom: "cm" }, status: "A" },
  { item: "mat", qty: 85, size: { h: 27.9, w: 35.5, uom: "cm" }, status: "A" },
  { item: "mousepad", qty: 25, size: { h: 19, w: 22.85, uom: "cm" }, status: "P" },
  { item: "notebook", qty: 50, size: { h: 8.5, w: 11, uom: "in" }, status: "P" },
  { item: "paper", qty: 100, size: { h: 8.5, w: 11, uom: "in" }, status: "D" },
  { item: "planner", qty: 75, size: { h: 22.85, w: 30, uom: "cm" }, status: "D" },
  { item: "postcard", qty: 45, size: { h: 10, w: 15.25, uom: "cm" }, status: "A" },
  { item: "sketchbook", qty: 80, size: { h: 14, w: 21, uom: "cm" }, status: "A" },
  { item: "sketch pad", qty: 95, size: { h: 22.85, w: 30.5, uom: "cm" }, status: "A" }
] );
```

Select All Documents in a Collection

- Use db.inventory.find({}) to select all documents
- This operation corresponds to the following SQL statement:
  SELECT * FROM inventory

- Printing in JSON (JavaScript Object Notation) format
  db.inventory.find().forEach(printjson)
  or db.inventory.find().pretty()

- Count the number of documents
  db.inventory.count()

Specify Equality Condition

- To specify equality conditions, use <field>:<value> expressions
  - db.inventory.find({ status: "D" })

- This operation corresponds to the following SQL statement:

  SELECT * FROM inventory WHERE status = "D"

Specify Conditions Using Query Operators

- A query filter document can use the query operators to specify conditions in the following form:

  { <field1>: { <operator1>: <value1> }, ... }

- The following example retrieves all documents from the inventory collection where status equals either "A" or "D":

  db.inventory.find({ status: { $in: ["A", "D"] } })

- The operation corresponds to the following SQL statement:

  SELECT * FROM inventory WHERE status in ("A", "D")

Comparison

$eq	Matches values that are equal to a specified value.
$gt	Matches values that are greater than a specified value.
$gte	Matches values that are greater than or equal to a specified value.
$in	Matches any of the values specified in an array.
$lt	Matches values that are less than a specified value.
$lte	Matches values that are less than or equal to a specified value.
$ne	Matches all values that are not equal to a specified value.
$nin	Matches none of the values specified in an array.

Logical

$and Joins query clauses with a logical AND returns all documents that match the conditions of both clauses.

$not Inverts the effect of a query expression and returns documents that do not match the query expression.

$nor Joins query clauses with a logical NOR returns all documents that fail to match both clauses.

$or Joins query clauses with a logical OR returns all documents that match the conditions of either clause.

More at https://docs.mongodb.com/manual/reference/operator/query/#query-and-projection-operators

Specify AND conditions

- The following example retrieves all documents in the inventory collection where the status equals "A" and qty is less than ($lt) 30:

```
db.inventory.find( { status: "A", qty: { $lt: 30 } } )
```

- The operation corresponds to the following SQL statement:

```
SELECT * FROM inventory WHERE status = "A" AND qty < 30
```

Specify OR Conditions

- The $or operator performs a logical OR operation on an array of two or more <expressions> and selects the documents that satisfy at least one of the <expressions>. The $or has the following syntax:

  { $or: [{ <expression1> }, { <expression2> }, ... , { <expressionN> }] }

- The following example retrieves all documents in the collection where the status equals "A" or qty is less than ($lt) 30:

  db.inventory.find({ $or: [{ status: "A" }, { qty: { $lt: 30 } }] })

Specify AND as well as OR Conditions

- In the following example, the compound query document selects all documents in the collection where the status equals "A" and either qty is less than ($lt) 30 or item starts with the character p:

```
db.inventory.find( {
    status: "A",
    $or: [ { qty: { $lt: 30 } }, { item: /^p/ } ]
} )
```

```
SELECT * FROM inventory WHERE status = "A" AND ( qty < 30 OR item
LIKE "p%")
```

Update a Single Document

- The following example uses the db.collection.updateOne() method on the inventory collection to update the first document where item equals "paper":

```
db.inventory.updateOne(
  { item: "paper" },
  {
    $set: { "size.uom": "cm", status: "P" },
    $currentDate: { lastModified: true }
  }
)
```

- Check the result

```
db.inventory.find({item: "paper"})
```

Update Multiple Documents

- The following example uses the db.collection.updateMany() method on the inventory collection to update all documents where qty is less than 50:

```
db.inventory.updateMany(
  { "qty": { $lt: 50 } },
  {
    $set: { "size.uom": "in", status: "P" },
    $currentDate: { lastModified: true }
  }
)
```

Replace a Document

- The following example replaces the first document from the inventory collection where item: "paper":

```
db.inventory.replaceOne(
  { item: "paper" },
  { item: "paper", instock: [ { warehouse: "A", qty: 60 }, { warehouse: "B", qty: 40 } ] }
)
```

Delete All Documents

- The following example deletes all documents from the inventory collection:

  db.inventory.deleteMany({})

- The following example removes all documents from the inventory collection where the status field equals "A":

  db.inventory.deleteMany({ status : "A" })

Delete Only One Document that Matches a Condition

- The following example deletes the ***first*** document where status is "D":

```
db.inventory.deleteOne( { status: "D" } )
```