The background of the slide features a large, abstract cluster of colored dots in shades of orange, teal, pink, and yellow, arranged in a roughly circular pattern.

# **MongoDB for beginner: Basic Operations and API Design**

Course

Macy Kung

# Welcome to the Course

- Introduction to NoSQL and MongoDB
- Key Concepts & Knowledge Notes
- Environment Setup & Installation
- Inserting Documents into MongoDB
- Querying with MongoDB Query Language
- Deleting Documents from Collections
- Updating Existing Documents
- Designing Effective Data Models
- Understanding REST API & Practicing with Postman

# Introduction to NoSQL Database

What is a Database?

What is an SQL Database?

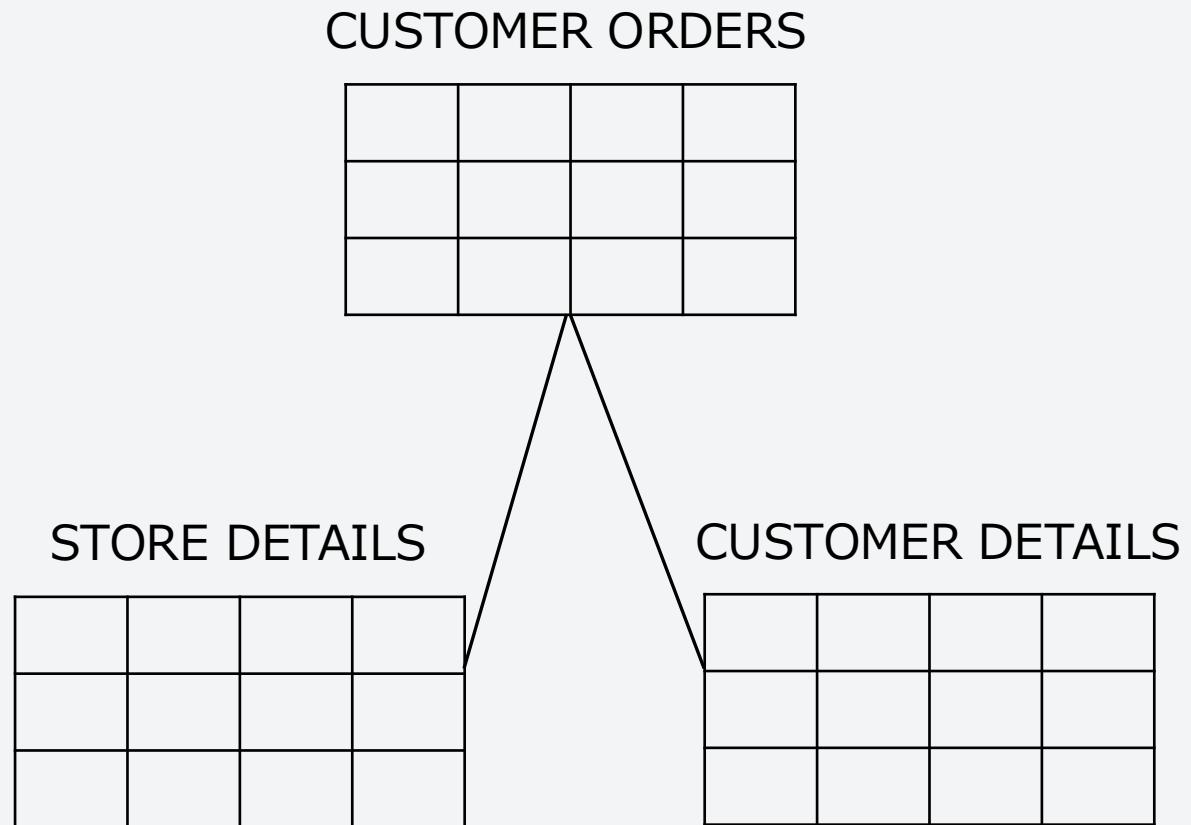
What is a NoSQL Database?



# **What is a Database**

A database is defined as an organized collection of structured information or data typically stored electronically.

# What is an SQL Database

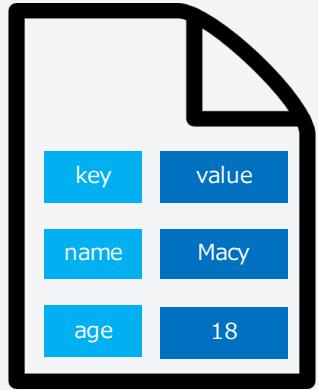


# What is a NoSQL Database

NoSQL (also refers to Not only SQL, non-SQL or non-relational) is a database which gives you a way to manage the data which is in a non-relational form i.e. which is not structured in a tabular manner and does not possess tabular relationships.

# Types of NoSQL Database

Document

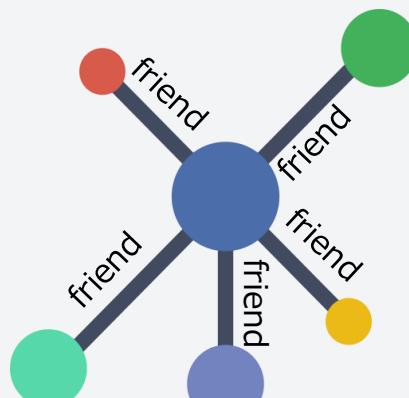


Key Value

key	value
Student_1	name@Laura @A4- tel@45789
Student_2	name@Chirs @B7- tel@12349

Apache, MongoDB, CouchDB

Graph



Neo4j, AllegroGraph,  
InfiniteGraph

Column Family

COLUMN FAMILY: Users			
Row Key	Columns		
Macy	name	age	email
Macy Kung 20 macy@...			
James	name	age	email
James Hatcher 20 james@...			

COLUMN FAMILY: Schools

Cassandra, Hbase, Google BigTable

# What is MongoDB

DATABASE

COLLECTION

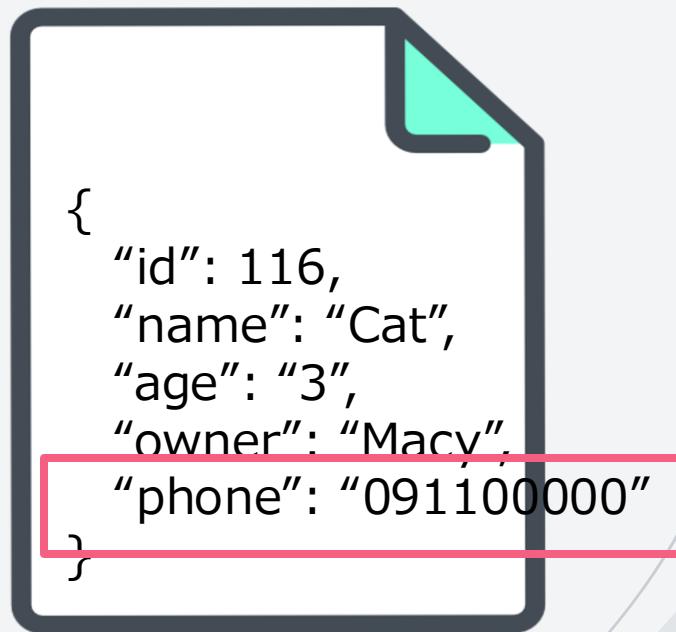
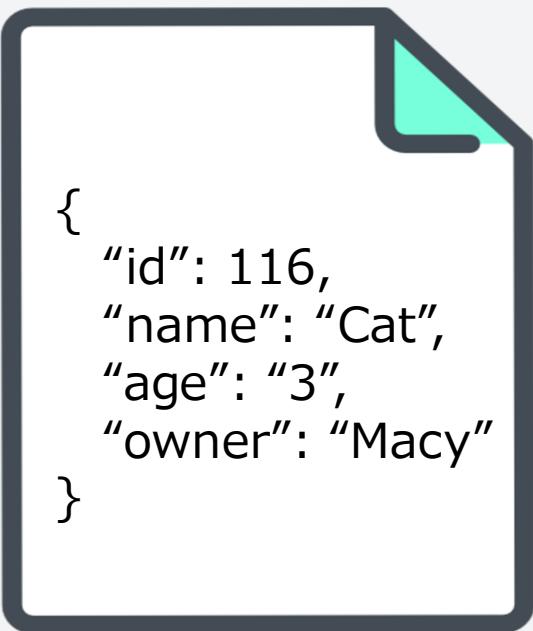


COLLECTION



```
{  
  "field": "value",  
  "field": "value",  
  "field": "value",  
  "field": "value"  
}
```

# What is MongoDB

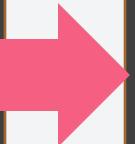


Documents are **polymorphic** i.e. they don't have a fixed structure.  
Changes can be made easily to an individual document structure  
e.g. new field value pairs can be added.

# Previous example in SQL database

SQL

ID	NAME	AGE	OWNER
1	Cookie	3	Macy
2	Cin cin	7	Cindy
3	Dao	6	Lien
4	Pi	1	Yao

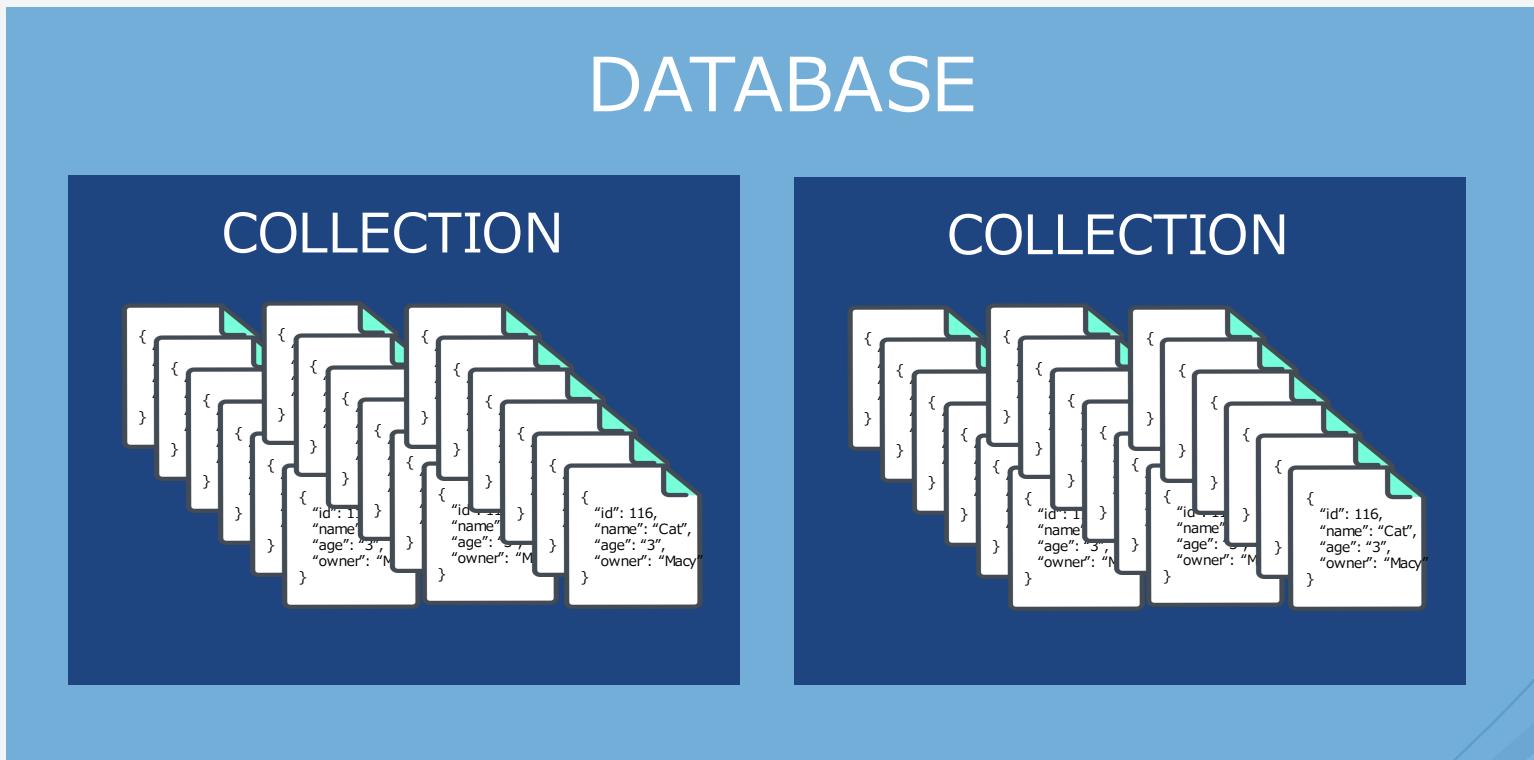


ID	NAME	AGE	OWNER	PHONE
1	Cookie	3	Macy	098100
2	Cin cin	7	Cindy	null
3	Dao	6	Lien	null
4	Pi	1	Yao	091888

# What is MongoDB

In general, data is stored more efficiently in MongoDB than in SQL because it is schema-less resulting in less data redundancy and more efficiency

# Documents in MongoDB



# Documents in MongoDB



# Documents in MongoDB

```
{  
  "_id": ObjectId(11666),  
  "name": "Cat",  
  "address": {  
    "street": "No.1 Neihu road",  
    "city": "Taipei",  
    "postal code": "114"  
  }  
}
```

Nested Document

# Documents in MongoDB



```
{  
    "_id": ObjectId(11666),  
    "name": "Cat",  
    "phone": ["02-0034241", "091133442"]  
    "address": {  
        "street": "No.1 Neihu road",  
        "city": "Taipei",  
        "postal code": "114"  
    }  
}
```

An array is a data structure consisting of a collection of elements  
With an array data type, we can store multiple values in a single key of the document.

# Documents in MongoDB

```
{  
  "_id": ObjectId(11666),  
  "name": "Cat",  
  "age": "3",  
  "owner": "Macy"  
}
```

```
{  
  "_id": ObjectId(11666),  
  "name": "Cat",  
  "age": "3",  
  "owner": "Macy",  
  "phone": "0911000000"  
}
```

```
{  
  "_id": ObjectId(11666),  
  "name": "Cat",  
  "age": "3",  
  "owner": "Macy",  
  "cell phone": "0911000000"  
}
```

Not the same field

# MongoDB - Datatypes

**NUMERICAL:**  
Numbers such as integers  
and decimals

**DATE:**  
Date and time values

**STRING:**  
Charater / text  
values

👉 [Datatypes Reference](#)

```
{"hello": "world"} → \x16\x00\x00\x00          // total document size  
 \x02                      // 0x02 = type String  
 hello\x00                  // field name  
 \x06\x00\x00\x00world\x00    // field value  
 \x00                      // 0x00 = type E00 ('end of object')
```

```
{"BSON": ["awesome", 5.05, 1986]} → \x31\x00\x00\x00  
 \x04BSON\x00  
 \x26\x00\x00\x00  
 \x02\x30\x00\x08\x00\x00\x00awesome\x00  
 \x01\x31\x00\x33\x33\x33\x33\x33\x33\x33\x14\x40  
 \x10\x32\x00\xc2\x07\x00\x00  
 \x00  
 \x00
```

# What is BSON? Does MongoDB use BSON, or JSON?



# SQL vs NoSQL: comparison table





- SQL (Structured Query Language) is a traditional Relation database management system(RDBMS).
- SQL uses a fixed schema, where the structure of the tables must be defined before data can be inserted.
- In SQL, data is stored in tables with rows and columns.
- A great choice if you have structured data and need a traditional relational database



mongoDB

- MongoDB is a document-oriented NoSQL database.
- MongoDB uses a dynamic schema, where documents can have different fields.
- MongoDB uses a more expressive query language based on JSON
- In MongoDB, data is stored in collections of JSON-like documents.
- An ideal choice if you have unstructured and/or structured data with the potential for rapid growth

# When to use NoSQL

- To handle a huge volume of structured, semi-structured and unstructured data.
- If your relational database is not capable enough to scale up to your traffic at an acceptable cost.
- If you want to have an efficient, scale-out architecture in place of an expensive and monolithic architecture.
- If you have local data transactions that need not be very durable.
- If you are going with schema-less data and want to include new fields without any ceremony.
- When your priority is easy scalability and availability.

# When to Avoid NoSQL

- In such cases like financial transactions, etc., you may go with SQL databases.
- If consistency is a must and if there aren't going to be any large-scale changes in terms of the data volume, then going with the SQL database is a better option.

# Set Up & Installation

- Click **Try Free**, SignUp to [MongoDB Atlas](#) with Google Account
- [MongoDB Atlas Quick Tour](#)
- Create database
- Create Users
- Network access
- [How can I connect to my MongoDB database from VS Code?](#)

# Create Database

When using the `use` directive to specify a database, if the database does not exist, MongoDB will automatically create it.

```
Create Database  
1 use DATABASE_NAME
```

## Create Database

```
1 > use test_tv  
2 switched to db test_tv  
3 > db  
4 test_tv  
5 >
```

# Create Collection

Collections are similar to tables in a relational database. The steps to create a collection are as follows:

Create Collection

```
1 use test_tv  
2 db.createCollection("dramas")
```

# Inserting Documents - insertOne



## insertOne

```
db.collection.insertOne(  
  <document or array of documents>  
)
```

Inserts a single document into a collection.  
Returns an object that contains  
the status of the operation.

Return :

```
1 db.dramas.insertOne(  
2   {  
3     "_id": ObjectId("a23t4464732"),  
4     "name": "腦筋急轉彎2",  
5     "episodes": [  
6       {  
7         "season": 1,  
8         "episode": 1,  
9         "link": "http://link1.com",  
10        "description": "第1集簡介"  
11      }  
12    ],  
13    "end_date": "2024-07-30 00:00:00",  
14    "release_date": "2024-06-13 00:00:00",  
15    "description": "深入探索踏上青少女時期的萊莉內心，全新情緒角色也將全面解鎖",  
16    "poster": "http://poster1.jpg",  
17    "category": "電影"  
18  }  
19 )
```

# Inserting Documents - insertMany



## insertMany

```
db.collection.insertMany(  
  <document or array of documents>  
)
```

Inserts multiple documents  
into a collection.

Return :

```
1 db.dramas.insertMany(  
2   {  
3     "name": "腦筋急轉彎2",  
4     "episodes": [  
5       {  
6         "season": 1,  
7         "episode": 1,  
8         "link": "http://link1.com",  
9         "description": "第1集簡介"  
10      }  
11    ],  
12    "end_date": "2024-07-30 00:00:00",  
13    "release_date": "2024-06-13 00:00:00",  
14    "description": "深入探索踏上青少女時期的茉莉內心，全新情緒角色也將全面解鎖",  
15    "poster": "http://poster1.jpg",  
16    "category": "電影"  
17  },  
18  {  
19    "name": "荒野機器人",  
20    "episodes": [  
21      {  
22        "season": 1,  
23        "episode": 1,  
24        "link": "http://link1.com",  
25        "description": "第1集簡介"  
26      }  
27    ],  
28    "end_date": "2024-11-20 00:00:00",  
29    "release_date": "2024-10-10 00:00:00",  
30    "description": "一個機器人簡稱羅茲的羅茲森7134號機器人，因為船難被困在一座無人荒島，...",  
31    "poster": "http://poster1.jpg",  
32    "category": "電影"  
33  }  
34 )
```

# Using the find Methods



find

```
db.collection.find({query},{projection})
```

Returns all documents in a collection

Query and projection are optional

- Query : Specifies selection filter.
- Projection: Specifies the fields to return in the documents that match the query filter.
  - 1: true, query this field
  - 0: false, ignore this field

find

1 MongoQL:

```
2 db.dramas.find({"category": "電影"}, {"name":1})
```

3

4 Return:

```
5 [
6   {_id:ObjectId("dshth343"), name: "腦筋急轉彎2"},
7   {_id:ObjectId("dsadaw4t"), name: "荒野機器人"}
8 ]
9
```

# Using the findOne Methods



findOne

```
db.collection.findOne({query},{projection})
```

Returns one document from the collection  
If multiple documents satisfy the query,  
the methods returns the first document.

find

```
1 MongoQL:  
2 db.dramas.findOne({"category": "電影"}, {"name": 1})  
3  
4 Return:  
5 [  
6   {_id:ObjectId("dshth343")}, name: "腦筋急轉彎2"}  
7 ]  
8
```

# Case Sensitivity in MongoDB

Objects in MongoDB are case sensitive.

For example, the `findOne` method (performed in the `sample_training` database on the `shoes` collection) should be as follows:

**`db.dramas.findOne()`** – this is the correct syntax

**`Db.dramas.findOne()`** – will not work because `Db` contains an upper case character

**`db.Dramas.findOne()`** – will not work because the collection is saved as “`trips`” not “`Trips`”, case sensitivity matters

**`db.dramas.FindOne()`** – will not work because case sensitivity also matters on methods. It should be “`findOne`” not “`FindOne`”

The findOne method performed in the database on the shoes collection

- a. db.dramas.findOne()
- b. Db.dramas.findOne()
- c. db.Dramas.findOne()
- d. db.dramas.FindOne()
- e. All of the above



**Which of the  
following is correct**



# From creating a database to querying data



## 1. Create Database

```
use test_tv
```

## 2. Create Collection

```
db.createCollection("dramas");
```

## 3. Insert data

```
db.dramas.insertMany([ { name: "Squid Game",  
category: "亞洲", ... } ]);
```

## 4. Query Data : 動漫

```
db.dramas.find({ category: "動漫" });
```



# Use of \$ in Mongo query language

- Precedes operators in Mongo query language
- Precedes field values
- Aggregation Pipeline



Equal to

**{“size”:{\$eq:”UK8”}}**

**{field:{operator : value}}**

# Logical Operators

\$and

Return all documents  
that match all conditions

\$or

Return all documents that  
match any of the conditions

\$nor

Return all documents that  
fail all of the conditions

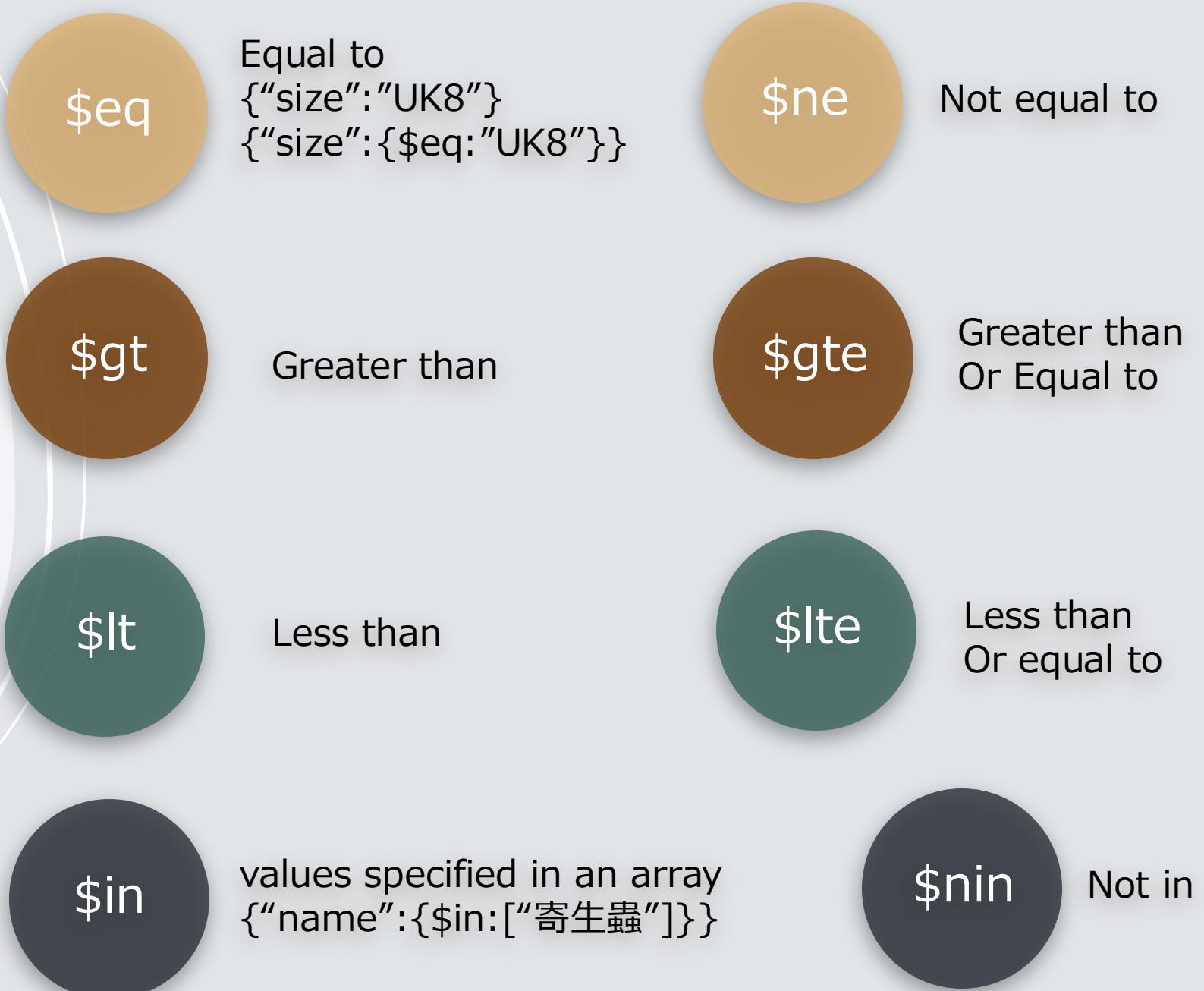
{operator: [{condition1},{condition2},..]}

\$not

Return all documents that  
do not match the expression

{operator: [{condition1}]}  
}

# Comparison Operators



# Elements Operators

\$exists

Return documents that contain the specified field

**db.collection.find({field:{\$exists:<boolean>}})**

\$type

Return documents that contain values of a specified data type

**db.collection.find({field:{\$type:<BSON type>}})**

**db.collection.find({field:{\$type:[<BSON type1>, <BSON type2>,...]}})**



# Upcoming movie list query



## 1. Query Data : 即將上線

```
db.dramas.find({release_date: { $gte: "2024-05-24 00:00:00" }})
```



# Query Embedded Documents

You can perform read operations using the db.collection.find() method

- Match an Embedded/Nested Document
- Specify Equality Match on a Nested Field
- Specify Match using Query Operator
- Specify AND Condition

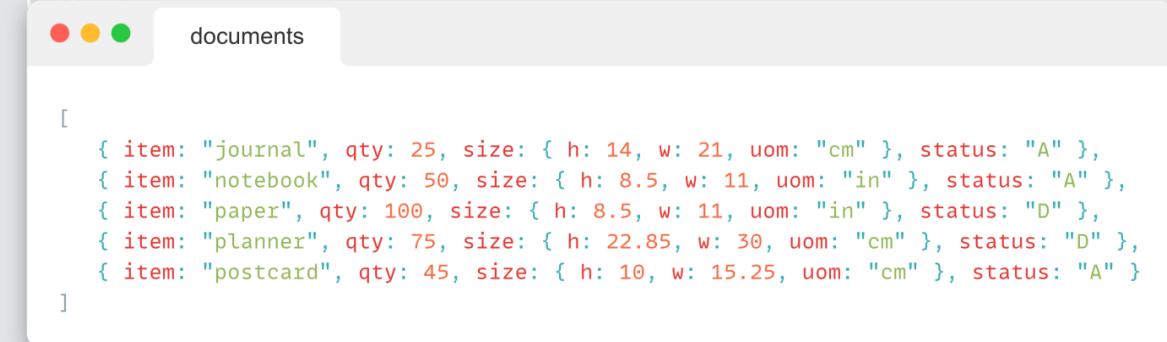
# Match an Embedded/Nested Document

To specify an equality condition on a field that is an embedded/nested document, use the [query filter document](#)

**{ <field>: <value> }**

where <value> is the document to match.

```
db.inventory.find({ size: { h: 14, w: 21, uom: "cm" } })
```



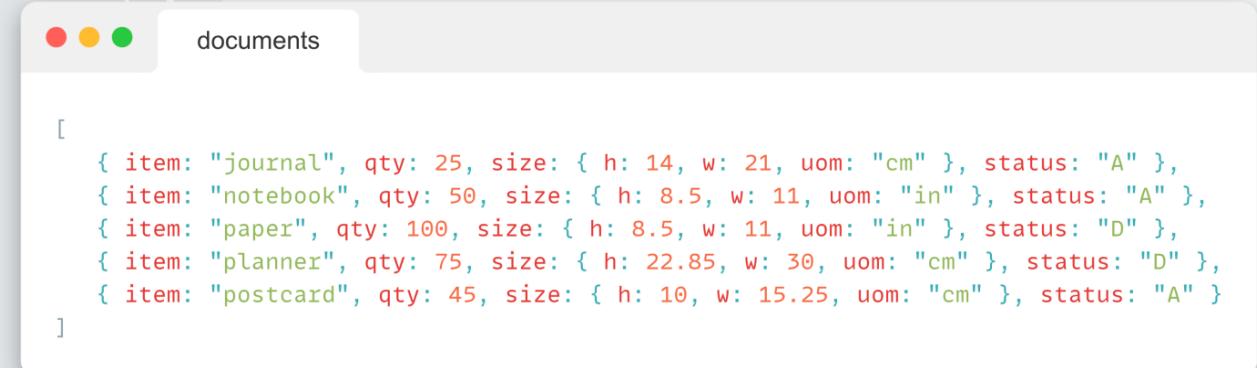
The screenshot shows a MongoDB shell window with the title bar 'documents'. The window displays a JSON array representing the results of a database query. The query finds documents where the 'size' field contains an object with 'h' set to 14, 'w' set to 21, and 'uom' set to 'cm'. The resulting array contains five documents, each with an 'item' field and various other fields like 'qty' and 'status'.

```
[{"item": "journal", "qty": 25, "size": { "h": 14, "w": 21, "uom": "cm" }, "status": "A"}, {"item": "notebook", "qty": 50, "size": { "h": 8.5, "w": 11, "uom": "in" }, "status": "A"}, {"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"}]
```

# Specify Equality Match on a Nested Field

The following example selects all documents where the field uom nested in the size field equals "in"

```
db.inventory.find({ "size.uom": "in" })
```



A screenshot of a MongoDB shell window titled "documents". A cursor is hovering over the first document in the results array. The document contains the following data:

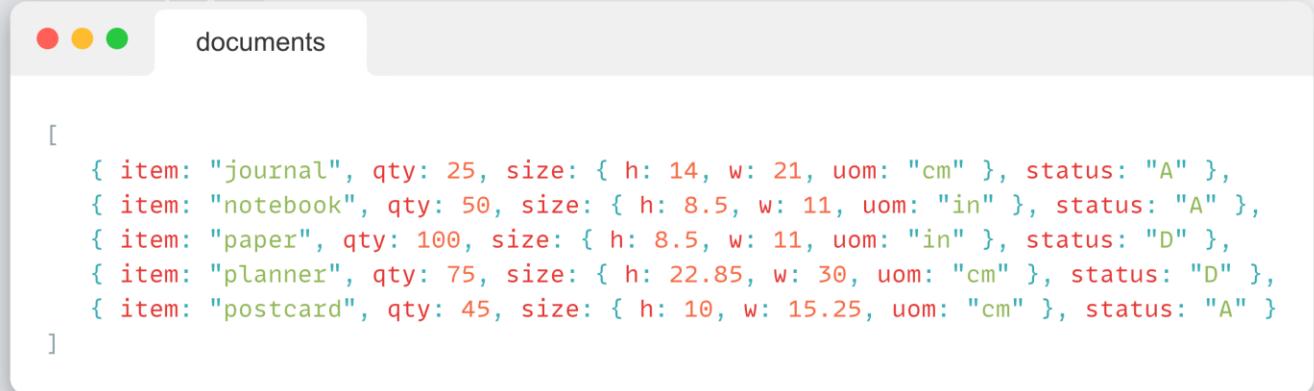
```
[  
  { item: "journal", qty: 25, size: { h: 14, w: 21, uom: "cm" }, status: "A" },  
  { item: "notebook", qty: 50, size: { h: 8.5, w: 11, uom: "in" }, status: "A" },  
  { item: "paper", qty: 100, size: { h: 8.5, w: 11, uom: "in" }, status: "D" },  
  { item: "planner", qty: 75, size: { h: 22.85, w: 30, uom: "cm" }, status: "D" },  
  { item: "postcard", qty: 45, size: { h: 10, w: 15.25, uom: "cm" }, status: "A" }]
```

# Specify Match using Query Operator

A [query filter document](#) can use the [query operators](#) to specify conditions in the following form:

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

```
db.inventory.find({ "size.h": { $lt: 15 } })
```



The screenshot shows a macOS-style application window titled "documents". Inside the window, a JSON array is displayed, representing the results of the MongoDB query. The array contains five documents, each representing a different item with its quantity, size (height and width), uom (unit of measurement), and status.

```
[  
  { item: "journal", qty: 25, size: { h: 14, w: 21, uom: "cm" }, status: "A" },  
  { item: "notebook", qty: 50, size: { h: 8.5, w: 11, uom: "in" }, status: "A" },  
  { 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" }]
```

# Specify AND Condition

The following query selects all documents where the nested field h is less than 15, the nested field uom equals "in", and the status field equals "D"

```
db.inventory.find({ "size.h": { $lt: 15 }, "size.uom": "in", status: "D" })
```

documents

```
[  
  { item: "journal", qty: 25, size: { h: 14, w: 21, uom: "cm" }, status: "A" },  
  { item: "notebook", qty: 50, size: { h: 8.5, w: 11, uom: "in" }, status: "A" },  
  { 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" }  
]
```

# Query an Array of Embedded Documents

- Query for a Document Nested in an Array
- Specify a Query Condition on a Field Embedded in an Array of Documents
- Use the Array Index to Query for a Field in the Embedded Document
- A Single Nested Document Meets Multiple Query Conditions on Nested Fields
- Combination of Elements Satisfies the Criteria

# Query for a Document Nested in an Array

The following example selects all documents where an element in the instock array matches the specified document

```
db.inventory.find( { "instock": { warehouse: "A", qty: 5 } } )
```



A screenshot of a MongoDB shell window titled "documents". The window shows a list of documents in JSON format. The query executed is: db.inventory.find( { "instock": { warehouse: "A", qty: 5 } } ). The results returned are:

```
[  
  { item: "journal", instock: [ { warehouse: "A", qty: 5 }, { warehouse: "C", qty: 15 } ] },  
  { item: "notebook", instock: [ { warehouse: "C", qty: 5 } ] },  
  { item: "paper", instock: [ { warehouse: "A", qty: 60 }, { warehouse: "B", qty: 15 } ] },  
  { item: "planner", instock: [ { warehouse: "A", qty: 40 }, { warehouse: "B", qty: 5 } ] },  
  { item: "postcard", instock: [ { warehouse: "B", qty: 15 }, { warehouse: "C", qty: 35 } ] }  
]
```

# Specify a Query Condition on a Field Embedded in an Array of Documents

If you do not know the index position of the document nested in the array, concatenate the name of the array field, with a dot (.) and the name of the field in the nested document.

The following example selects all documents where the `instock` array has at least one embedded document that contains the field `qty` whose value is less than or equal to 20

```
db.inventory.find( { 'instock.qty': { $lte: 20 } } )
```



A screenshot of a computer screen displaying a MongoDB query result. The window title is "documents". The query is: `db.inventory.find( { 'instock.qty': { $lte: 20 } } )`. The results are shown as an array of documents:

```
[ { item: "journal", instock: [ { warehouse: "A", qty: 5 }, { warehouse: "C", qty: 15 } ] }, { item: "notebook", instock: [ { warehouse: "C", qty: 5 } ] }, { item: "paper", instock: [ { warehouse: "A", qty: 60 }, { warehouse: "B", qty: 15 } ] }, { item: "planner", instock: [ { warehouse: "A", qty: 40 }, { warehouse: "B", qty: 5 } ] }, { item: "postcard", instock: [ { warehouse: "B", qty: 15 }, { warehouse: "C", qty: 35 } ] } ]
```

# Use the Array Index to Query for a Field in the Embedded Document

Using [dot notation](#), you can specify query conditions for field in a document at a particular index or position of the array. The array uses zero-based indexing.

The following example selects all documents where the `instock` array has as its first element a document that contains the field `qty` whose value is less than or equal to 20

```
db.inventory.find( { 'instock.0.qty': { $lte: 20 } } )
```



A screenshot of a MongoDB shell window titled "documents". The window shows the results of a query. The results are displayed in a JSON array, starting with a bracket "[", followed by five document objects. Each document has an "item" field and an "instock" array. The "instock" array contains two warehouse documents, each with a "warehouse" field and a "qty" field. The "qty" field values are 5, 15, 60, 40, and 35 respectively. The "warehouse" field values are "A", "C", "A", "B", and "B".

```
[  
  { item: "journal", instock: [ { warehouse: "A", qty: 5 }, { warehouse: "C", qty: 15 } ] },  
  { item: "notebook", instock: [ { warehouse: "C", qty: 5 } ] },  
  { item: "paper", instock: [ { warehouse: "A", qty: 60 }, { warehouse: "B", qty: 15 } ] },  
  { item: "planner", instock: [ { warehouse: "A", qty: 40 }, { warehouse: "B", qty: 5 } ] },  
  { item: "postcard", instock: [ { warehouse: "B", qty: 15 }, { warehouse: "C", qty: 35 } ] }]
```

# A Single Nested Document Meets Multiple Query Conditions on Nested Fields

Use \$elemMatch operator to specify multiple criteria on an array of embedded documents such that at least one embedded document satisfies all the specified criteria.

The following example queries for documents where the instock array has at least one embedded document that contains both the field qty equal to 5 and the field warehouse equal to A

```
db.inventory.find( { "instock": { $elemMatch: { qty: 5, warehouse: "A" } } } )
```

documents

```
[  
  { item: "journal", instock: [ { warehouse: "A", qty: 5 }, { warehouse: "C", qty: 15 } ] },  
  { item: "notebook", instock: [ { warehouse: "C", qty: 5 } ] },  
  { item: "paper", instock: [ { warehouse: "A", qty: 60 }, { warehouse: "B", qty: 15 } ] },  
  { item: "planner", instock: [ { warehouse: "A", qty: 40 }, { warehouse: "B", qty: 5 } ] },  
  { item: "postcard", instock: [ { warehouse: "B", qty: 15 }, { warehouse: "C", qty: 35 } ] }  
)
```

The following example queries for documents where the instock array has at least one embedded document that contains the field qty that is greater than 10 and less than or equal to 20

```
db.inventory.find( { "instock": { $elemMatch: { qty: { $gt: 10, $lte: 20 } } } } )
```

documents

```
[  
  { item: "journal", instock: [ { warehouse: "A", qty: 5 }, { warehouse: "C", qty: 15 } ] },  
  { item: "notebook", instock: [ { warehouse: "C", qty: 5 } ] },  
  { item: "paper", instock: [ { warehouse: "A", qty: 60 }, { warehouse: "B", qty: 15 } ] },  
  { item: "planner", instock: [ { warehouse: "A", qty: 40 }, { warehouse: "B", qty: 5 } ] },  
  { item: "postcard", instock: [ { warehouse: "B", qty: 15 }, { warehouse: "C", qty: 35 } ] }  
)
```

# Combination of Elements Satisfies the Criteria

If the compound query conditions on an array field do not use the `$elemMatch` operator, the query selects those documents whose array contains any combination of elements that satisfies the conditions.

For example, the following query matches documents where any document nested in the `instock` array has the `qty` field greater than 10 and any document (but not necessarily the same embedded document) in the array has the `qty` field less than or equal to 20

```
db.inventory.find( { "instock.qty": { $gt: 10, $lte: 20 } } )
```



```
[{"item": "journal", "instock": [{"warehouse": "A", "qty": 5}, {"warehouse": "C", "qty": 15}], "item": "notebook", "instock": [{"warehouse": "C", "qty": 5}], {"item": "paper", "instock": [{"warehouse": "A", "qty": 60}, {"warehouse": "B", "qty": 15}], {"item": "planner", "instock": [{"warehouse": "A", "qty": 40}, {"warehouse": "B", "qty": 5}], {"item": "postcard", "instock": [{"warehouse": "B", "qty": 15}, {"warehouse": "C", "qty": 35}]}]
```

The following example queries for documents where the instock array has at least one embedded document that contains the field qty equal to 5 and at least one embedded document (but not necessarily the same embedded document) that contains the field warehouse equal to A

```
db.inventory.find( { "instock.qty": 5, "instock.warehouse": "A" } )
```



A screenshot of a Mac OS X application window titled "documents". The window contains a list of documents, each representing an item in an inventory collection. The documents are formatted as JSON objects:

```
[  
  { item: "journal", instock: [ { warehouse: "A", qty: 5 }, { warehouse: "C", qty: 15 } ] },  
  { item: "notebook", instock: [ { warehouse: "C", qty: 5 } ] },  
  { item: "paper", instock: [ { warehouse: "A", qty: 60 }, { warehouse: "B", qty: 15 } ] },  
  { item: "planner", instock: [ { warehouse: "A", qty: 40 }, { warehouse: "B", qty: 5 } ] },  
  { item: "postcard", instock: [ { warehouse: "B", qty: 15 }, { warehouse: "C", qty: 35 } ] }  
]
```

# Deleting Documents - deleteOne



deleteOne

```
db.collection.deleteOne(<filter>)
```

The first document that matches  
the filter condition will be deleted

deleteOne

MongoQL:

```
db.dramas.deleteOne({_id: ObjectId("dsadaw4t")})
```

Return:

```
{ "acknowledged" : true, "deletedCount" : 1 }
```

# Delete Documents - deleteMany



deleteMany

```
db.collection.deleteMany(<filter>)
```

All documents that match the condition  
will be deleted.

deleteMany

MongoQL:

```
db.dramas.deleteMany({"category": "電影"})
```

Return:

```
{ "acknowledged" : true, "deletedCount" : 2 }
```

# Updating Documents



updateOne

```
db.collection.updateOne(  
  <filter>, <update>, <options>  
)
```

Update one will update the first documents that match the filter criteria.



updateMany

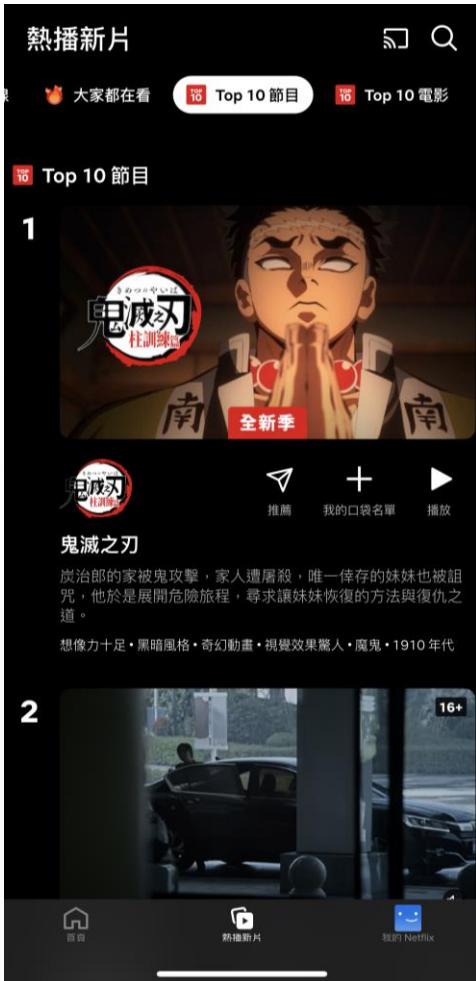
```
db.collection.updateMany(  
  <filter>, <update>, <options>  
)
```

Update many will update all documents that match the filter criteria.

\$set

```
db.collection.updateOne({filter}, {$set:{field:value,...}}, {options})  
db.collection.updateMany({filter}, {$set:{field:value,...}}, {options})
```

# Multi-document update exercise: add top10 tags to episodes



## 1. Update Data : Top10

```
db.dramas.updateMany(  
  { name: { $in: ["淚之女王", "葬送的芙利蓮", "出租車司機", "肌肉魔法使"] } },  
  { $set: { tag: ["top10"] } })
```

## 2. Query Top10

```
db.dramas.find({ tag: "top10" })
```



# Update Operators

\$unset

Removes the specified field from a document.

**db.collection.updateMany({filter},{\$unset:{field:value,...}},options)**

\$inc

Increments the value of the field by the specified amount.

**db.collection.updateMany({filter},{\$inc:{field:value,...}},options)**

\$rename

Renames a field.

**db.collection.updateMany({filter},{\$rename:{field:value,...}},options)**

\$push

Adds an item to an array.

**db.collection.updateMany({filter},{\$push:{field:value,...}},options)**

\$pull

Remove items from an array.

**db.collection.updateMany({filter},{\$pull:{field:value,...}},options)**



# Comparing SQL and NoSQL: Syntax Differences Between MySQL and MongoDB





MySQL	MongoDB
<b>INSERT</b>	
<pre>INSERT INTO dramas(name, category, release_date, end_date, description, poster) VALUES ('犯罪都市3：無法無天', '亞洲', '2024-06-02', '2024-12-30', '第三部《犯罪都市》系列，主要講述了“野獸警察”馬錫道對抗財閥繼承人和日本黑幫老大的故事。', 'http://poster1.jpg');</pre>	<pre>db.dramas.insertOne({ name: "犯罪都市3：無法無天", category: "亞洲", release_date: "2024-06-02", episodes: [{season: 1, episode: 1, link: "http://link1.com", description: "第1集簡介"}, {season: 1, episode: 2, link: "http://link2.com", description: "第2集簡介"}], end_date: "2024-12-30", description: "第三部《犯罪都市》系列，主要講述了“野獸警察”馬錫道對抗財閥繼承人和日本黑幫老大的故事。", poster: "http://poster1.jpg"});</pre>
<b>FIND</b>	
<pre>SELECT category, release_date FROM dramas WHERE name = '犯罪都市3：無法無天';</pre>	<pre>db.dramas.find({name: "犯罪都市3：無法無天"}, {category: 1, release_date: 1});</pre>
<b>UPDATE</b>	
<pre>UPDATE dramas SET category = '動作' WHERE name = '犯罪都市3：無法無天';</pre>	<pre>db.dramas.update({name: "犯罪都市3：無法無天"}, {\$set: {category: "動作"}});</pre>
<b>DELETE</b>	
<pre>DELETE FROM dramas WHERE category = '電影';</pre>	<pre>db.dramas.deleteMany({category: "電影"});</pre>

# Data Modeling Considerations

- The right schema design can enable you to make the most out of your database
- When designing your database it is important to consider:

Data Use and Performance

Determine important queries

Read vs Write

# Data Model Design

Embedding

vs

Referencing

user document

```
{  
  _id: <ObjectId1>,  
  username: "Chan",  
  contact: {  
    phone: "0922111444",  
    email: "chan0616@example.com"  
  },  
  access: {  
    level: 5,  
    group: "dev"  
  }  
}
```

user document

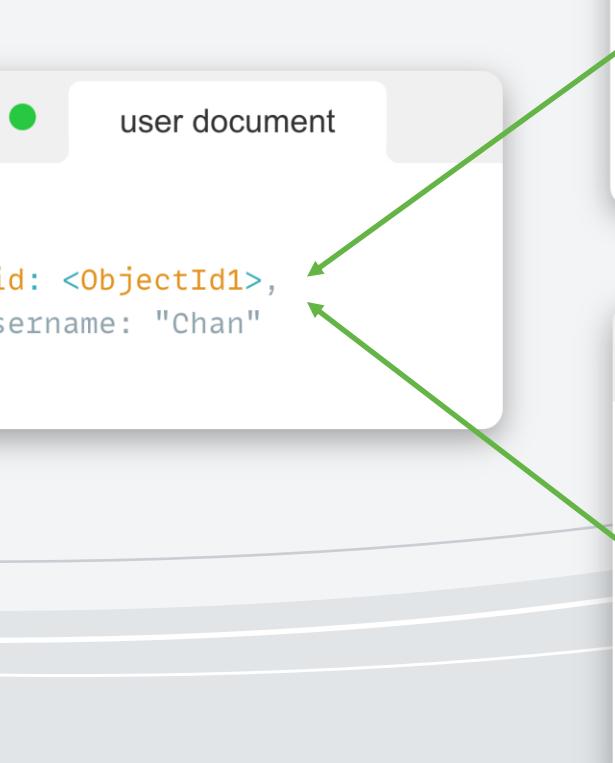
```
{  
  _id: <ObjectId1>,  
  username: "Chan"  
}
```

contact document

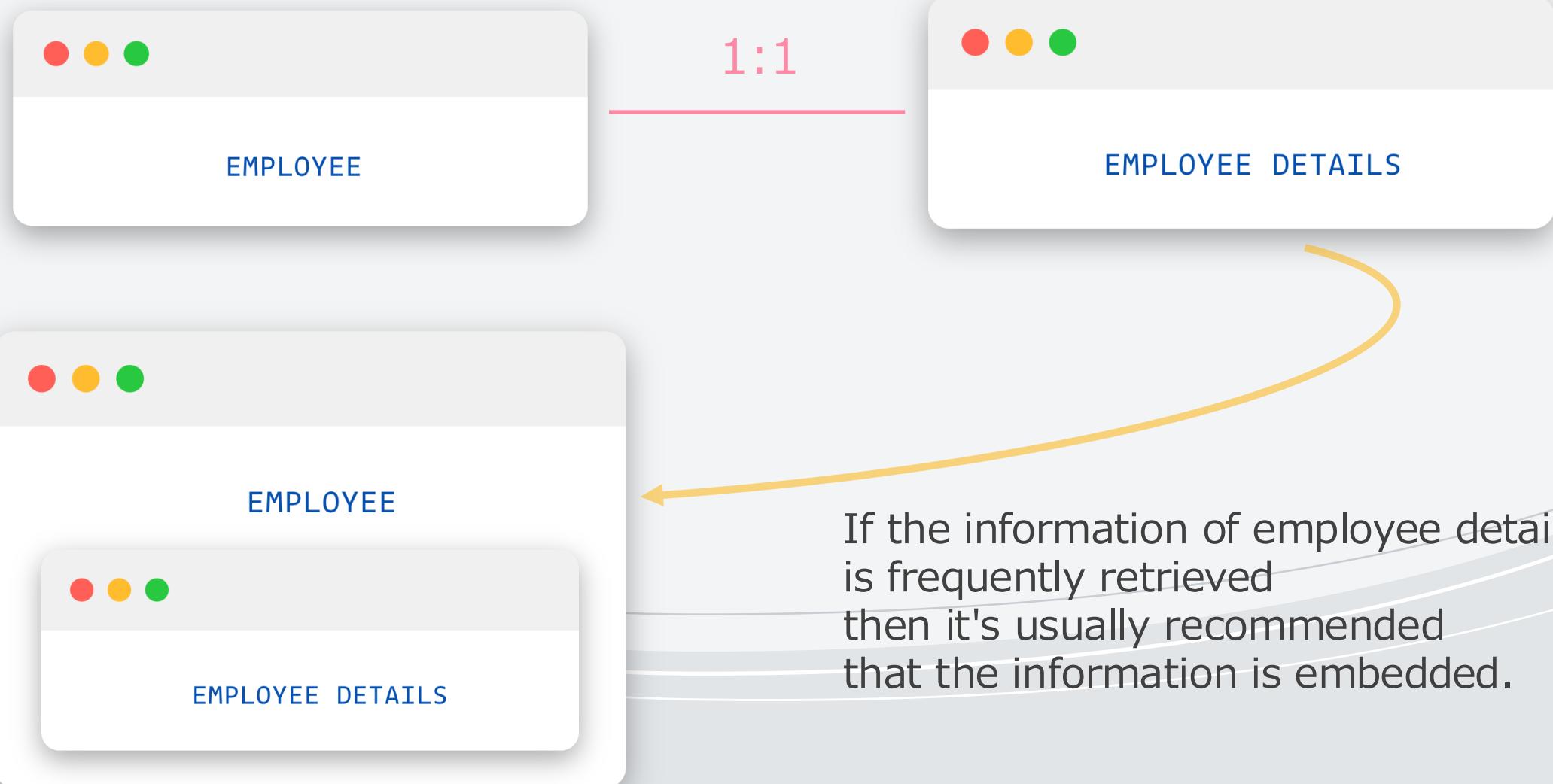
```
{  
  _id: <ObjectId2>,  
  user_id: <ObjectId1>,  
  phone: "0922111444",  
  email: "chan0616@example.com"  
}
```

access document

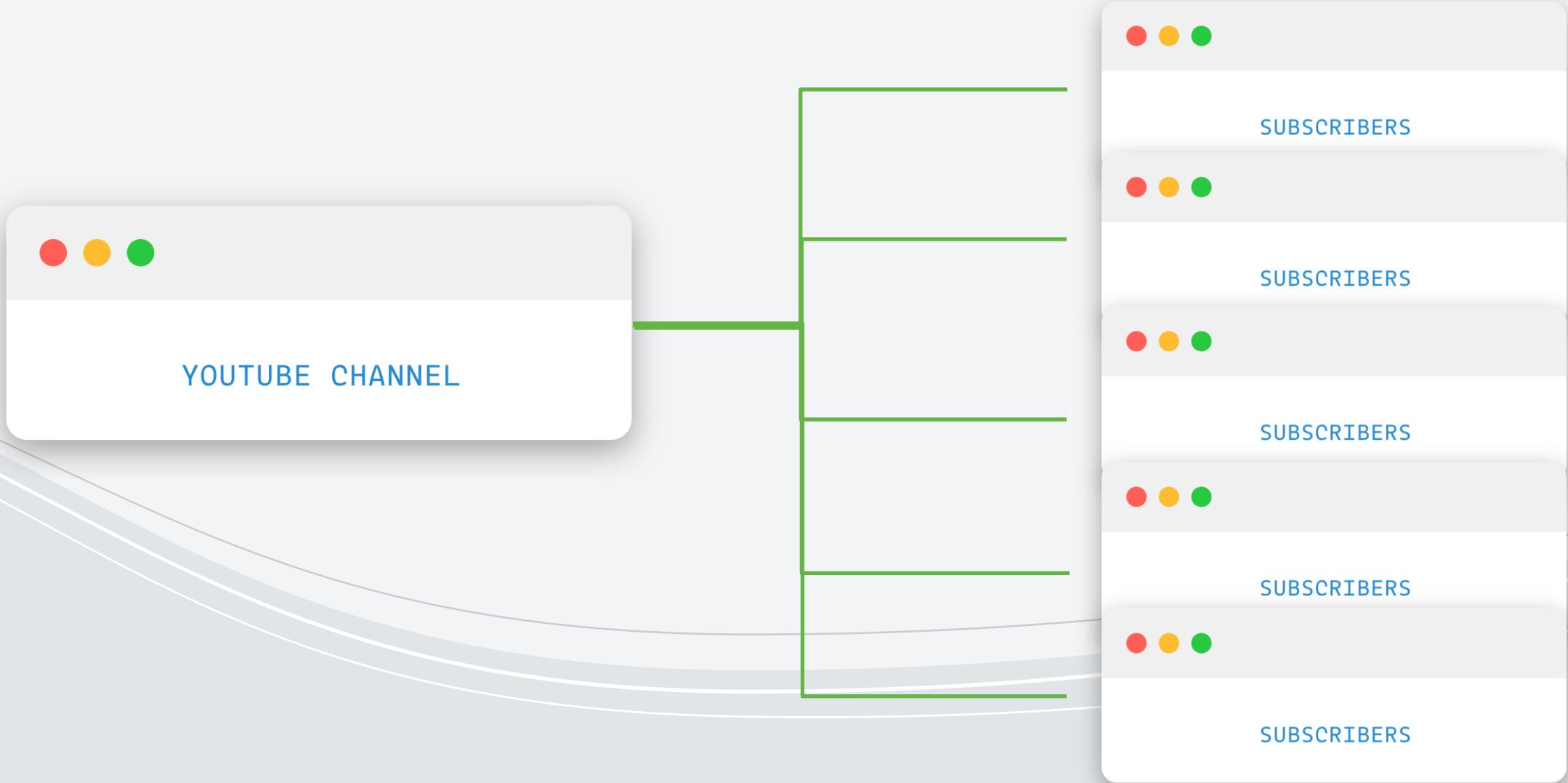
```
{  
  _id: <ObjectId3>,  
  user_id: <ObjectId1>,  
  level: 5,  
  group: "dev"  
}
```



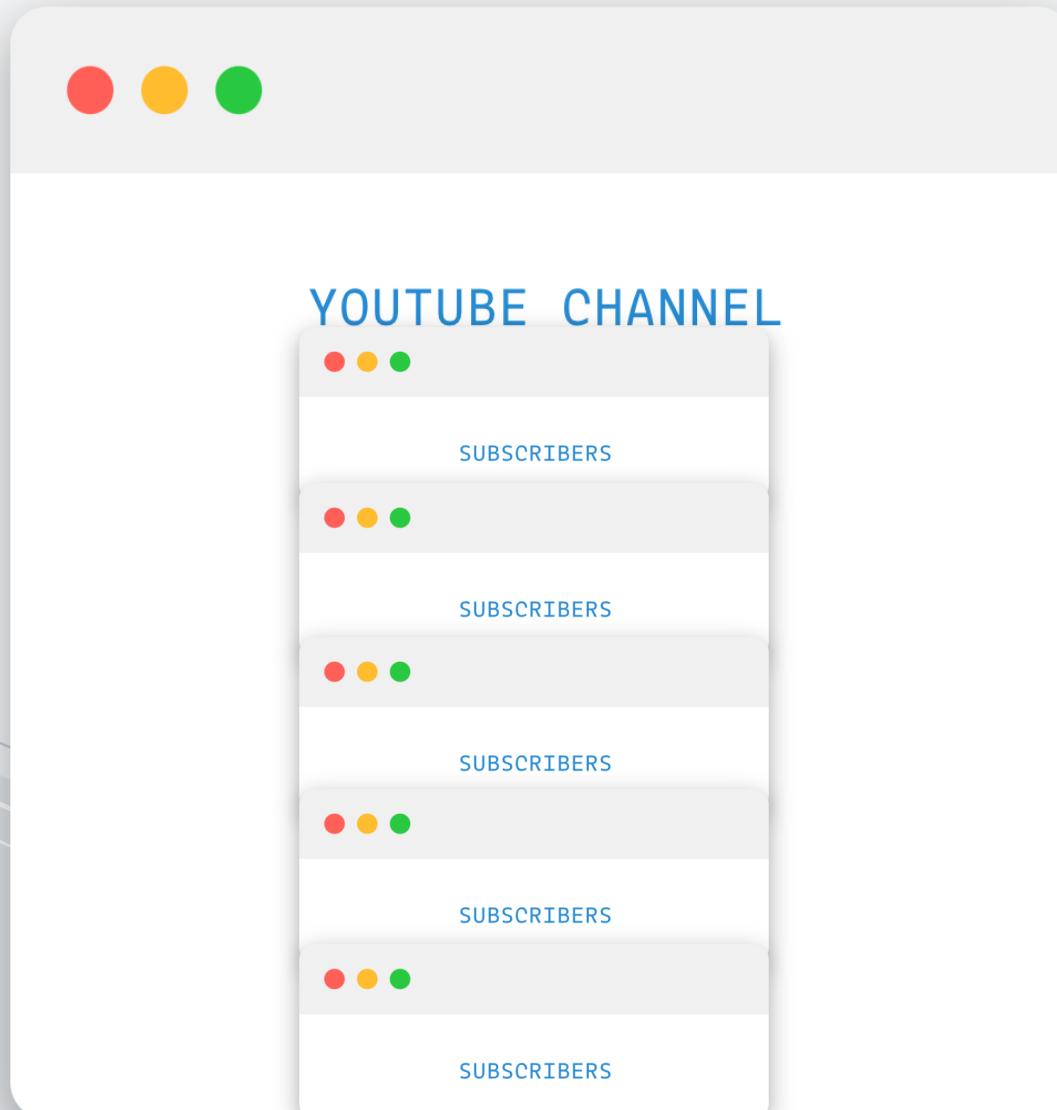
# 1:1 Relationship



# 1:Many Relationship



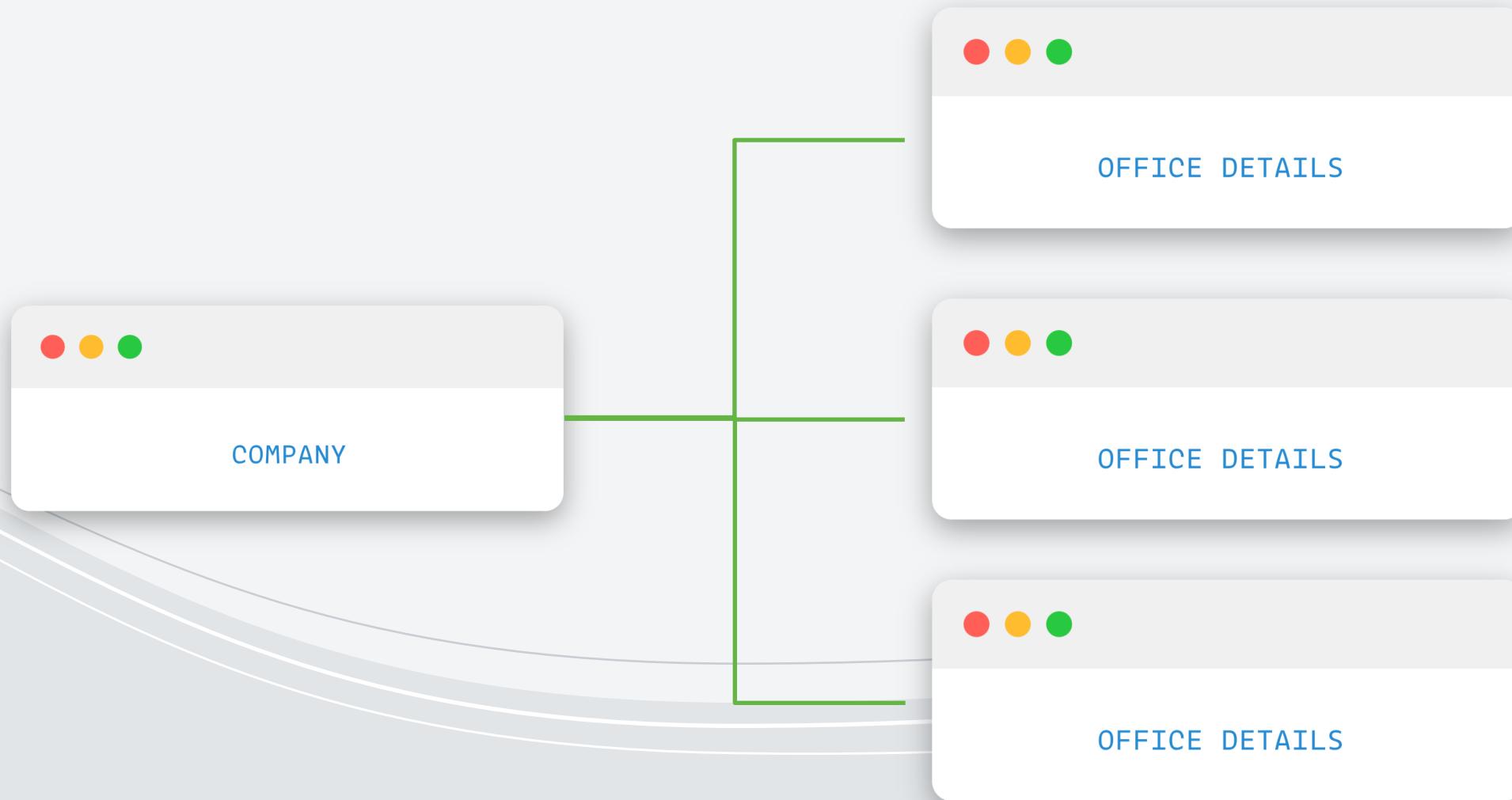
# 1:Many Relationship



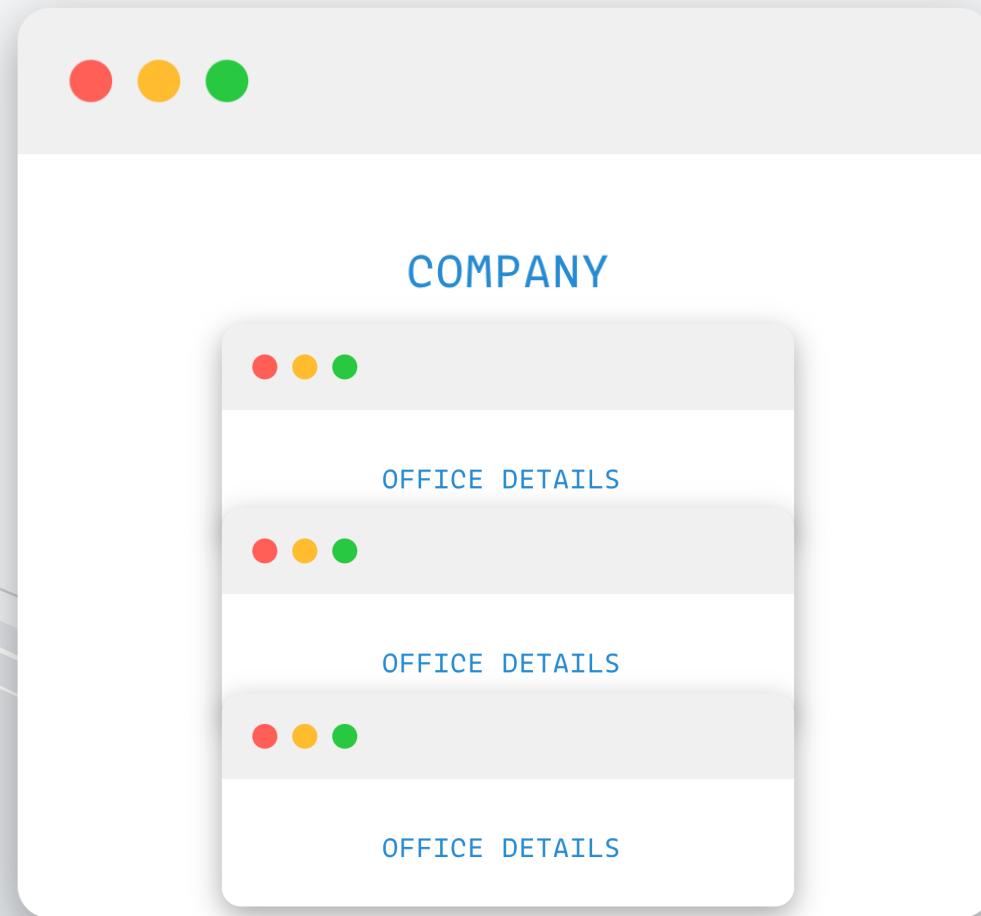
Too many embedded documents



# 1:Many Relationship

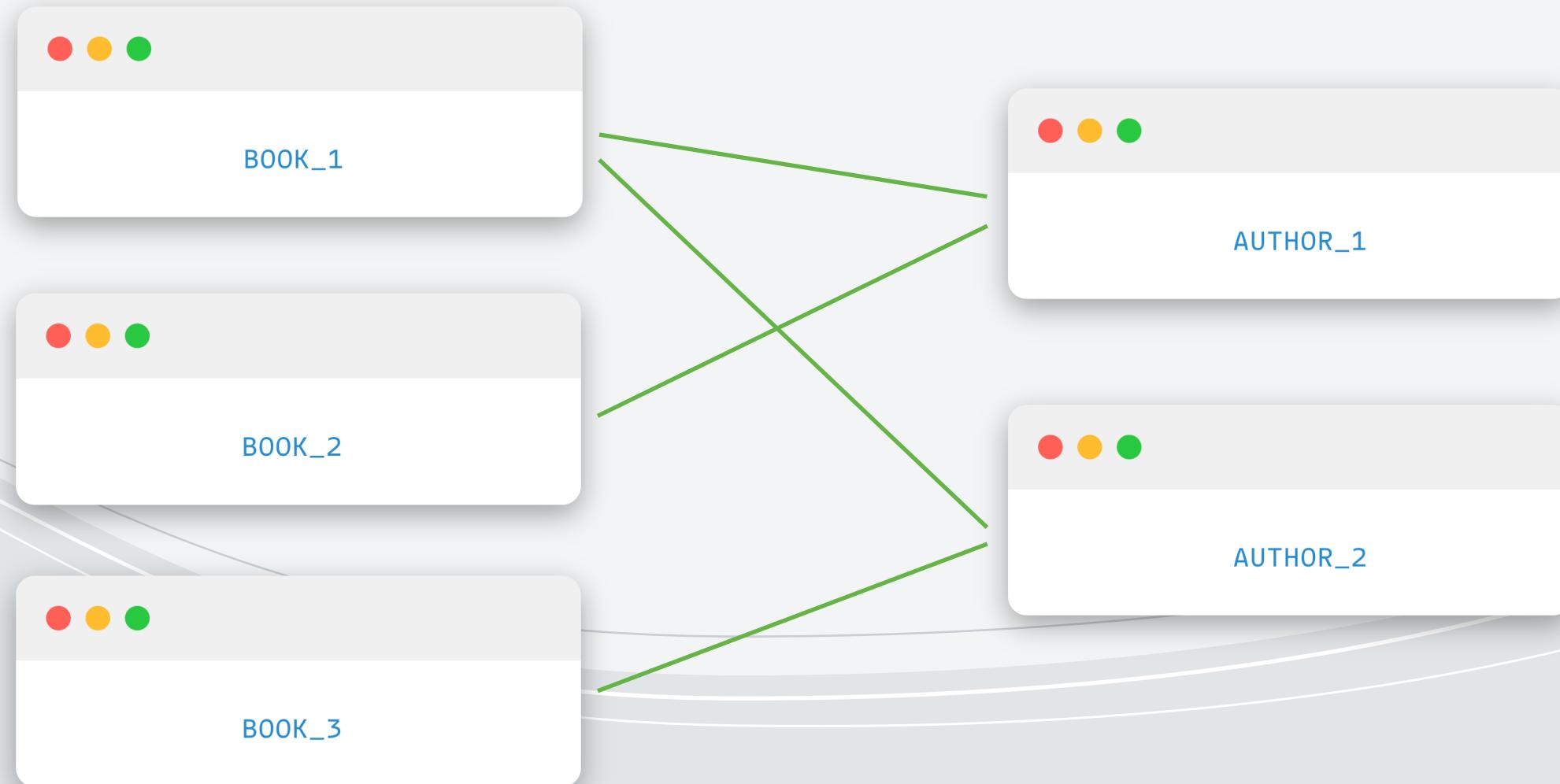


# 1:Many Relationship

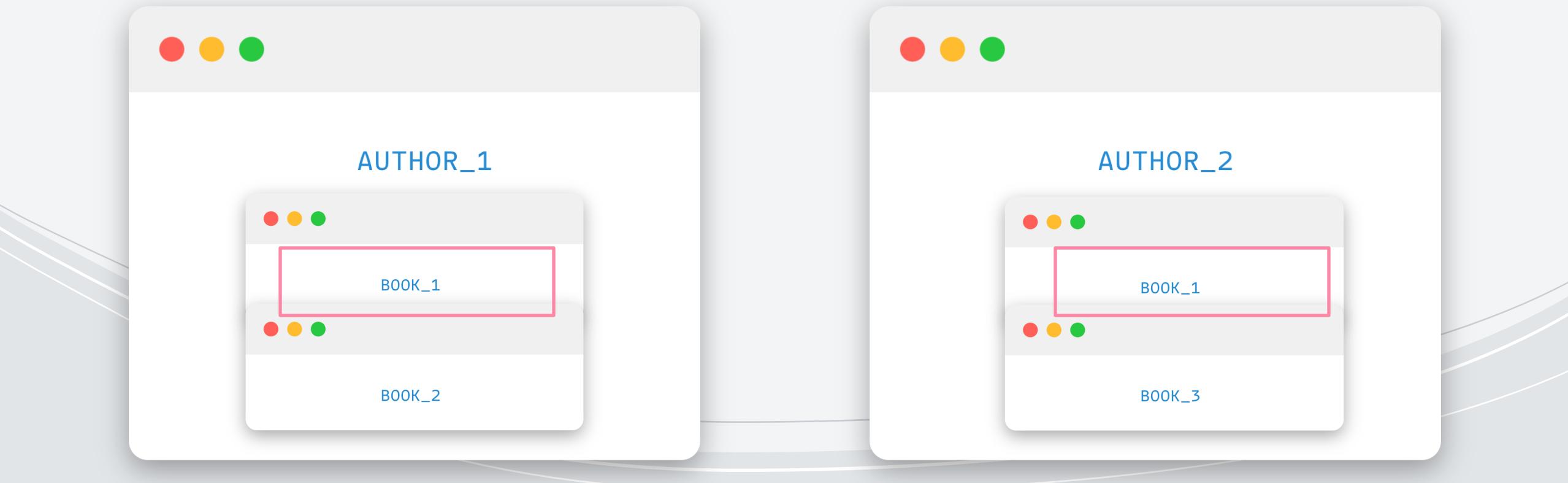


More suited to embedding documents

# Many:Many Relationship



# Many:Many Relationship



# Building with Pattern

Here is a very useful resource on [Schema Patterns](#).

Schema Patterns are very useful when deciding how to model your data in MongoDB so please be sure to check it out.

# Benefits of Using MongoDB

- Less complexity vs relational databases
- Schema-less
- Easier to maintain
- Flexible data model design



# Data Modeling and Operations: My Pocket List



1. 建立 Collection: **users**
2. 新增 users information ( 至少兩個 user )
  - **account, password, name, followedDramas**
3. 更新 users 的追蹤片單 **followedDramas**
4. 查詢 user 的 片單資訊, 只列出 **followedDramas**
  - tips: find methods and **specific projection**

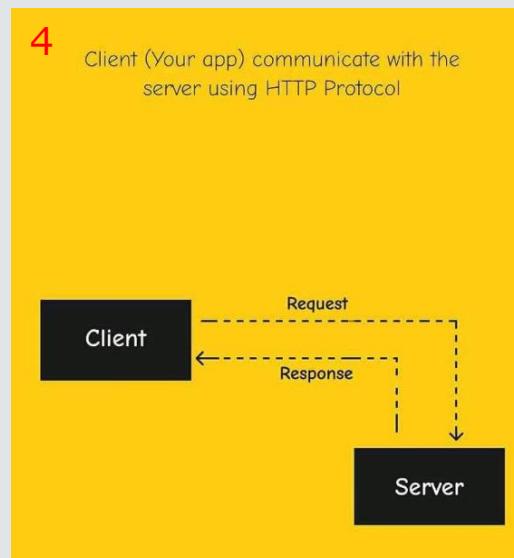
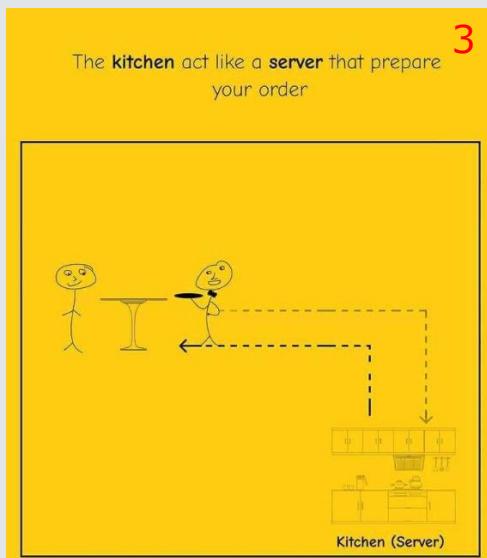
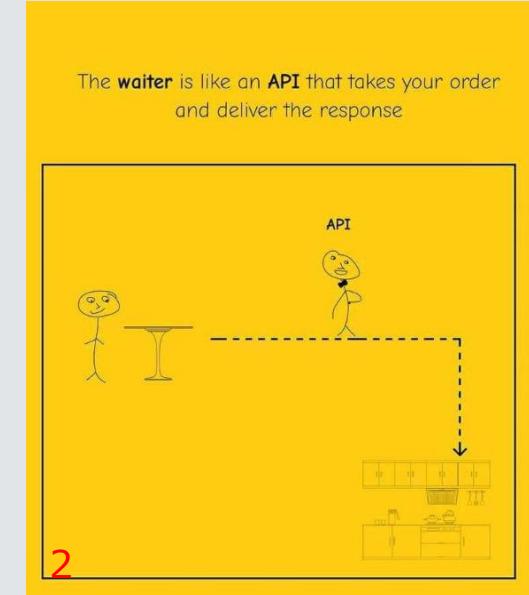
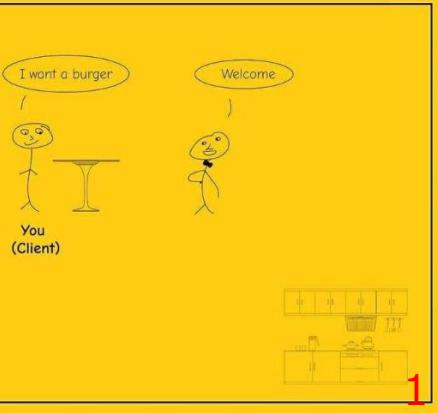


# REST API



## ANALOGY

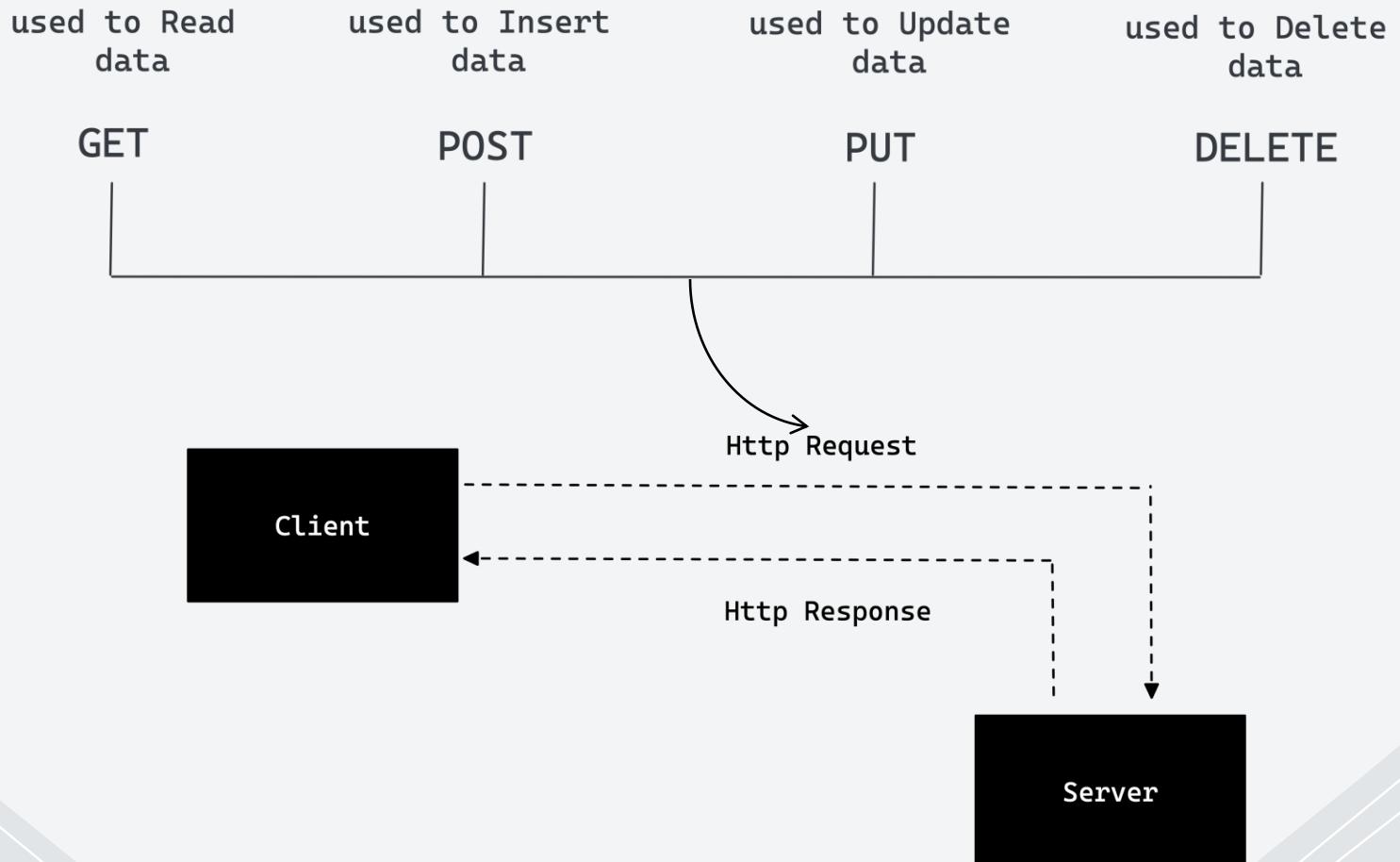
You're in a restaurant, asking for a burger



1. Think of yourself in a restaurant, where you are the client asking for a service. This scenario will help us understand how REST APIs function in a software environment.
2. In our restaurant analogy, the waiter acts as the API. Just as the waiter takes your order to the kitchen and brings back your food, an API receives requests from the client and delivers data from the server.
3. The kitchen represents the server. It's responsible for preparing your order based on the request sent by the waiter (API). The server processes these requests and sends back the appropriate response.
4. The client (your application) communicates with the server using the HTTP protocol, which is the fundamental technology that enables the exchange of data on the web.

# HTTP Methods

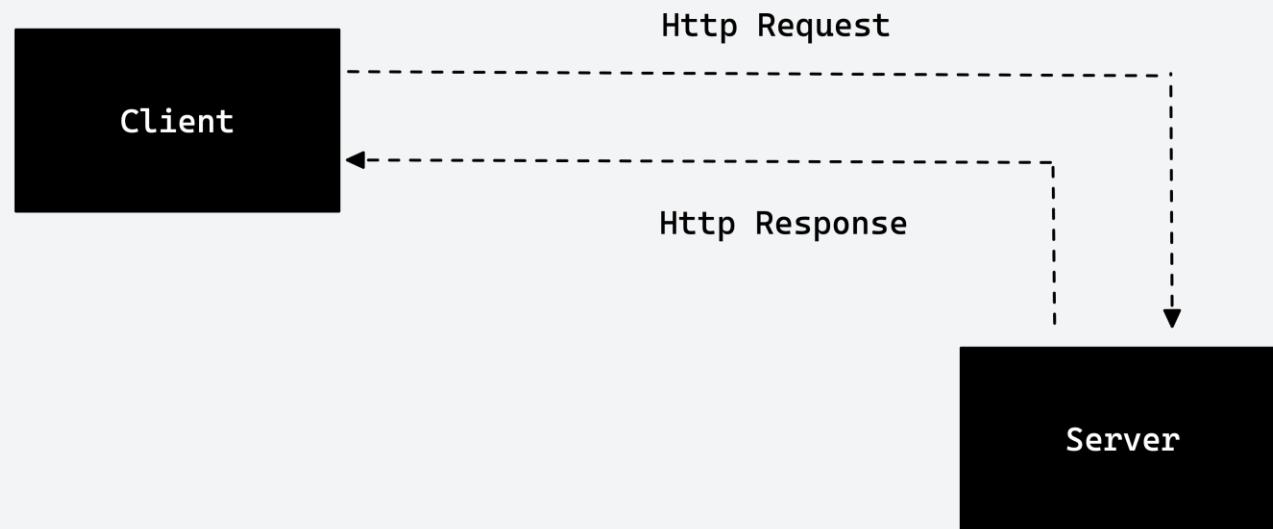
The client 4 methods to communicate with the server



# Example of Get Request

http://restaurant.com/api/meals

↑  
Called Resource



# Best Practice for better naming

## 1. Don't use verbs

GET	/getAllDramas	/dramas
POST	/createNewDramas	/dramas
DELETE	/deleteAllDramas	/dramas

## 2. Use plural nouns

/drama~~s~~ instead of /drama  
/user~~s~~ instead of /user

## 3. Use sub-resources for relations

GET	/dramas/1111	#Return the drama that id is 1111
GET	/users/viewingHistory	#Return user's viewing history

# Best Practice for better naming

## 4. Filtering

```
GET /dramas?category=anime #Return a list of category anime of dramas
```

## 5. Sorting

Allow ascending and descending sorting over multiple fields.

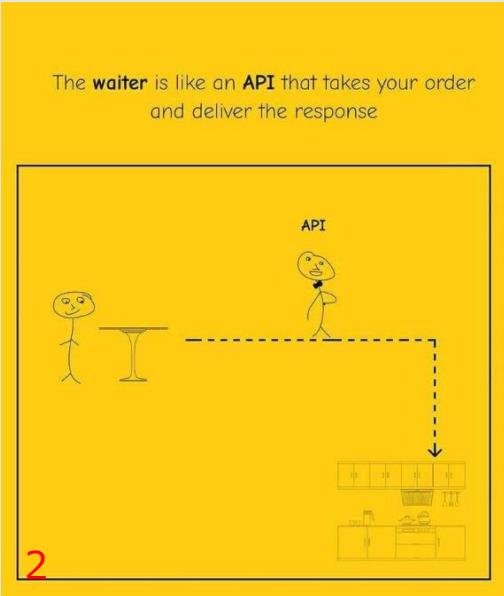
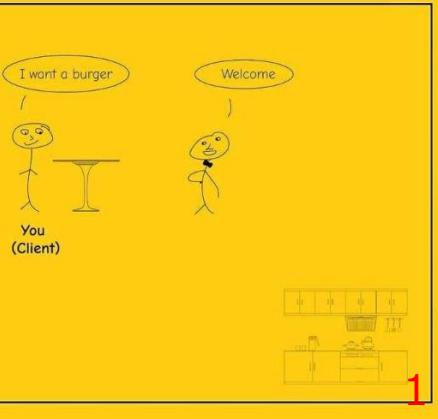
```
GET /dramas?sort=-release_date
```

## 6. Version your API

```
https://example.com/v1/dramas
```

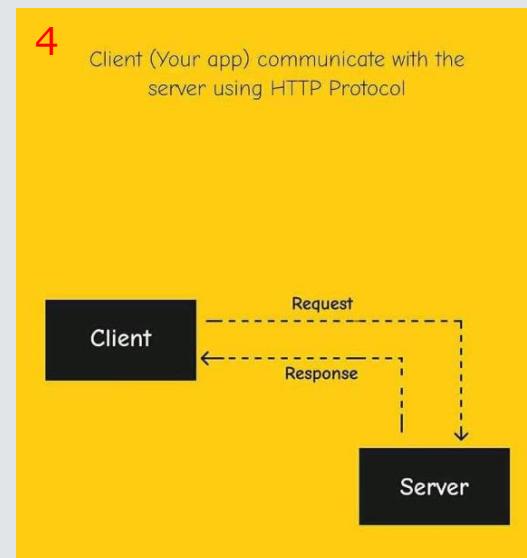
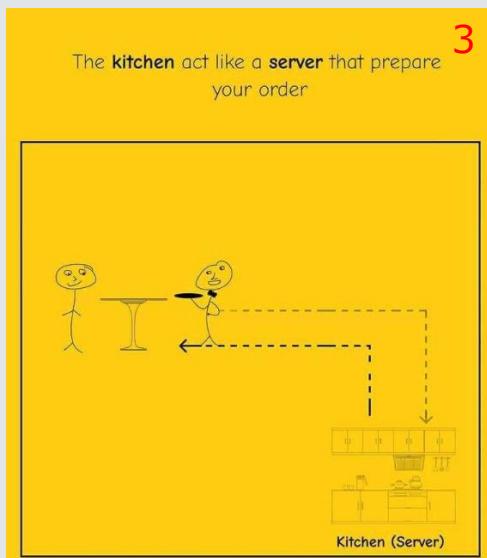
## ANALOGY

You're in a restaurant, asking for a burger



# "Ordering Like a Pro!" — Learn API and HTTP Status Codes at the Table

狀態碼	意思	餐廳比喻
200 OK	成功	餐點順利送到桌上
404 Not Found	找不到資源	菜單上沒有你點的這道菜
500 Internal Server Error	廚房出錯	廚師炒菜時鍋子爆炸了
403 Forbidden	沒有權限	你想點員工餐，但你不是員工
401 Unauthorized	未授權	你沒帶會員卡，不能點會員專屬餐點
201 Created	新品上架成功	你點了一道「客製化料理」，廚房剛剛特別為你做了一份！





# From Database to API: Building and Testing with Flask, MongoDB & Postman



## Database Foundation: MongoDB

- Collections: dramas and users
- Used `insertMany()` to add multiple documents
- Used `find()` to retrieve documents based on filters

## \* API Development: Python Flask

- Built RESTful API using Flask
- Integrated with MongoDB via `flask_pymongo`
- Implemented two example APIs:
  - `POST /api/v1/dramas`: Add drama records
  - `GET /api/v1/dramas?category=亞洲`: Query dramas by category

## API Testing: Postman

- Sent JSON body to test the POST endpoint
- Used query strings to test the GET endpoint
- Verified response data format and correctness

## \* Learning Objectives

- Understand how to turn database operations into web APIs
- Gain hands-on experience with API testing using



# Insert dramas and Query drama with specific category



## 1. Insert data

**POST /api/v1/dramas**

```
db.dramas.insertMany([ { name: "Squid Game",  
category: "亞洲", ... } ]);
```

## 2. Query Data : category=動漫

**GET /api/v1/dramas?category=anime**

```
db.dramas.find( { category: "動漫" } );
```





# Upcoming movie list query



## 1.Query Data : 即將上線

**GET /api/v1/dramas**

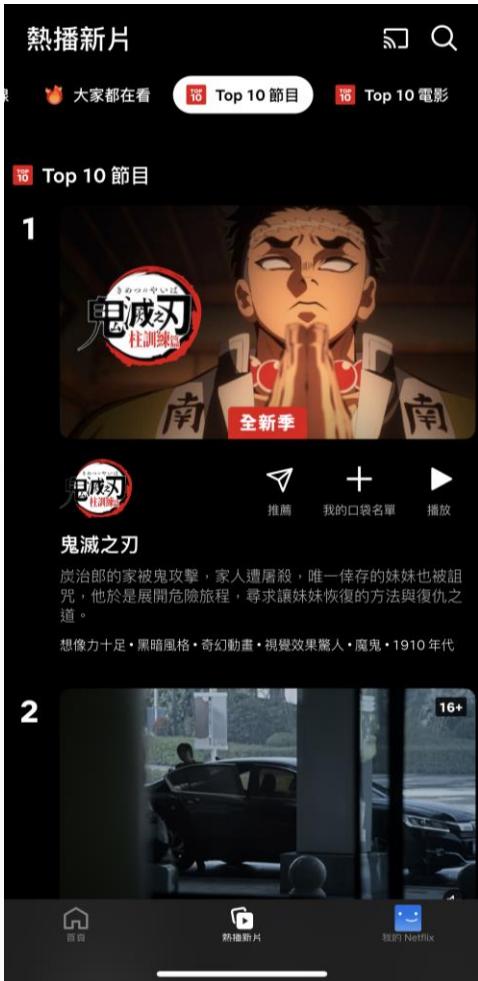
**?release\_date=2024-05-24&operator=gte**

```
db.dramas.find({release_date: { $gte: "2024-05-24  
00:00:00" }})
```





# Multi-document update exercise: add top10 tags to episodes



## 1. Update Data : Top10

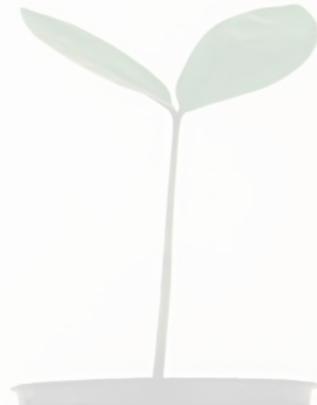
**PUT /api/v1/dramas/tags**

```
db.dramas.updateMany(  
  { name: { $in: ["淚之女王", "葬送的芙利蓮", "出租車司機", "肌肉魔法使"] } },  
  { $set: { tag: ["top10"] } })
```

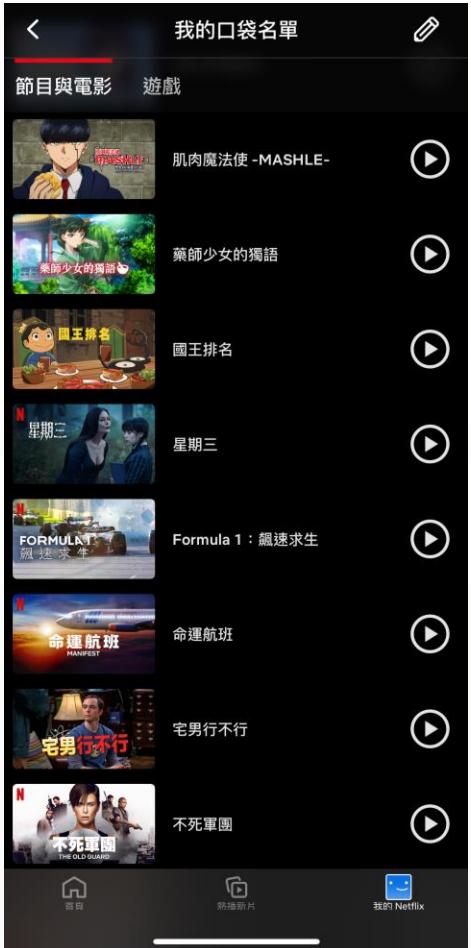
## 2. Query Top10

**GET /api/v1/dramas/tags/top10**

```
db.dramas.find({ tag: "top10" })
```



# Data Modeling and Operations: My Pocket List



1. 建立 Collection: **users**
  2. 新增 user information ( 至少兩個 user )
    - account, password, name, followedDramas
- POST /api/v1/users**
3. 更新 users 的追蹤片單 followedDramas
- PUT /api/v1/users**
4. 查詢 user 的 片單資訊, 只列出 followedDramas
    - tips: find methods and specific projection
- GET /api/v1/users/followedDramas**



# Happy Learning

