MongoDB Aggregation

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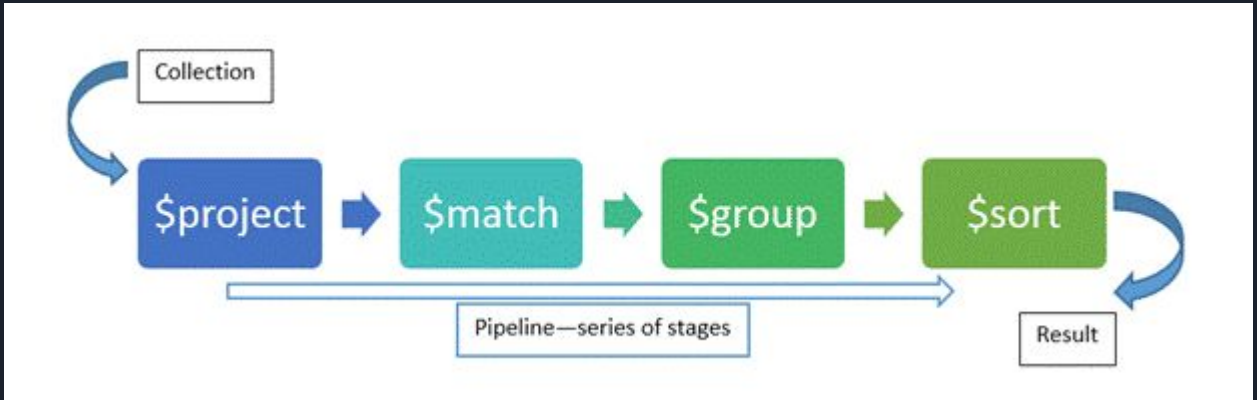
Aggregation Pipeline



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Simple Group by

```
    db.products.aggregate([
        {$group:
            {
            "_id":"$category",
            "num_of_products":{$sum:1}
            }
        }
])
```

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The Aggregation Pipeline

`$project`	select, reshape	1:1
`$match`	filter	n:1
`$group`	aggregate	n:1
`$sort`	sort	1:1
`$skip`	skip	n:1
`$limit`	limit	n:1
`$unwind`		1:n

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Compound Aggregation

```
    db.products.aggregate([
        {$group:
            {
            _id:{"maker"  :  "$manufacturer,
                  "cat"       :  "$category"},
            "num_of_products":{$sum:1}
            }
        }
])
```

Using a Document for `_id`

- `_id` field of a document need not be a scalar value.
- It can be a json document by itself

  Example:

```
db.xyz.insert({_id:{name:'ramesh',gender:'m'},profession:"Trainer"})
```

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Aggregation Expressions

`$sum`	- used for sum & count
`$avg`	
`$min`	
`$max`	
`$addToSet`	- used along with arrays
`$push`	- used along with arrays
`$first`	- used along with sort
`$last`	- used along with sort

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Using $sum

- To get sum:

```
db.zips.aggregate([{
  $group:
  { _id:"$state",
  "population":{$sum:"$pop"}
  }
}])
```

- To get count use `{$sum:1}`

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Using $avg

- To get average

```
db.zips.aggregate([{
    $group:
    { _id:"$state",
    "average_pop":{$avg:"$pop"}
    }
 }])
```

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Using $addToSet

- No parallel in sql world
- Creates an array of values based on the aggregation key.

```
db.zips.aggregate([{
    $group:
        { _id:"$city","postal_codes":
        {$addToSet:"$_id"}
    }
}])
```

- Are both the _id fields same?

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Using $push

- $push works like $addToSet
- It does not check for duplicates

```
db.zips.aggregate([{
    $group:
        { _id:"$city","postal_codes":
        {$push:"$_id"}
    }
}])
```

Using $max

- Helps you find the maximum value

```
db.zips.aggregate([{
        $group:
        {
            "_id":"$state",
            "pop":{$max:"$pop"}
        }
}])
```

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Using $min

- Helps you find the minimum value

```
db.zips.aggregate([{
     $group:
     {
          "_id":"$state",
          "pop":{$min:"$pop"}
     }
}])
```

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Double Grouping

- Unlike in the sql world you can do double grouping

```
db.class.aggregate([{
        $group:{ _id:{a:"$a", b:"$b"},
            c:{$max:"$c"}}},
                {$group:{ _id:"$_id.a",
                    c:{$min:"$c"}}
}])
```

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Using `$project`

- `$project` is used to reshape the output of an aggregation
  - remove keys
  - add keys
  - reshape keys
  - use some simple functions on keys like
    - `$toLower`
    - `$toUpper`
    - `$multiply`
    - `$add`

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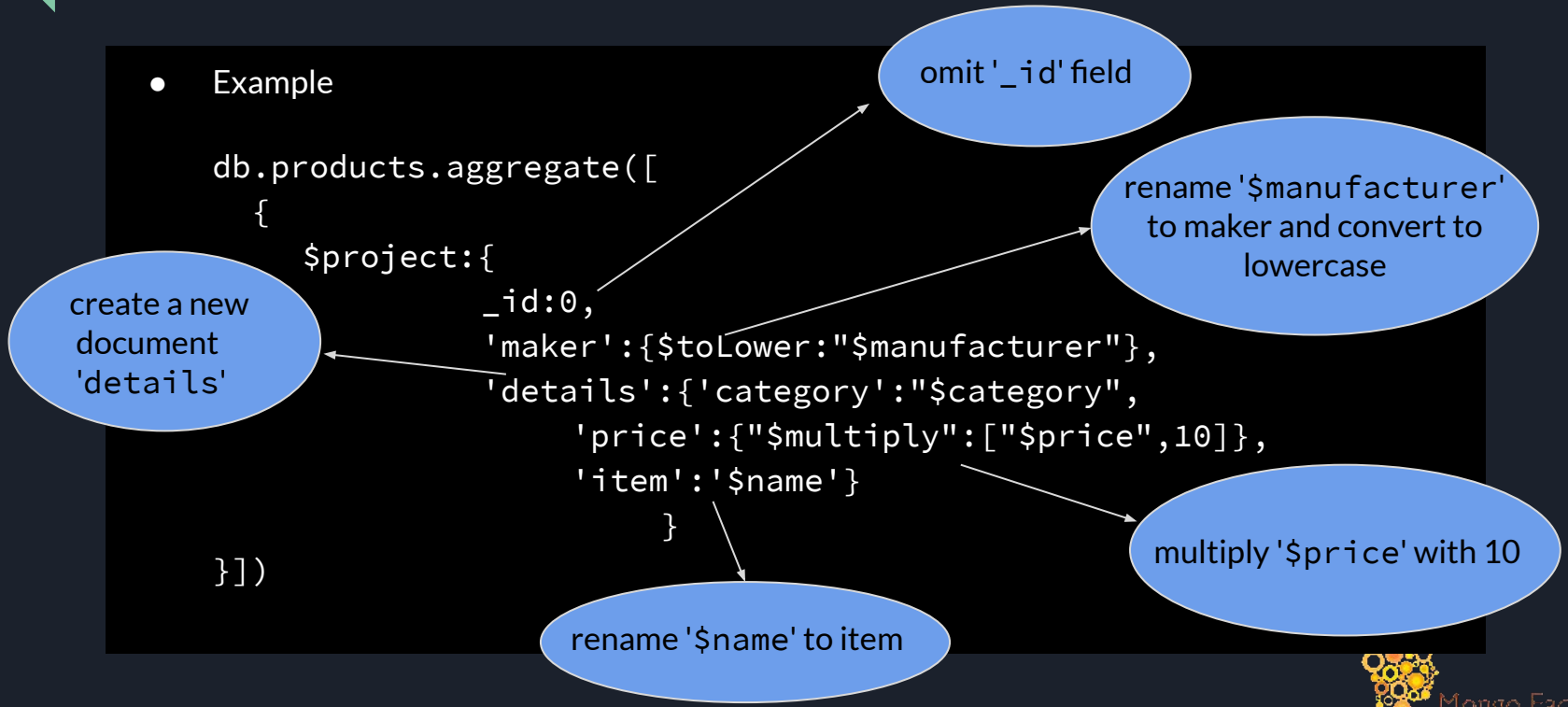
Using $project

- Example

```
db.products.aggregate([
  {
    $project:{
              _id:0,
              'maker':{$toLower:"$manufacturer"},
              'details':{'category':"$category",
                   'price':{"$multiply":["$price",10]},
                   'item':'$name'}
                   }

}])
```



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Using $match

- $match works pretty much like find

```
db.zips.aggregate([{
     $match:
     {
          pop:{$gt:200000}
     }
}])
```

Using $sort

- Can be used before or after the $group
- Can be used multiple times
- Can be a memory hog

```
db.zips.aggregate([
    {$sort:{state:-1}}
])
db.zips.aggregate([
    {$sort:{state:1,city:1}}
])
```

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$skip and $limit

- work exactly the same way as they work with `find`
- Almost always used along with `$sort`
- `$skip` comes first then comes `$limit`.

```
db.zips.aggregate([
    {$sort:{state:1,city:1}},
    {$skip:10},
    {$limit:5}
])
```

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Example of a Pipelined Aggregate

```
db.zips.aggregate([
    {$match:
     {
         state:"NY"
     }
    },
    {$group:
     {
         _id: "$city",
         population: {$sum:"$pop"},
     }
    },
    {$project:
     {
         _id: 0,
         city: "$_id",
         population: 1,
     }
    },
    {$sort:
     {
         population:-1
     }
    },
    {$skip: 10},
    {$limit: 5}
])
```

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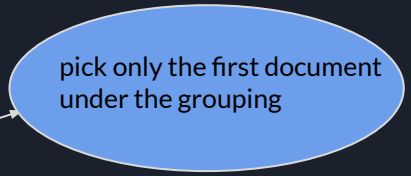
$first and $last

- Used to pick up the first or the last of the grouped values

```
db.class.aggregate([
        {$match:{a:0}},
        {$sort:{c:-1}},
        {$group:{_id:"$a", c:{$first:"$c"}}}
])
```



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$unwind

- Think of it as an opposite to $push
- Used to process elements in the array, by creating 1 to many documents
- Example:
  - Document before unwind

    ```
    {animal:"Cow",eats:["grass","leaves","bananas"]}
    ```

  - Document after unwind

    ```
    {animal:"Cow",eats:"grass"}

    {animal:"Cow",eats:"leaves"}

    {animal:"Cow",eats:"bananas"}
    ```

- Beware of document explosion

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SQL to Aggregation Mapping Chart

SQL Terms, Functions, and Concepts	MongoDB Aggregation Operators
`WHERE`	`$match`
`GROUP BY`	`$group`
`HAVING`	`$match`
`SELECT`	`$project`
`ORDER BY`	`$sort`
`LIMIT`	`$limit`
`SUM()`	`$sum`
`COUNT()`	`$sum`
`join`	No direct corresponding operator; however, the `$unwind` operator allows for somewhat similar functionality, but with fields embedded within the document.

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SQL vs MongoDB Aggregation

- The SQL examples assume two tables, `orders` and `order_lineitem` that join by the `order_lineitem.order_id` and the `orders.id` columns.
- The MongoDB examples assume one collection `orders` that contain documents of the following prototype:

```
{
  cust_id: "abc123",
  ord_date: ISODate("2012-11-02T17:04:11.102Z"),
  status: 'A',
  price: 50,
  items: [ { sku: "xxx", qty: 25, price: 1 },
           { sku: "yyy", qty: 25, price: 1 } ]
}
```

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$lookup

- Introduced in version 3.2
- Performs a left outer join to an unsharded collection in the *same* database to filter in documents from the “joined” collection for processing.
- To each input document, the $lookup stage adds a new array field whose elements are the matching documents from the “joined” collection.
- The $lookup stage passes these reshaped documents to the next stage.

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$lookup - Single Equality Join

```
db.orders.aggregate([
   {
     $lookup:
       {
         from: "inventory",
         localField: "item",
         foreignField: "sku",
         as: "inventory_docs"
       }
  }
])
```

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SQL vs MongoDB Aggregation

- The MongoDB statements prefix the names of the fields from the documents in the collection `orders` with a $ character when they appear as operands to the aggregation operations.

SQL Example	MongoDB Example	Description
SELECT COUNT(*) AS count FROM orders	`db.orders.aggregate( [ { $group: { _id: null, count: { $sum: 1 } } } ] )`	Count all records from `orders`
SELECT SUM(price) AS total FROM orders	`db.orders.aggregate( [ { $group: { _id: null, total: { $sum: "$price" } } } ] )`	Sum the `price` field from `orders`

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SQL vs MongoDB Aggregation

SQL Example	MongoDB Example	Description
SELECT cust_id, SUM(price) AS total FROM orders GROUP BY cust_id	db.orders.aggregate([{ $group: { _id: "$cust_id", total: { $sum: "$price" } } }])	For each unique cust_id, sum the price field.
SELECT cust_id, SUM(price) AS total FROM orders GROUP BY cust_id ORDER BY total	db.orders.aggregate([{ $group: { _id: "$cust_id", total: { $sum: "$price" } } }, { $sort: { total: 1 } }])	For each unique cust_id, sum the price field, results sorted by sum.
SELECT cust_id, ord_date, SUM(price) AS total FROM orders GROUP BY cust_id, ord_date	db.orders.aggregate([{ $group: { _id: { cust_id: "$cust_id", ord_date: "$ord_date" }, total: { $sum: "$price" } } }])	For each unique cust_id, ord_date grouping, sum the price field.

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Limitations of MongoDB Aggregations

- Limited to 16MB
- Cannot use more than 10% of the memory on the host machine.

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