

# CSCI235 Database Systems

## JSON and BSON Data Models

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# JSON and BSON Data Models

## Outline

[JSON ? What is it ?](#)

[BSON ? What is it ?](#)

# JSON ? What is it ?

Java Script Object Notation (JSON) is a light-weight data interchange format

It is based on a subset of the JavaScript Programming

Language Standard ECMA-262 3rd Edition - December 1999 JSON is built on two structures:

- A collection of name:value pairs - object
- An ordered list of values - array

Object is an unordered set of name:value pairs

<pre>{"first name": "James"}</pre>	JSON objects
<pre>{"city":"Sydney", "street":"Victoria", "building number":25}</pre>	
<pre>{"number":"25", "isOdd ?":true, "nothing":null}</pre>	
<pre>{ }</pre>	Empty JSON object

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# JSON ? What is it ?

Value is either a string or a number or true or false or null or an object or an array

JSON object with the special characters

```
{"single quote": "\"", "back slash": "\\",  
  "forward slash": "\/", "line feed": "\u000A" }
```

JSON object with a number, true, false, and nothing values

```
{"fraction":0.25, "true":true, "false":false, "nothing": null}
```

Nested JSON object

```
{"full name": {"first name":"James",  
              "initials":null,  
              "last name":"Bond"},  
  "number":"007"}
```

JSON object with an array of strings

```
{"colours":["red", "green", "blue"]}
```

JSON object with an array of numbers

```
{"numbers":[10, 20, 30, 40, 50]}
```

# JSON ? What is it ?

**Array** is a sequence of **values**

```
{"2dim array": [ [11,12,13,14],  
                [21,22,23,24],  
                [31,32,33,34] ] }
```

JSON object with two dimensional array

```
{"array of objects": [ {"name":"James Bond"},  
                      {"name":"Harry Potter"},  
                      {"name":"Robin Hood"} ] }
```

JSON object with an array of objects

```
{"array of truth": [true, false, true, true]}
```

JSON object with an array of Boolean values

```
{"array of nothing": [null, null, null, null, null]}
```

JSON object with an array of nulls

```
{"empty array": [ ] }
```

JSON object with an empty array

```
{"array of varieties": [1, "one", true, ["a", "b", "c"]]}
```

JSON object with an array of different values

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# JSON and BSON Data Models

## Outline

[JSON ? What is it ?](#)

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# BSON ? What is it ?

**Binary JSON (BSON)** is a computer data interchange format used mainly as a data storage and network transfer format in the MongoDB database system

**BSON** is a binary encoded serialization of **JSON**-like documents (objects)

**BSON** includes the extensions not in **JSON** that allow for representation of data types

For example **BSON** has a **Date** type and a **BinData** type

The common data types include: `null, boolean, number, string, array, embedded document(object)`

The new data types include: `date, regular expression, object id, binary data, code`

# BSON ? What is it ?

```
{"nothing":null}
```

BSON document with a null

```
{"truth":false}
```

BSON document with a Boolean value

```
{"pi":3.14}
```

BSON document with a floating point value

```
{"int":NumberInt("345")}
```

BSON document with an integer value

```
{"long":NumberLong("1234567890987654321")}
```

Long integer value in BSON document with long integer value

```
{"greeting":"Hello !!"}
```

BSON document with a string value

```
{"pattern":/(Hi|Hello)!/}
```

BSON document with a regular expression

```
{"date":new Date("2016-10-17")}
```

BSON document with a date

```
{"array of varieties":[1, "one", true, ["a", "b", "c"]]}
```

BSON document with an array of different values

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# BSON ? What is it ?

```
{"_id":ObjectId()}
```

BSON document with an object identifier

```
{"code":function(){ /* ... */ }}
```

BSON document with a functions

```
{"Double":124.56}
```

BSON document with a timestamp

```
{"timestamp":Timestamp(1234567,0)}
```

BSON document with a timestamp

```
{"timestamp":Timestamp()}
```

BSON document with a timestamp

```
{"maxkey":{"$maxKey": 1} }
```

BSON with the largest possible value

```
{"minkey":{"$minKey" : 1} }
```

BSON with the smallest possible value

# BSON ? What is it ?

Every document (object) in BSON must have an `"_id"` key !

`"_id"` key's value can be of any type

A default value of `"_id"` key is `ObjectId()`

In a collection of documents (objects) every document (object) must have a unique value for `"_id"`

If a document has no `"_id"` key then when it is inserted into a collection `"_id"` key is automatically added to the document

BSON document with an automatically generated object identifier

```
{"_id":ObjectId()}
```

BSON document with an object identifier

```
{"_id":ObjectId("507f191e810c19729de860ea") }
```

BSON document with an object identifier, student number

```
{"_id": NumberInt(1234567) }
```

BSON document with an object identifier, enrolment

```
{"_id": "1234567 CSCI235 01-AUG-2021" }
```

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# References

[Introducing JSON](#)

[BSON](#)

[MongoDB, Document Data Format: BSON](#)

Banker K., Bakkum P., Verch S., Garret D., Hawkins T., MongoDB in Action, 2nd ed., Manning Publishers, 2016