



BIRMINGHAM CITY
University

CMP6207 - Assignment 1

IoTThings Application Report

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CMP6207 - Modern Data Stores

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Introduction

The report will be based on the design and implementation of a MongoDB NoSQL database system for the company "IoThings Home Automation Solutions". There are two assignments in this module, where this report is worth **60%**, and a presentation is the remaining **40%**. This module will also incorporate elements of web design, with HTML and CSS also playing a role alongside the primary use of JavaScript.

- Konstas cares more for the functionality over aesthetics. While you should put effort into the HTML and CSS parts, they're a lesser concern than the overall usability of the system.
- A literature review is expected in this report.
- 4,000 word count, so 4,400 hard limit.
- The presentation is about this report. It must cover the design, implementation and data management.
 - You would show him your database cluster (local or Atlas?) as part of it.
- IT WILL BE THIRTY MINUTES. If the report contains all the screenshots (which it will) you might not need to make slides, though consider it anyway. You can still show the report alongside the slides where needed.
- He wants you to make an Atlas account even if you do it locally.
- You are creating the dataset for this assignment. You will describe it in an appendix rather than the report's main body.
- This is a "professional report", and as such the title page with the BCU logo and your info should probably change. It needs to also show the date.

Types of NoSQL databases

Structured Query Language, or SQL, was developed by IBM following Codd (1970)'s groundbreaking publication in the ACM journal, with the first commercial SQL implementation being published by Oracle in 1979 (Oracle, 2025). SQL powers many relational database systems even today, though the problems associated with its age, most notably in the speed of its operations, are beginning to show in modern systems. Therefore, NoSQL ("Not Only SQL") was developed as an extension of SQL, allowing data to be stored in a non-tabular, non-relational format for efficient storage of semi-structured and unstructured data in a flexible, functional and scalable model for faster operations than standard relational databases in most scenarios (Google Cloud, 2025; AWS, 2025). There are a wide variety of NoSQL database types which vary in complexity, functionality and purpose, meaning that identification of the most suitable type is paramount for maximum efficiency.

1.1 Document database

Document databases are intuitive, flexible and horizontally scalable databases that work well in a wide variety of general purpose use cases. They store records as "documents", which store an object's data and metadata, in a format such as JSON ¹, BSON ², or XML ³.

```
{
  "_id": {
    "$oid": "67abd1bdc98fd31d547cdb0d"
  },
  "name": "Liora",
  "age": 44,
  "gender": "F",
  "exp": 17,
  "subjects": [
    "MATHS",
    "PSK",
    "PSK"
  ],
  "type": "Full Time",
  "qualification": "Ph.D"
},
```

Figure 1.1: An example of a JSON Document.

Figure 1.1 depicts an example JSON document of a school teacher stored in MongoDB, a popular DBMS for document databases. Within it, the internal object ID (metadata) is stored, as well as other data of varying types including strings, integers and arrays. This makes document databases easily integratable into a development workflow due to the direct storage of object types typically used in programming languages like Python and JavaScript.

¹JavaScript Object Notation

²Binary JSON

³Extensible Markup Language

- 1.2 Key-value database
- 1.3 Column-oriented database
- 1.4 Graph database
- 1.5 In-memory database

Comparing NoSQL and Relational databases

- Compare types of NoSQL databases here.
- This section "shouldn't be too long, but enough to convince them."
- **This is NOT comparing *MongoDB* to relational databases.** The brief mentions that it should be "generic just in case after seeing your MongoDB database they decide to go with another software provider."

Database design and implementation

MongoDB, an acronym from "**h**um**o**ngous **D**B", aims to address some of SQL's antiquation issues. . .

API Implementation and Documentation

Conclusion

Overall, something was done. . .

Bibliography

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