



ECOMMERCE DATA MANAGEMENT

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Abstract

Product management is crucial for e-commerce businesses, and it can help you crush the competition if you have the correct e-commerce data management software in place. You are only as successful in the realm of online commerce as the administration of your product data. Data is the new money in the online and digital world. You can outperform your rivals and boost your profitability if you know how to use it to your advantage. Ecommerce data management, to put it simply, is a highly collaborative and organised modern system that assists you in managing, sharing, and accessing vast quantities of essential product data that are highly valuable to your company. By allowing you to respond to market demands more swiftly, effective data management also aids in keeping you competitive. When meeting the needs of your consumers, EDM enables you to work more efficiently and with less time and human mistake [13]. Product Data Management is a structured approach to assist in managing, gaining access to, and disseminating vast amounts of essential product data that is highly beneficial to your company. The product catalog, attributes, product content, and the consumer data gathered are typically included in this information in eCommerce. In this paper , we have studied How to choose a database management system. There are several database management systems available. Each of them has benefits and downsides in its own particular ways. We tried to compare the databases that are frequently used for both small web applications and massive data warehousing systems, even though we haven't even touched on a third of all databases. So, how do for your own software program? Did you choose the best choice? Databases like MySQL might be a logical starting point for local eCommerce businesses that are just getting off the ground and are compatible with OLTP and web-based BI TOOLS. If you want to create a massive eCommerce company that offers a full customer journey, Cassandra is a good option.. You may also attach the Elasticsearch database solution to it to give it a strong search engine as an addition. In relation to Cassandra, it's also a respectable option for data centres and real-time analytics with massive amounts of data. It may be fair to choose NoSQL databases like MongoDB when discussing analytical tools without numerous data layers. It works great for product catalogs as well. MSSQL is also important to note in the context of data warehousing applications, especially for businesses that have several different Microsoft subscriptions. Oracle is a strong option as well for developing OLTP solutions and data warehousing applications. Our list of the finest use cases for Redis will be summarized by IoT applications and microservice architecture that prefer to scale its data hosting. Yes, there are more database systems to take into account. Your business concept and needs will determine everything. Currently, e-commerce websites not only supply massive amounts of data to e-commerce businesses, but also provide insights data using so many analytics techniques [5].

Keywords—ecommerce data management, MySQL, NoSQL, OLTP, or online transactional processing

1. Introduction:

The two primary types of DBMSs are relational and non-relational DBMSs, commonly referred to as SQL and NoSQL, respectively.

1.1 Relational or SQL databases: An explanation of the name is that In a relational database, data is arranged into tables that are linked to one another to create a form of data repository. Foundation of these systems is Structured Query Language, which gave rise to its second term, SQL databases. It is used to interact with and maintain these databases. Data is stored in rows (also known as records) and columns (also known as attributes) using a specified schema in



RDBMSs. Since each record typically contains a value for each attribute, there are definite relationships between the various data points in this situation **Scalability**: Relational databases typically scale vertically, which means that data resides on a single server, and scaling is accomplished by enhancing the server's computing resources (CPU, GPU and RAM) power to that one server. However, there is a lot of downtime when switching from smaller to larger units. Since it calls for data format modifications and additional engineering work, horizontally scaling a SQL database over several servers can be challenging. **Performance**: On small to medium datasets, relational databases perform admirably when read/write operations are demanding. By including indexes to data fields, they also provide faster table joining and querying. However, performance may decrease as data volume and user demand increase. **Security**: Creating well-protected SQL databases doesn't take much engineering work because of the integrated structure and data storage mechanism. They are an excellent option for developing and maintaining complicated software solutions where every interaction might have a variety of effects. **ACID compliance** (Atomicity, Consistency, Integrity, Isolation, Durability)) is one of the cornerstones of SQL[7]. If you develop applications like eCommerce or financial ones, where database integrity is crucial, ACID compliance is a recommended choice. The list of SQL databases including: MySQL MariaDB, Oracle, PostgreSQL. MSSQL

1.2 Non- relational or NoSQL databases: Non-tabular databases that use distinct data models for data storage, management and access are known as non-relational databases. The most common data models are--Data can be represented as a set of key-value pairs, where keys are unique strings with corresponding values for the data; can be stored in a graph, where nodes are data points and edges indicate their relationships; and data can be stored, retrieved, and managed as JSON documents. • wide-column, which allows for flexible columns that can change from row to row inside the same table while storing data in a tabular format. These databases are known as NoSQL since they aren't constrained by a table structure. They enable the storage of unstructured data in a variety of formats, including texts, images, videos, PDF files, and many others[7] Though not necessarily organized into rows and columns like in a relational database, data is nonetheless easy to query. **Scalability**: When the amount of data and requests rises, non-relational or NoSQL databases are often scalable horizontally by adding more servers to the pool. They lower the request-per-second rate of each server by distributing data over numerous servers, each of which holds only a fraction of the total[7]. Non-relational databases are well known for their excellent **performance** because of their distributed design, which reduces the performance load on the system and enables numerous users to access the database at once. These databases provide limitless storage capacity for data sets of all sizes and kinds. Additionally, they are able to adjust to shifting data types. **Security**: Because NoSQL databases lack strong security, many infrastructures are quite concerned about them, in contrast to relational systems. While they might offer ACID assurances, they usually only apply to one database partition, even if certain DBMSs offer sophisticated security capabilities that adhere to stringent compliance and security requirements[7]. It makes sense that NoSQL databases continue to gain popularity because they enable grouping different data kinds into reservations and scalability by expanding over numerous servers. A wonderful alternative for startups using sprint-based Agile development is to create an MVP Fast, lag-free modifications to the data structure are made simpler by NoSQL since no pre-deployment preparations are necessary[7]. such NoSQL databases as: MongoDB, Redis, Cassandra, Elasticsearch, Firebase [14].

1.3

Architecture:

1) RDBMS architecture: An RDBMS is a type of database management system (DBMS) that stores data in a row-based table structure that links pertinent data items. An RDBMS provides features that maintain the data's accuracy, consistency, reliability, and security. This is different from how a DBMS stores files. Three different types of DBMS architecture exist: one, two, and three tiers. Fig1.1[9]

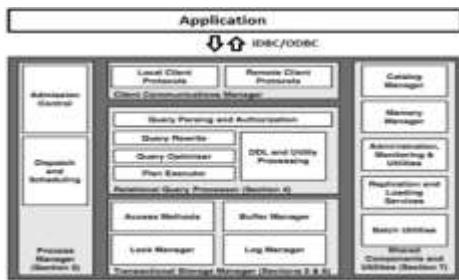


Fig. 1.1 Main components of a DBMS

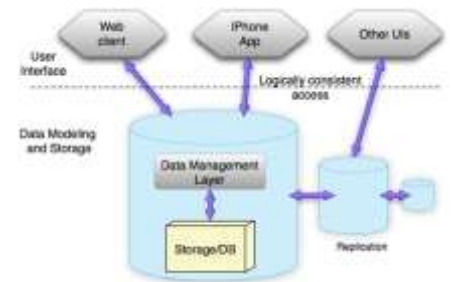
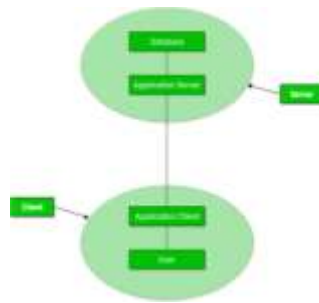


Fig1.2 3- Tier Architecture[10] 2) Architecture with NoSQL Fig 1.3[8] NoSQL Databases Enable **Horizontal Scaling (Scaling Out)** This architecture is often referred to as 'horizontal scale,' or 'scaling out' (NoSQL database horizontal scaling). Administrators can easily increase the number of nodes in a NoSQL database to increase its capacity in contemporary cloud environments. These are the four main categories of NoSQL databases: document databases, key-value stores, column-oriented databases, and graph databases. It's important to comprehend how to separate data management and data storage concerns in order to correctly construct applications using NoSQL databases. It's important to comprehend how to separate data management and data storage concerns in order to correctly construct applications using NoSQL databases.. The previous era of SQL-based databases made an effort to use databases to address both issues. This is exceedingly challenging, and Programs would inevitably assume part of the responsibilities for data maintenance, carrying out some validation tasks, and incorporating modelling logic. One of the main ideas behind NoSQL is to make databases concentrate on the job of high-performance [8] scalable data storage while allowing for low-level access to a database. Data management tasks can now be easily written in the preferred programming language, as opposed to being spread among Turing-complete application languages, SQL, and occasionally even DB-specific stored procedure languages.

3Architecture with IOT :

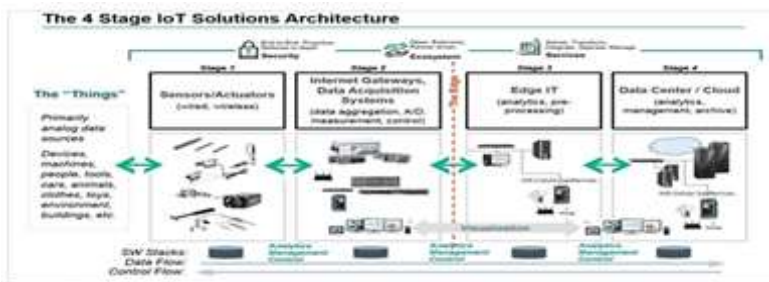


Fig 1.4[11]

To provide clients specialized services, IoT mixes corporate data and personal data. To better serve their customers, several retailers offer more specialized activities, information, and data integration for houses or specific members basedon the social connections of their customers.

4. Methodology

One of the most popular languages for creating eCommerce platforms is **Python** since it can process millions of customer requests at once. With Python, there is possible both horizontal as well as vertical scaling for web and mobile eCommerce applications. Additionally, it aids in improving the website's performance and speed. **MySQL** offers the ability to scale and be adaptable enough to efficiently manage enterprises' growing data needs. It can swiftly scale to meet the growing demands, from deeply embedded applications to large-scale applications that stack terabytes of data [7].

NoSQL Databases and MongoDB:

One of the best NoSQL e-commerce systems, in my opinion. It is also very simple to transform queries and results into a language that your front-end code can understand because MongoDB stores



documents in a JSON-like manner. This removes the need to write object-relational mappers (ORMs). The condensed code editor Visual Studio Code supports task execution, debugging, and version management. It seeks to give programmers the bare minimum of tools required for a short cycle of building code and debugging, leaving more complex procedures to IDEs with more functionality, like Visual Studio IDE. VS Code OK for Python. Python is completely supported by the free source code editor Visual Studio Code, which also has practical elements like real-time collaboration. It is very adaptable to support your classroom and your preferred teaching style.

Python developers can use a variety of essential features provided by **PyCharm**, a specialist Python Integrated Development Environment (IDE). These tools work together closely to build a practical environment for productive Python, web, and other programming projects and data science development

Django, a high-level Python web framework, allows for the quick creation of trustworthy and secure websites. Django, created by seasoned programmers, handles a lot of this. Instead of having to reinvent the wheel, you can focus on creating your app by avoiding the hassles involved with web development.

4.1 Proposed System:

The Product Order Database for sellers, customers.

5. Implementation:

Project1: In this project, Ecommerce record storage, assume that you have to keep the record of the customers and Sellers along with the different products available for purchase and the orders placed by different customers. The focus of the project will be to learn data modeling and implement various functionality based on that. You will use numerous commands, knowledge about MySQL, and MySQL for database storage.. In this project, writing a Python program to implement the functionality of connecting to a database and performing the basic CRUD operations. Drawing ER diagram of the database Creating schema and tables. Use either Python program or MySQL Workbench UI. The data is stored in MongoDB. The project's main goal is to develop some data modeling skills in MongoDB and create various functions using those skills.

project 2: The Product Order Database project. The Product Order database maintains an inventory of Fridge products of various brands and models. It allows users to place orders for one or more of these items, and offers discounts on these purchases. four categories of information User information Product information Order information Inventory information Doing this project with NoSQL databases, the approach taken is different. NoSQL databases are generally designed to be distributed systems, with the data stored spread across multiple nodes. Also, the way the information is modeled - is designed to depend on the use case at hand. This project in the MySQL perspective, followed the database normalization process while modeling this information, and found that splitting this information into the **Product** and **Product Details** tables, with a foreign key relationship between them, allowed us to bring it into 3NF. This was an advantage, from a data integrity perspective. In the case of MongoDB, it stores data in Object format, using the JSON notation. This allows us to store documents in a collection - with an arbitrary level of nesting of information - since information is stored and retrieved as objects. In MongoDB, in addition to nested information, it is possible to store aggregate objects (such as lists, or arrays) as well. Therefore, since a single order can contain multiple items - it is possible to store the entire information relevant to an order - as a single document. Programming MongoDB With PyMongo

.a way to create, insert information into, and access that information from a MongoDB database - using the PyMongo Python programming client. After installing the PyMongo client, can write a simple client program. Augmenting The Utility Functions :The aggregate() Function, The update() Function ,The delete single() Function ,The delete multiple() Function ,Client Code: Running Some New Queries ,Some More Read Queries

,Some Queries Involving Aggregation ,Some Queries With Indexing ,Some Update Queries ,A

Delete Query.

6. Result Analysis:

INSERT Operation: A database table can have new rows of data added to it using the INSERT INTO Statement. The analysis reveals that MongoDB executes the INSERT operation more quickly than other databases..

DELETE Operation: Existing records in a table can be removed using the DELETE query. In order to prevent the deletion of all entries, we combine the DELETE query with the WHERE command. We can see that

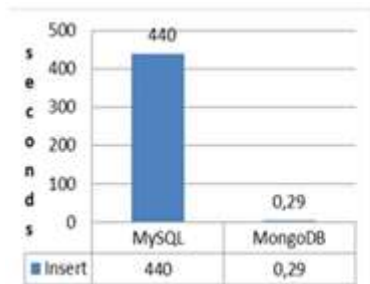


Fig 1.5 [6]

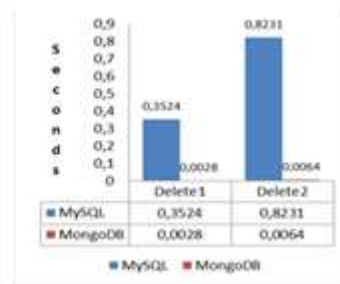
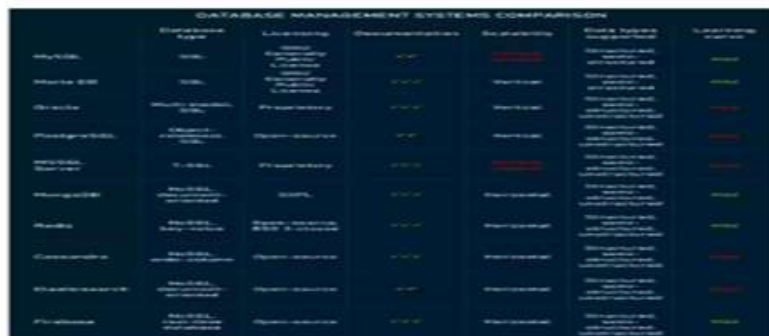


Fig 1.6[6]

MongoDB performs better than MySQL. A query that alters many records simultaneously is called an update. Since then, noted that MongoDB shows superiority. The data in Datasheet view is displayed via a database object known as a select query. This query doesn't actually store any data; it only displays the information that is present in the tables [6].



Fig 1.7[7]



Most popular database systems

Fig 1.8[7]

7. Future Scope

There will be more internet retailers as entry barriers decline. Even as regions begin to reopen, e-commerce growth is still rising. In 2022, it's anticipated that global e-commerce sales would amount to \$5 trillion.by 2024, plus \$6 trillion. Merchants are swarming to e-commerce in previously unheard of numbers as they continue to meet online customer demand. The latest trend in the e-commerce industry is AR, Augmented reality (AR) has fundamentally altered the rules of e-commerce. Customers can actually see the goods they're buying with this type of technology,

8. Conclusion:

A database's major job in an e-commerce application is to store data that can be retrieved to keep track of transactions, find out about customers and products, and keep track of stocks. One of the primary benefits of having a database for e-commerce is the capability to arrange massive amounts of shop data.

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