Comparative Case Study Difference Between Azure Cloud SQL and Atlas MongoDB NoSQL Database

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ABSTRACT

Azure SQL and Atlas Mongodb NoSQL(Azure instance) databases are the most popular, systematic process to database solutions. Which Azure SQL database is also referred to as RDBMS (Relational Database Management Systems). The data are structured into tables or associations. The Atlas Mongodb NoSQL database is called a non-relational database management systems. The data are included in unstructured tables or associations. In this research, evaluate both the Azure SQL and Atlas Mongodb NoSQL databases. During the experiment compare the loading time, response time, and retrieval time of both Azure SQL and Atlas Mongodb NoSQL databases, and justify which one is fast, efficient and better performance.

Key words : SQL, Atlas Mongodb NoSQL Database, SQL, MongoDB.

1. INTRODUCTION

Today mostly in the industry, there are many databases used. Some of them are SQL, and some are NoSQL. The standard [1]language for handling structured queries. An RDMS database defines table relations, and NoSQL is a non-relational database management system. There is a fixed, static, or preselected pattern in SQL databases and NoSQL databases have an unstructured schema. Azure SQL programming (DML, DDL, and DCL) can be used in an effective way to collect declarations and Atlas Mongodb NoSQL database queries. It prevents joining and is easy to scale Atlas Mongodb NoSQL, which does not require a fixed scheme. Scale Azure SQL databases vertically scale, and scale Atlas Mongodb NoSQL databases horizontally. Databases are utilized in numerous organizations, managing an account, website, and numerous other industries. A relational database is a list of predefined data objects. These objects are arranged in columns and rows as a series of tables. Tables are used to contain information about items in the database. Each column in a table holds a certain kind of data and a field stores the actual value of an attribute. The rows in the table represent a collection of related values of one object or entity. A special identification called the primary key can be used for each row of a table, and columns may be generated using foreign keys in certain tables. Relational database work on vertically adaptable and utilized in store procedures, join queries, views methods, etc. A database that does not use the table pattern of rows and columns used in most of the standard database frames may be a non-related database. Instead, non-relational databases use a capacity model designed for the basic specifications of the type of information that is being supplied. For illustration, information may be put away as basic keys and values sets, records, charts, columns store and non- relational database utilized in Atlas Mongodb NoSQL Database. The following *Figure: 1* is clearly defining Azure SQL and Atlas Mongodb NoSQL Databases.
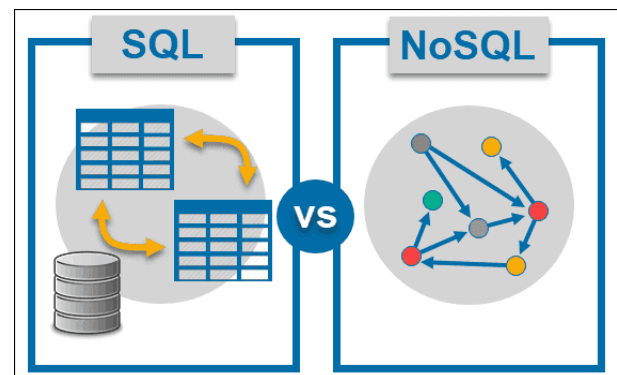

Figure1: Azure SQL and Atlas MongoDB NoSQL Database (reproduced from [16])

2. BACKGROUND

SQL is Hierarchical Database Management Framework is also known as (RDMS). The architecture of the best-known

open source database system worldwide is very significant, and architecture of SQL is unique to another many major users, including Oracle, Microsoft Azure SQL and DB2. It is Structured Query Language (SQL) program. This statements used in (DML, DDL, DCL and TCL). Relationship approaches used in ERD, Database Schema, Joining Quires, Views, and Triggers program. It is easy to understand and easy to read for consumers. In *Figure 2:* **Azure SQL** Database languages & *Figure 3:* Entity Relationship Diagram (ERD) are well defined.

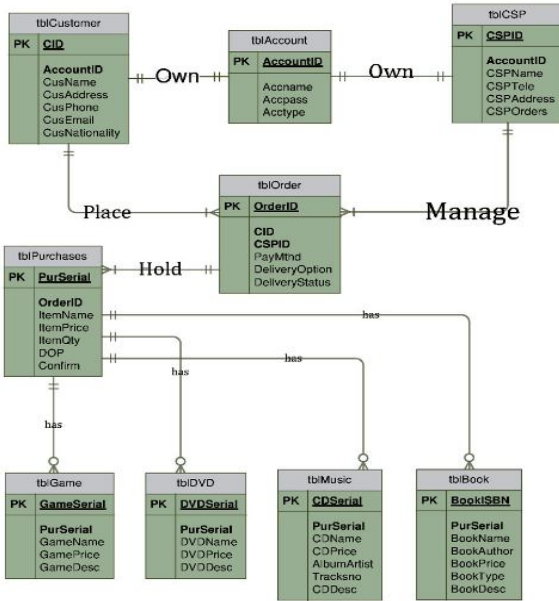Figure2: Azure SQL Database languages (reproduced from [17])

Figure3: Entity Relationship Diagram (ERD) (reproduced from).

2.1 Relational Data Model

The main model of data is relational data. It is commonly used in data collection and retrieval around the world. This is a basic model with all the properties and capabilities needed to efficiently process data. Relations are stored in table format in a relational data model. This format saves the interaction between individuals. The relationships have various examples: relationship schema, relationship key and aggregate function is used**.**

The following *Figure: 4* are clearly defining Two Relational Database tables.
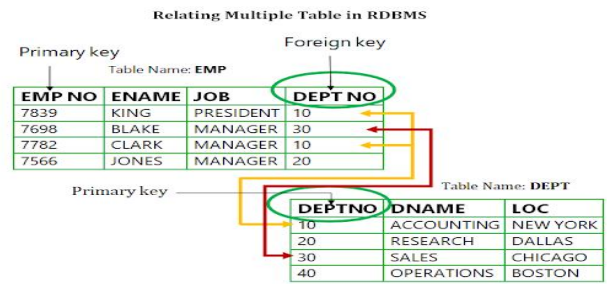

Figure4: Two Relational Database Tables (reproduced from [14])

Atlas Mongodb NoSQL database management system for high-capacity data storage, and it uses collections, documents, field, embedded documents and primary key (default key _id provided by MongoDB itself). Documents are primary value pairs and are the simple data unit of MongoDB. The collections contain record sets and associated tables-like features. It is a non-relational database, also document-oriented database software for open sources and cross platforms. In the four architectural trends of the data, and Atlas Mongodb NoSQL trends can be saved (Key Values, Columns, Documents, and Graphs). It's uses JSON-like documents with optional schemas, known as an Atlas Mongodb NoSQL database application. This has been used for CRUD operations (create, read, update, delete) and aggregate functions etc.

2.2 Document Data Model

Document Data Model that reflects their particular category. A huge volume of information can be saved in the single document and can nest records. Key value stores have a simple data model, and just as their name suggests. Wide column stores more features, variable in data types, and number of columns in use than row-based relational database. From the *Figure 5:* are clearly defining MongoDB Relational Documents two tables.
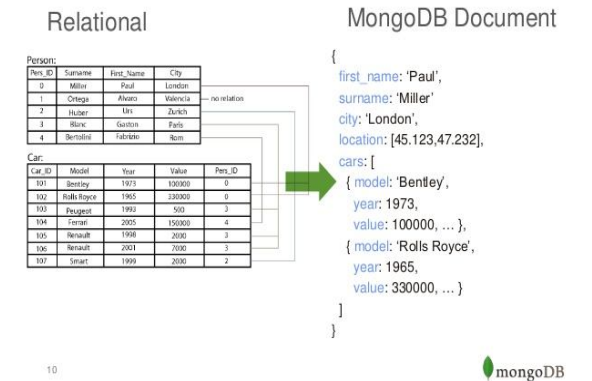

Figure5: MongoDB Relational Documents two tables (reproduced from [15])

Table 1: Comparison of Azure SQL and Atlas Mongodb NoSQL Databases (reproduced from [9])

Distinguishing Feature	Azure SQL	Atlas Mongodb NoSQL
Relational	Yes	No
SQL	Yes	No
Document	NO	Yes
OLTP (Online transaction processing)	Not	fully Supported
Scaling	No	Yes
Query Complexity	Low	High
Distributed	No	Yes

3. PERFORMANCE ANALYSIS OF AZURE SQL AND ATLAS MONGODB NOSQL DATABASE

JMeter is a open source and stress tester [18] used mainly for checking the performance of web applications. JMeter connect SQL database, and MongoDB database through NodeJS programming language. During experiment use the SQL database inner join query is to merge two tables and use the same aggregate feature inner join solution in the MongoDB code base and run three different programs after logging in to the data database and received three different results (first program run ten thousand, second program run twenty thousand, and third program thirty thousand) records and results found through google network performance. Throughout all of these applications are running on the personal computer. The configuration of pc is given below:

- Processor Intel(R) core i7-3770 CPU @2.50 GHz, Second Generation.
- RAM 8.00 GB.
- System 64 Bit operating system.
- Windows 10 (Professional).
- SSD 512 GB.

Empirical work has implemented on both Azure SQL database (SQL), and Atlas Mongodb NoSQL Database (MongoDB). Comparison has been found on two databases, with the parameters, loading time, response time, and retrieval time using database table and method used through inner join (SQL), and aggregate function (Atlas Mongodb NoSQL) databases.

1. **Loading Time:** It is average amount of time it takes for a page on show in your page of screen.
2. **Response Time:** It takes a total of time to answer a service request.

3. **Retrieval Time:** It is total amount of time it takes to all retrieve data. It is a part and parcel communication system.
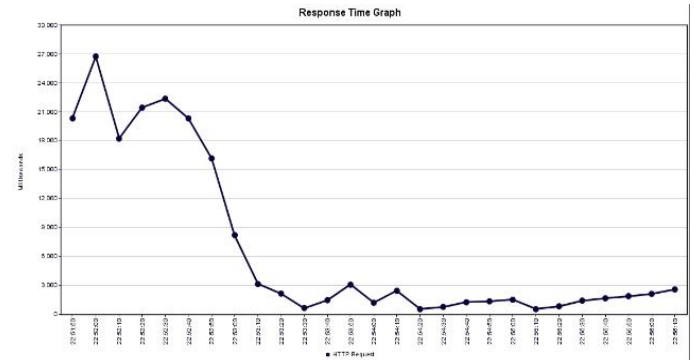

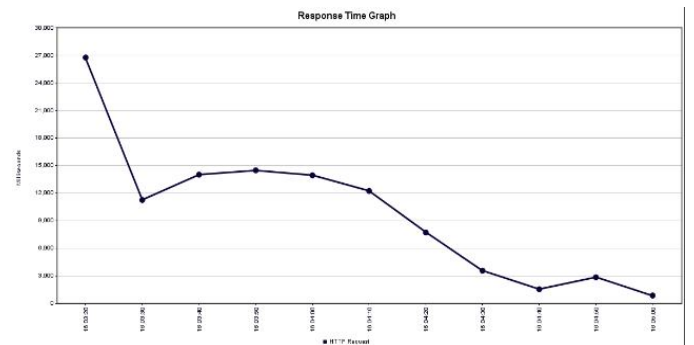Figure 6: Azure SQL Database Ten Thousand Records

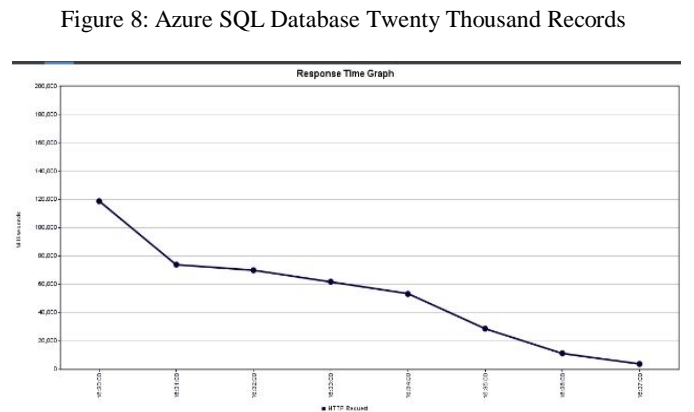
Figure 7: Atlas Mongodb NoSQL Database Ten housand Records
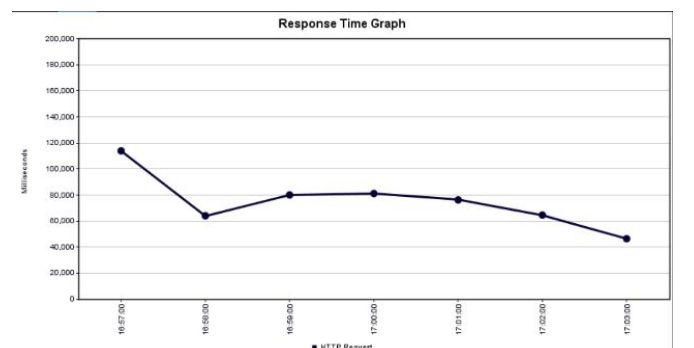
Figure 8: Azure SQL Database Twenty Thousand Records

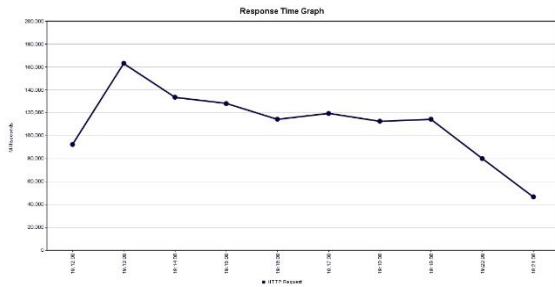Figure 9: Atlas Mongodb NoSQL Database Twenty Thousand Records

Figure 10: Azure SQL Database Thirty Thousand Records

Figure 10: Atlas Mongodb NoSQL Database Thirty Thousand Records

4. CONCLUSION

During the experiment checking the performance of two databases with records on Azure SQL and Atlas Mongodb NoSQL. The parameters loading time, response time, and retrieval time have been observed on both databases Azure SQL (SQL), and Atlas Mongodb NoSQL (MongoDB) through JMeter database connectivity, it has been observed that Azure SQL (SQL) loading time, response time, and retrieval time much less than the Atlas Mongodb NoSQL (MongoDB) loading time, response time, and retrieval time. According to these results we can say that Azure SQL Database is more efficient and faster than Atlas Mongodb NoSQL Database on the bases of parameters loading time, response time, and retrieval time.

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