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FIREBASE AND MYSQL PERFORMANCES FOR DATA EXCHANGING WITH CSV FILE IN PHP-BASED WEBSITE

Ridwan B. Marqas[1] *, Murat Karabatak[2], Saman M. Almufti[3]

[1]Department of Computer Engineering, Firat University, Elazig, Turkey
[2]Department of Software Engineering, Firat University, Elazig, Turkey
[3]Department of Computer science, Nawroz University, Duhok, Iraq

Abstract – as world growing with technology and revolution to computerized the information get massive that become data; those data need to be collected somewhere as can be called a database, by classifying the database into SQL (structure query language) that's related to relational databases and NoSQL that belongs to not relational databases or distributed database. Generally, many of research declare about the comparison between SQL among the NoSQL database, this paper goes further to compare Firebase which is a NoSQL database with phpMyAdmin (MySQL) which is a SQL database in exchanging data with CSV file for php-based website. The experimental result where collected for two CSV file of 1000 and 4997 number of records for both importing and exporting process. this paper concludes that MySQL is quicker than Firebase in dealing with websites.
Keywords: SQL, NoSQL, Firebase, MySQL, CSV, Website.

I. INTRODUCTION

An organized data collection which is stored and accessed by a computer system usually called a database (Ullman 2007). In massive range and the highly diverse and complex existence of data, today's digital systems are responsible for big-dimensional data. Also, a large volume of data needs to be stored, handled or analyzed in cloud systems and social media systems (Ramzan and Bajwa 2018). The most growing and conventional approach to database solutions is SQL or Relational Database Management Systems. The data are stored in tables or relationships in an organized way (Binani, Gutti, and Upadhyay 2016). The NoSQL databases are applications that enable large-scale data storage through decentralized servers both in enterprise and open source database management. NoSQL cares SQL, and thus NoSQL is redefined as "Not Just SQL" to prevent the lack of understanding that SQL cannot be included (Ganesh Chandra 2015). horizontal scaling can be allowed by NoSQL, that's many implementations are stored continuously on separate servers. The column-based NoSQL database holds data in a large table rather than multiple tables in the relational data database to accommodate such an auto-scaling feature (Lee and Zheng 2015). Firebase is a NoSQL database that is hosted in the cloud. synchronization occurs between connected devices and is obtainable when local cache network connectionless. This is a database powered by events that function very differently from standard SQL database (Moroney and Moroney 2017a). The MySQL presented in PHP and it simply allows object-oriented programming in PHP without including additional libraries (Stephens and Russell 2004). PHP is a one of popular web development scripting language, in 1994 was created by Danish-Canadian programmer Rasmus Lerdorf, Php 7 is last improved version (Jentsch 1997). This paper compared firebase performance with MySQL in exchanging (importing and exporting) of data with a CSV file using a Php based website.

II. MATERIALS

A. Programming Hypertext Protocol (PHP)

Web pages mostly implemented with dynamic programming language called Programming Hypertext Protocol (PHP), it used in wide range of websites and web application which continually updated that makes it most common languages (Mon et al. 2019). The PHP code can be adapted to work with different web scripting languages to get and store data using various platforms. PHP languages uses functions to read and write data in Comma Separated Value (CSV) file (Mon et al. 2019).

CSV file are widely used in transferring huge amounts of data among none connected application. Mostly Microsoft Excel or Text pad used to edit the CSV files as spreadsheet fields separated by commas while the CSV records separated using system end of line characters (Hapeez, Yassin, and Hamzah 2010).

B. Structured Query Language (SQL)

The core programming language to handle data contained in baseline structures is the Structured Query Language (SQL). Though SQL was initially only implemented with Relational Database Management System (RDBMS), it has been extended considerably with the addition of new forms of databases (Silva, Almeida, and Queiroz 2016). SQL is the standard query language for relational database systems, including MySQL which is an open source RDBMS. It involves server and client (Wang 2018). While client is connected to server the users will be able to use SQL Data definition language (DDL) and Data manipulation language (DML) commands in the database (Wang 2018). MySQL has been used in various applications, for providing standard database system services MySQL joint with PHP to designing the backbone of most data management and online commerce Websites (Wang 2018).

C. NoSQL

NoSQL is unlike an RDBM (Relational Database Management System). NoSQL is an un-relational database serving a simple query language beyond a specified structure. NoSQL is a massively vast database that can distribute and reproduce data in a less controller environment universally. This database preserves the storing of data without any link. There is a hierarchical framework of NoSQL databases. It might also accommodate the data at top speed in a very rise volume. The NoSQL database is horizontally structured. Only several NoSQL database instances include Cassandra, HBase, Couchbase, Cosmos DB, Firebase, etc.

Firebase is a NoSQL cloud-based Realtime Database that synchronize data over clients in Realtime, and offline functionalities provided and Data is stored as a JavaScript Object Notation (JSON), thus all connected clients share one instance, new data automatically received through updates(Moroney and Moroney 2017b). Generally, firebase designed for mobile based application and web applications. this paper adapt firebase to work with PHP based website, this is needed for systems which requires both website and web-application to allow desktop and mobile clients to manage data simultaneously.

D. Criteria

Generally, SQL and NoSQL Database are compared in various criteria such as diversity, scalability, price, amount of data, accessibility, execution time, complexity, implementation, uniformity, security as shown in Table 1.

Table 1. comparison between SQL and NoSQL criteria

Criteria	**Relational Database (SQL)**	**NoSQL**
diversity	Open and closed source	Open-source
Scalability	Upgrade a single server with devices	Using standard servers scale horizontally
price	Costly data access solution	inexpensive than open source and cheaper update
Amount of data	Limited	Vast data hold
accessibility	Affect by single fail	Unaffected by one point of failure that’s distributed
Execution time	Long process time	Short process time
Complexity	Complex data creation	Less complex data creation
implementation	Small improvement occurs	Each stage own improvement occurs
uniformity	Structured	Unstructured
Security	Strong Security	Security not included is related to other parts

Generally, there are many Relational database and Non-Relational database, SQL can be categories as MySQL, Oracle, Microsoft SQL Server, PostgreSQL and DB2, While NoSQL can categories as follow Redis, Amazon DynamoDB, Cassandra, Scylla, HBase, Firebase, MongoDB, Couchbase, Neo4j, Datastax Enterprise Graph, Elasticsearch, Splunk, Solr as shown in figure 1.

Figure 1. Categories of SQL & NoSQL

Table 2. Comparison between Firebase and MySQL Criteria (DB-Engines.com 2020).

Criteria	**Firebase**	**MySQL**
Type	Cloud hosted Realtime	Open source RDBMS
Database Model	Document Store	RDBMS and Document Store
Develop by	Google company	Oracle company
Release	2012	1995
Commercial	Yes	No
Cloud based	Yes	No
Server OS	Hosted	FreeBSD Linux OS X Solaris Windows
Scheme of Data	Free schema	Yes
XML support	No	Yes
SQL	No	Yes
Access methods and API's	Android iOS JavaScript API RESTful HTTP API	ADO.NET JDBC ODBC Proprietary native API
Support program language	Java JavaScript Objective-C	Perl PHP Python Ruby C C# C++ Java JavaScript (Node.js) Objective-C And others
Server-side scripts	Functionality are limited with rules	proprietary syntax
Triggers	When data changes callbacks are triggered	Yes
Consistency	Eventual at offline immediate at online	Immediate consistency
Foreign keys	No	Yes

Integrity	Yes	ACID
Authentication	Authentication based and database rules	No user groups or roles

Table 2, shows features comparison between firebase that belongs to NoSQL database and MySQL that belongs to SQL database.

III. PROPOSED METHODS

In this section shows, the proposed procedure for reading csv file and import data to firebase and phpMyAdmin Database, vice versa exporting data from firebase and phpMyAdmin. The execution time measured to compare the efficiency of using firebase and MySQL in importing and exporting php-based website data.

A. Php and CSV file

PHP for reading and writing data from and to CSV file the following functions needs:

i. Fopen function

This function is used for opening CSV file

fopen (*file*, *mode*)

where, file represent the target file, and mode is access needed for reading or writing in CSV file.

ii. Fgetcsv function

This function is used for reading data from CSV file with line by line parsing an open file and checking for data fields.

fgetcsv (*file*, *length*, *separator*)

where, file represent the target file, length represent the maximum length in CSV row, and separator is comma separate CSV fields.

iii. Fputcsv function

This function is used for writing data to CSV file

fputcsv (*file*, *fields*)

where, file represent the target file, fields represent the data array.

iv. Fclose Function

This function is used for opening CSV file

fclose (*file*)

where, file represent the target file.

B. PHP and Firebase

Firebase is a Realtime and a cloud storage database designed for Mobile and web applications, it can't be used directly with php for developing websites. Firebase store data as JSON, then for connecting PHP with Firebase Composer dependency manager is needed

, which is a tool that offers a standard format for handling dependencies of PHP and libraries.

PHP need the following functions to read/write data from firebase database:

i. Getreference function

this function used to refence the source database needs to push and get value from its data.

getreference (*DB*)

where, DB represent the target Database.

ii. Push function

This function is used to insert a list of data in the firebase database. Firebase database create new unique key when pushing new node into the list of data.

Push (*Data*)

where, Data represent the list of data to be pushed in Database.

iii. getValue function

This function is used to retrieve a data from the firebase database.

getValue ()

C. PHP and phpMyAdmin

PHP need the following SQL statement to read/write data from phpMyAdmin database:

i. Insert Statement

This statement is used to insert a data in the phpMyAdmin database.

```
INSERT INTO table_name (column, ...)
VALUES (value, ...)
```

where, table_name represents the target table to insert data, column represents column names in the table and value represents the data to be inserted in the table.

ii. Select Statement

This statement is used to select a data from the phpMyAdmin database.

```
SELECT * FROM table_name
```

where, table_name represents the target table to select data from database and * is represent all columns in the table.

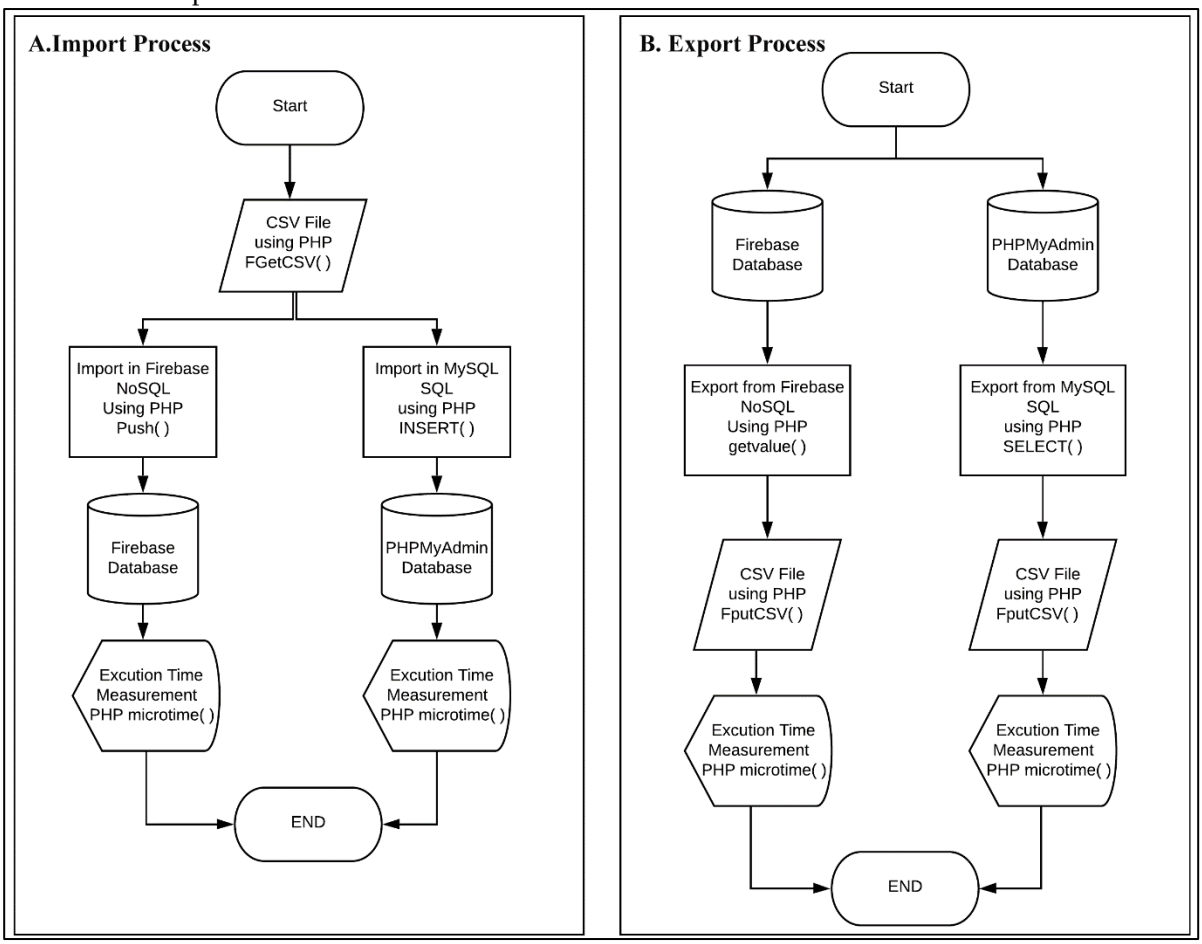


Figure 2. import and export process

Figure 2 shows the procedure of import and export data for both firebase and phpMyAdmin database.

IV. Experiment and Result

This section shows the experiment of import and export data from firebase and phpMyAdmin database with performance result with internet speed with 6 ping ms that download 34.65 Mbps and upload 36.06 Mbps.
In the experiment the two CSV file used that belong to a hospital, the first CSV file contains 1000 records while the second CSV file contains 4997 records, both files have 11 columns as shown in figure 3.

Hospital CSV file

- Country
- State
- County
- Lat
- Lng
- Type
- Measure
- Beds
- Year
- Source
- Population

Figure 3. CSV file columns name

Figure 4, shows the entire system connection that start by connection from pc to 000webhost server. The server hosts the website that connect to the following two different databases:

- phpMyAdmin: in the 000webhost using SQL
- Firebase: in Google server Using NoSQL

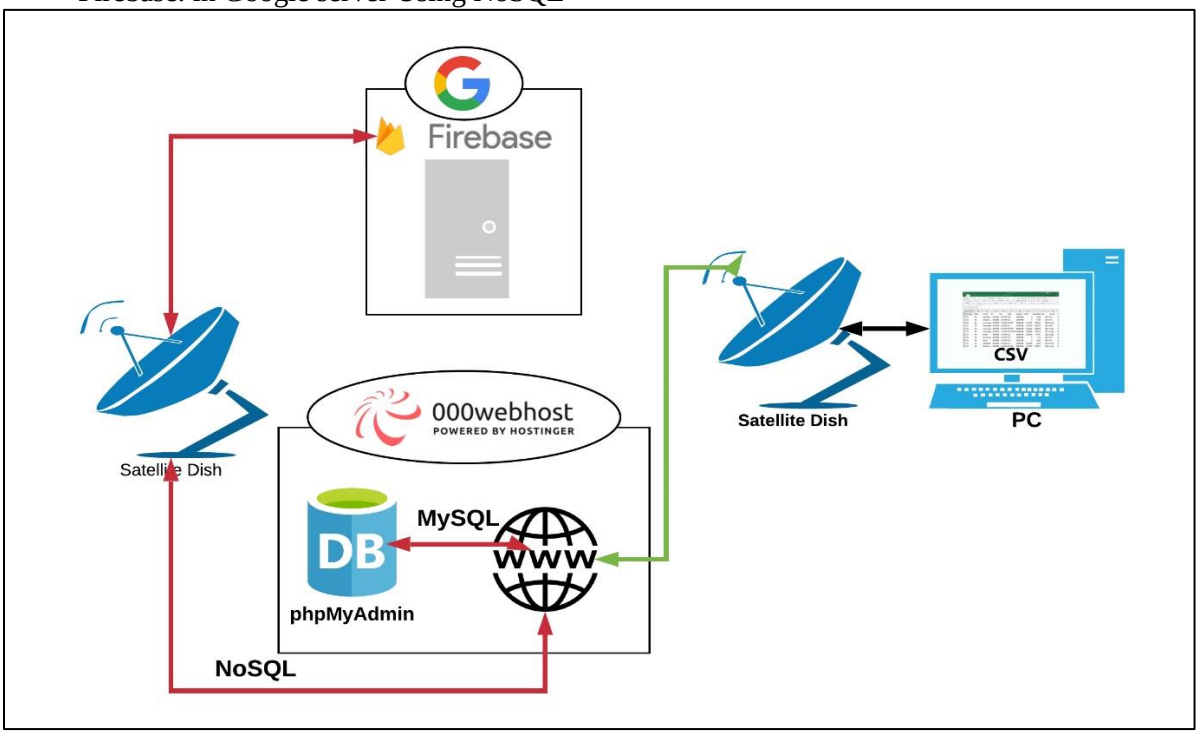
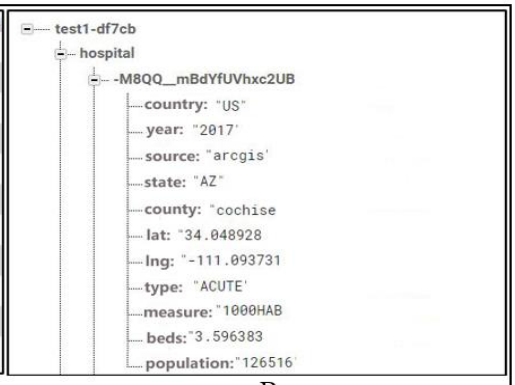


Figure 4. System connection

in phpMyAdmin and Firebase online database a table created according to CSV structure named hospital as shown in figure 5 (A) and (B).

#	Name	Type	Collation	Attributes	Null	Default
1	country	varchar(255)	utf8_unicode_ci		No	None
2	state	varchar(255)	utf8_unicode_ci		No	None
3	county	varchar(255)	utf8_unicode_ci		No	None
4	lat	float			No	None
5	lng	float			No	None
6	type	varchar(255)	utf8_unicode_ci		No	None
7	measure	varchar(255)	utf8_unicode_ci		No	None
8	beds	float			No	None
9	year	int(100)			No	None
10	source	varchar(255)	utf8_unicode_ci		No	None
11	population	int(100)			No	None

A



B

Figure 5. shows hospital table online database structure (A) phpMyAdmin (B) Firebase

The Execution time for importing ang exporting data in both databases are measured as shown in table 3.

Table 3. execution time of phpMyAdmin and Firebase

process	Record No.	phpMyAdmin	Firebase
import	1000	1.1398 seconds	138.649094 seconds
	4997	5.14542 seconds	735.564 seconds
export	1000	0.009865 seconds	0.495048046 seconds
	4997	0.053464 seconds	0.774774 seconds

Table 3 shows the execution time of importing and exporting for 1000 and 4997 records of CSV file in phpMyAdmin and firebase. the import and export process with 1000 records of CSV file execution time into phpMyAdmin and Firebase is shown in chart figure 7 while figure 8 shows the execution time of import and export the 4997 records of CSV file into phpMyAdmin and Firebase database.

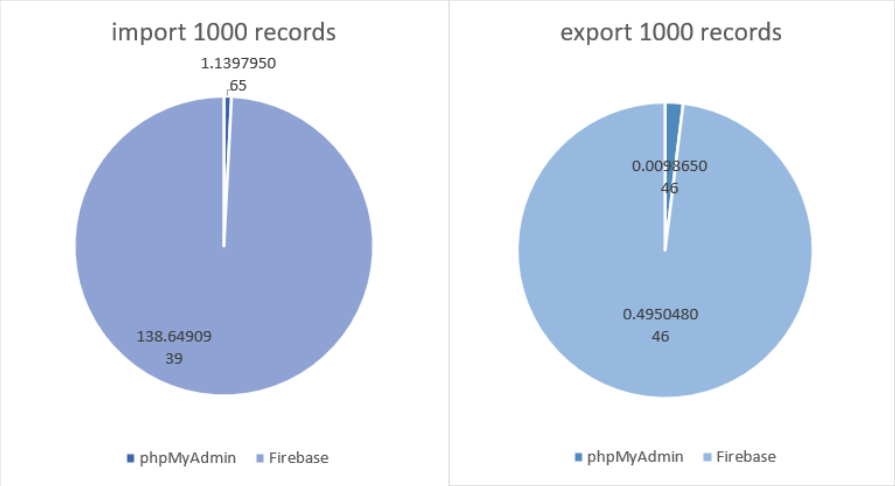


Figure 7. import and export 1000 records in phpMyAdmin and firebase

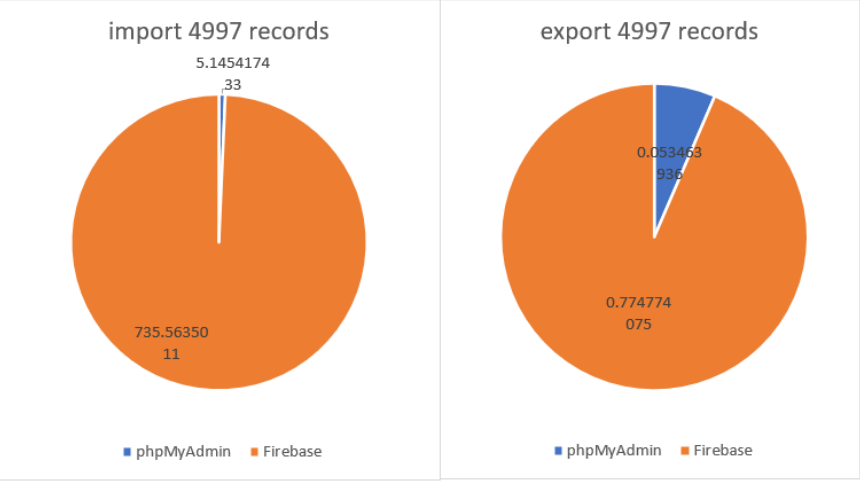


Figure 8. import and export 4997 records in phpMyAdmin and firebase

V. Conclusion

This paper present time performance evaluation for process of data exchanging (import and export) data between CSV file and online databases (MySQL and Firebase) with php-based website.

The experimental result where tested for two CSV files with 1000 and 4997 record number, it shows that the data importing and exporting process of MySQL is faster than Firebase in php-based website, this is because the

connection between website and phpMyAdmin are directly carried by MySQL in the same server, while the connection between website and firebase is not direct and require more time to reach database in external server.

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