

SYNCHRONIZATION OF TWO HOMOGENEOUS DATABASES USING DBFORGE

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Abstract

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Database synchronization is part of replication, which is a process to ensure that every copy of data in a database contains similar objects and data. The creation of a database with MySQL database management is made offline and due to the limited allocation of costs to the system. Database synchronization in time and cost is affordable to synchronize the database offline. The main purpose of database optimization is to make many users can access data simultaneously. Accessing this data is not problematic if all users only read data and they do not interfere with each other. But when many users access the same database simultaneously and one makes changes to the data, it can lead to inconsistency of data. From the development objectives, it can be concluded that the importance of synchronizing data to backup databases to maintain consistency. This research was conducted for database optimization using dbForge Schema Compare for MySQL. This research aims to optimize the database with a target market in organizations that have a small cost allocation. Database optimization is expected to contribute to help improve database management functionality, especially offline database management and organizations that have little cost allocation.

INTRODUCTION

Database optimization has the aim to make many users can access data simultaneously. Accessing this data is not problematic if all users are only read data and they don't interfere with each other. But when many users access the same database simultaneously and one makes changes to data, it will be able to cause inconsistency of data. From the purpose of this development can be concluded that the importance of synchronizing data for do a database backup to maintain consistency.

Database synchronization is a process that aims to maintain permanence or the consistency of the data contained on the database server against the data residing on the database server the other. This synchronization function is a

basis for replication in the DBMS (Database Management System). Database Administrators need to be more vigilant in their techniques used to protect company data, as well as monitor and ensure that adequate protection of data is available.

An organization's database must have a historical and consistency or time track when the data is backed up. Database creation with MySQL database management made offline and due to limited cost allocation for the system. Database development carried out in several stages, namely the stage of collecting data, processing data, analysing data, implement, and develop. This study aims to optimize.

A database with a target market in organizations that have a small allocation of

costs. As is this research is expected that database optimization can contribute to help improve database management functionality, specifically database management is offline and has a small allocation of costs. From the existing problems arise questions related to how the database optimization can be done to do synchronize databases in an affordable time and cost.

From research "Synchronization Data in Tables Saved in Two Different Database Servers "for the purpose of compare good software to use database synchronization process between MySQL and dBase and produce testing related to the time required for the process Data synchronization is very dependent on the existence of the computer used for placement data to be synchronized, sorted by trial results are LAN, Internet and Localhost. From these studies become the basis for further research with use the software for the synchronization process using that software based on open source, so that research in this field can develop rapidly. (Wintolo, 2010)

From the research entitled "A Review on Synchronization and Concurrency Control Techniques of Distributed Databases which aims to show various techniques used for synchronization and concurrency control of a distributed database, using this research method is comparing the synchronization of the Clock Synchronization algorithm and the Synchronization in Homogeneous database using audit log. From these studies it is the basis for further research by applying the concept of Concurrency Control consisting of Lock-Based Protocols and Timestamp Based Protocols can optimize distribution synchronization database by avoiding large network overhead. (ur Rehman Khan et al., 2019)

From the journal entitled "Two-ways database synchronization in homogeneous dbms using audit log approach "reveals that it exists a jumper table containing which data in the table should be skipped when data is sent to the targeted slave has the same identity as the jumper table. Implementation Synchronizing by utilizing this audit log method can be used to process DML replication and synchronization. Meanwhile it has weaknesses in recording activities DDL even though some DBMS like

Oracle can log into DDL. (Gudakesa, Made Sukarsa, & Gusti Made Arya Sasmita, 2014)

Database synchronization can be done using schema compare tools like Visual Studio - SQL Server Data Tools, Red Gate SQL Compare, dbForge Schema Compare for SQL Server, dbForge Schema Compare for MYSQL, SQL Admin Studio, etc. other. However, this research will use dbForge Schema Compare for MySQL because the database collected from third parties is a structured database. The database uses MySQL database management.

From some of these studies researchers were inspired to plan research database optimization that will be done in this study with due regard concurrency control and synchronization success in a homogeneous database saves time for the database synchronization process using database management offline, namely MySQL.

RESEARCH METHOD

Optimization by synchronizing databases on homogeneous databases with dbForge Schema Compare for MySQL has several steps attached to it Figure 1 below:

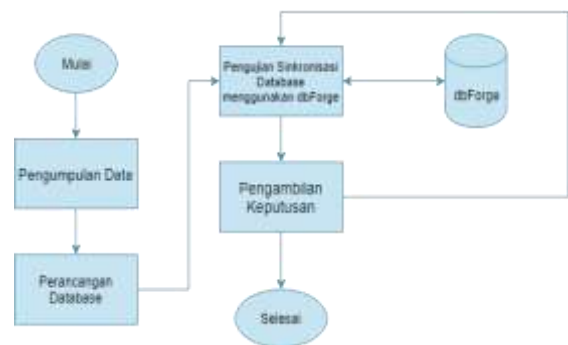


Figure 1. System Flow Diagram

1. Collecting data related to the database synchronization process the data collected is the master database record obtained from the process collecting sample data that has been shared from an organization.
2. Database design using the MySQL platform.
 - a. Export or Create Database
 - b. Master and Slave Database Structure

- c. Sample Query from the database synchronization process
3. Testing database synchronization using dbForge according to parameters and scenarios that have been provided DbForge Studio for MySQL is a universal GUI tool for development, management, and administration of MySQL and MariaDB databases. Researchers plan to synchronize the database in accordance with the parameters and scenarios that have been planned.

Planned testing parameters:

- a. Database Synchronization Success. The researcher plans to conduct a test related to the success of the process synchronization between two databases. Declared successful if the contents of the master database are the same with a slave database.
- b. Concurrency Control. Concurrency control is the process of managing operations in many ways transactions that run simultaneously on the database without interrupting operations on other transactions so as to produce consistent data (Collony & Begg, 2005). Researchers plan to conduct a test related to concurrency control by calculating the response time the database synchronization process uses dbForge. This will be seen from the performance of the contents of the master database and consistent slave too.

Scenarios to be planned:

- a. Synchronize between 2 databases that have the same structure
- b. Synchronization between 2 different table contents in a database that has a structure that is same
- c. Synchronization between 2 databases that have different structures
- d. Synchronization between 2 databases that have a lot of data (the limit is on the number big record)

4. Decision making. The decision will be taken after the researcher has tested 15 times probational period.

RESULT AND ANALYSIS RESULT

Data collection related to database synchronization process

Data collected is a database created using management MySQL database in Figure 2 of a cooperative.



Figure 2. Cooperative Master Database

Database design using the MySQL platform.

1. Export or Create Database
The database is created using MySQL database management with cooperative database name
2. Master and Slave Database Structure
Each database has 10 tables
3. Sample Query in Figure 3 of the database synchronization process

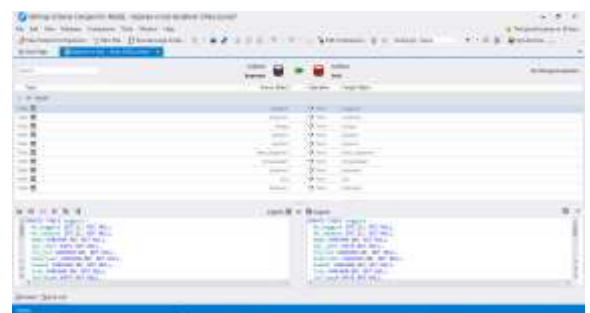


Figure 3. Query database synchronization process

Testing database synchronization using dbForge according to parameters and scenarios that have been provided Test parameters performed:

1. Database Synchronization Success
Researchers conducted tests related to the success of the synchronization process between the two the database. The synchronization process before synchronization can be seen in Figure 4. and declared successful as in Figure 5. because of the contents of the database master is the same as slave database.



Figure 4. Before the database synchronization process



Figure 5. After synchronizing the database

2. Concurrency Control
The researcher conducted a test related to concurrency control by counting response time database synchronization process using dbForge. This will seen in Table 1 regarding the response time obtained for each scenario.

Table 1. Table of Test Results Based on Response Time (per sec)

No	Scenario	Database Time Response Synchronization on trial n (per sec)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Synchronization between 2 the database that have structure same	65	88	64	58	75	73	85	78	88	67	64	65	56	87	78
2	Synchronization between 2 the database that have structure the same but	71	85	78	67	64	64	87	73	71	63	64	64	118	86	84
3	Synchronization between 2 the database that have structure different	64	58	73	71	84	67	84	65	58	83	78	123	58	88	73
4	Synchronization between 2 the database that have Data many (Data is in the amount 1kg security)	283	234	213	342	231	297	342	213	297	213	211	208	343	343	318

Average response time =
Formula = Amount of time / number of attempts
Scenario 1 = 1047/15 = 69.8 per sec
Scenario 2 = 1120/15 = 73.47 per sec
Scenario 3 = 1107/15 = 73.8 per sec
Scenario 4 = 4080/15 = 272 per sec
Response time is presented in graphical form which can be seen in Figure 6.

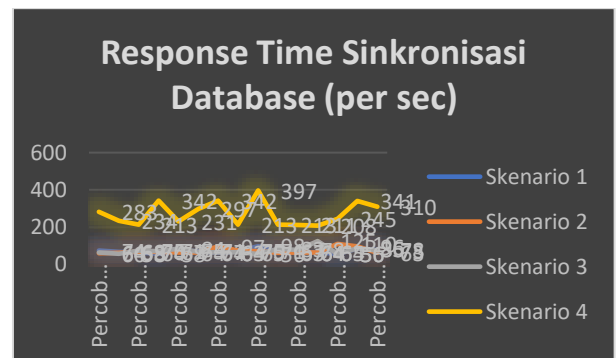


Figure 6. Graph of Test Results Based on Response Time (per sec)

The test is carried out using the following scenarios:

1. Synchronize between 2 databases that have the same structure
The database is created using the same database management, MySQL and The database is homogeneous. Synchronize 2 databases using dbForge Schema Compare for MySQL, then after comparing between two databases, you can performed by comparison between the master database and the slave database. Finally Database synchronization was successfully carried out, resulting in 2 of the same database exact or replica with 69.8 response time per sec.

2. Synchronize between 2 different table contents in a database that has the same structure

The database is created using the same database management, MySQL and The database is homogeneous. Synchronize 2 databases using dbForge Schema Compare for MySQL, then after comparing between the two tables that have different records, this can be done by comparison between databases master and slave database. Finally the database synchronization was successful, so produces 2 exact or replica databases with response time 73.47 per sec.

3. Synchronization between 2 databases that have different structures

The database is created using the same database management, MySQL and The database is heterogeneous. Synchronize 2 databases using dbForge Schema Compare for MySQL, then after comparing between two databases has a different database structure, this can be done by comparison between the master database and the slave database. Finally the database synchronization was successful done, so that it produces 2 databases that are an exact or replica of response time 73.8 per sec.

4. Synchronization between 2 databases that have a lot of data (the limit is on the number big record)

The database is created using the same database management, MySQL and The database has a lot of data. Synchronize 2 databases using dbForge Schema Compare for MySQL, then after comparing between the two tables has a different record, this can be done by comparison between databases master and slave database. Finally the database synchronization was successful, so produce 2 exact or replica databases with 272 response times per sec.

The decision is taken when it has finished doing 15 times a trial period with consider the parameters of successful synchronization and concurrency control from research results.

CONCLUSION

From the results of research related to homogeneous database synchronization using dbForge can concluded that:

- a. In accordance with the results of synchronization research using dbForge:

- 1) The synchronization scenario between 2 databases that have the same structure has results average response time of 69.8 per sec
 - 2) Synchronization scenario between 2 different contents of tables in a database that has the same structure has an average response time of 73.47 per sec
 - 3) The synchronization scenario between 2 databases that have different structures has results average response time of 73.8 per sec
 - 4) Scenario of synchronization between 2 databases that have a lot of data (the limit is on large number of records) has an average response time of 272 per sec
- From the above data it can be concluded that the response time for each database synchronization the scenario varies depending on the structure of the database itself. So that it can It is said that MySQL database management, is offline and homogeneous as well as methods synchronization also affects the efficiency of the synchronization process.
- b. In terms of cost, dbForge is open source, so for beginners who want to learn database synchronization and having a minimum budget would be highly recommended.
 - c. Database synchronization can be done offline and fast by using tools and The menu is provided on dbForge, thus saving synchronization time the database.

In the development of further research it is recommended to be tested by comparing an online database that uses minimum costs in its operations and can database testing with more data but with the results more effective in terms of time for further research.

REFERENCE

- Collony, T., & Begg, C. (2005). *A Practical Approach in Design, Implementation, and Management. Fourth Edition* (Fourth). Addison Wesley.

Gudakesa, R., Made Sukarsa, I., & Gusti Made Arya Sasmita, I. (2014). *Two-ways database synchronization in homogeneous DBMS using audit log approach*. *Journal of Theoretical and Applied Information Technology*, 65(3), 854–859.

Jindal, R., *Review Paper on Database Synchronization between Local and Server*, in *International Journal of Engineering Sciences and Research Technology (IJESRT)*, vol. 5, no. 7, July. 2016, pp. 1396-1400.

ur Rehman Khan, S., Sheraz Arshad Malik, M., Waleed Ashraf, M., Saif Ullah, A., Asghar, I., & Razzaq, N. (2019). *A Review on Synchronization and Concurrency Control Techniques of Distributed Databases*, *International Journal of Computer Science and Network Security*, VOL. 19 No. 2, February 2019.pdf. IJCSNS *International Journal of Computer Science and Network Security*.

Sekar Dewi, W.E. Utami, B. Sudaryatno, *Database Migration using Data Synchronization and Transactional Replication*, in *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, vol. 8, issue. 10, August 2019, pp. 2730-2734.

Shabani, I., Cico, B., Dika, A., *Solving Problems in Software Applications through Data Synchronization in Case of Absence of the Network*, in *International Journal of Computer Science (IJCSI)*, vol. 9, issue. 1, no. 3, January. 2012, pp. 10-16.

Singh, G.S. Satardekar, Y. Rane, and Prof. A. Srivastava, *Database Migration between Two Heterogeneous Systems*, in *International Journal of Engineering Trends and Technology (IJETT)*, vol. 2, no.3, April. 2015, pp. 126–128.

Suresh M, P. Sruthi Mol, S. Dharmalingam, *Data Synchronization Using Offline Communication*, in

Advances in Natural and Applied Sciences, August. 2017, pp. 24-27.

Wintolo, H. (2010). Sinkronisasi data pada tabel yang tersimpan di dua database server yang berbeda. *Jurnal Ilmiah Angkasa*, 2(1), 39–48.