Distributed Database Implementation in Point of Sale System with Synchronous Replication Method (A Case Study SBS Endang Buah)

Sri Wulandari [*, a, 1], Galuh Son Adji [b,2]

[a] University of Technology Yogyakarta, Yogyakarta, Indonesia
[b] University of Technology Yogyakarta, Yogyakarta, Indonesia
[1] sri.wulandari@staff.uty.ac.id [*], [2] galuhsonadji666@gmail.com

Abstract

This SBS Endang Buah is a trading agency that sells various kinds of products fruit. Initially SBS Endang Buah only had one shop with increase in customers then open a branch store to deal with customers which increases. Data that is not distributed quickly result in data delays and make it difficult for the agency to manage sales data at branch stores and central stores. Therefore, all data from branches and central stores must be distributed to each other and a base system is made distributed data on the sales system to make it easier for the agency processing sales data. And remembering these data is very important, of course requires data backup to anticipate data loss. Process database distribution will be created in real-time using replication synchronous. Where the master database residing in the central store will be replicated to the branch store slave database and vice versa, replication is carried out in both directions, so that data delays for processing sales data can be resolved as well as with the existence of two databases can anticipate data loss from things technical and non-technical.

Keywords: Sales, Distributed Database, Synchronous Replication

I. INTRODUCTION

The development of information and communication technology is increasing day by day growing rapidly. The development of information technology has had an impact on great for life, the many benefits that come from using technology[6]. Current technological developments have provided many conveniences in the delivery of information, information is stored, processed, and deleted become a major part of the availability of information. With advances in technology current information, access to available data and information can take place quickly, efficiently, and accurately. This requires the business people to be able to develop their businesses in order to survive in one of the competition is Sbs Endang Buah.

Initially SBS Endang Buah only had one shop with the increase in customers, a branch store was opened to overcome more customers. However, data that are not distributed with quickly resulted in data delays and made it difficult for the agency to manage sales data at branch stores and central stores. Based on the analysis listed above, therefore all data from between stores must be distributed to each other to avoid data delays as well as avoid data loss caused by technical and non-technical matters. This problem solve, an interconnected database will be created using bidirectional synchronous replication that backs up data done in real time.

II. RESEARCH METHOD

Distributed databases can be also interpreted as an integrated database, in accordance with developments information technology, in accordance with the development of information technology today, In general, it is a form of implementation of the concept of processing distributed [1]. A distributed database has the implication of understanding that an application can work transparently operating on data that stored in multiple database locations, using multiple DBMS software product, running on different computers, and on different operating systems, and are connected to each other connected through various communication network media[7].

Replication synchronous is data replication for data synchronization as a data replication solution known as synchronous replication where each database image data is written quickly [2]. In this technique data integrity is maintained in a stale solution traditional data with a dual phase carried out in transactions that access each element database for writing and processing only when each available database is updated. In traditional database solutions, synchronous replication is sensitive to system failure. If a database is not available due to server failure, the success of the transaction will be delayed.

Synchronous replication allows exchange data in real-time so that the synchronization of a data will be maintained, where when there is operational transaction that is writing something to the source disk, then the Simultaneously writes are also made to the target disk at the remote location [3]. The he entire write process on the source disk and the target disk must be completed first before moving on to the next operational transaction and given acknowledge for both when done[4]. In this replication mode, the need high system performance must be considered. In addition, the distance between source disk and target disk is also a major prerequisite, that the party who involved in this mode of replication should be < 100 km between the two[5]. The advantage of this replication mode is that it provides consistent recovery and complete for all

timeframes. Synchronous replication mechanism using the 2PC protocol (2-phase commit)[8]. A copy of the data on one of the servers will be updated immediately when the source data is updated.
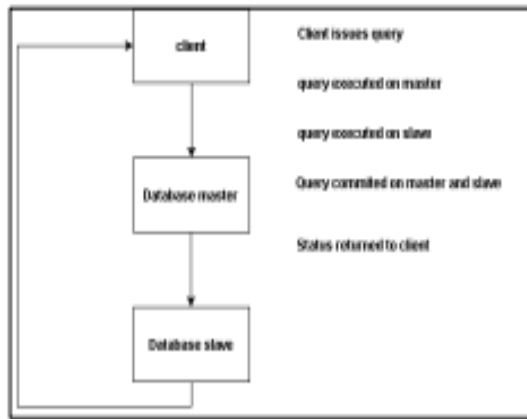

Figure 1. Synchronous replication architecture

Based on the analysis of the case study, the researcher will carry out system design with distributed database to complete problems found by the author in the case study in the recording process sales and sales data processing between branches as well as data backup with using a circular relationship replication model with the replication method. Synchronous replication method will be applied to the system to distributing sales between central stores and branch stores of Sbs Endang Buah. The synchronous replication model applied is in the form of 2 master/slave servers which are interconnected by two-way replication.
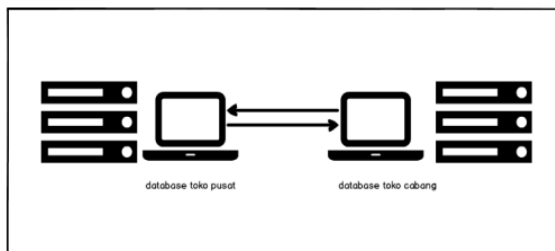

Figure 2. Database Distribution Process

III. SYSTEM DEVELOPMENT

A. System Planing

At this stage to overcome the problems that occur, the researcher will implement a distributed database. In this way it is hoped that SBS Endang Buah can perform data processing at the central store and branch stores and make it easier for store management to monitor and manage data at both stores. In addition, with a point of sale system with a database, it is hoped that this distribution will make it easier for the owner of SBS Endang Buah in managing data from both stores, employees at SBS Endang fruit in do their job. As well as improving store performance in daily transactions,

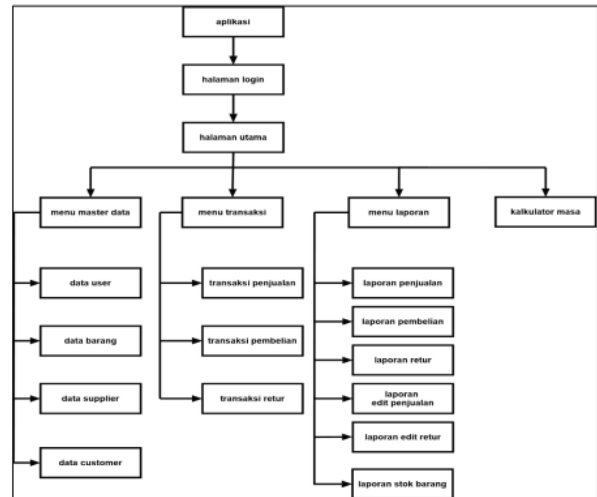the following is the menu analysis proposed in the point of sale system.

Figure 3. Point Of Sale System Menu Analysis

The database distribution process proposed by the researcher is as follows :

a. The distribution of the database will be carried out in two directions and carried out synchronously (real time) which serves to speed up the process of distributing data and minimizing data loss caused by technical and non-technical matters.

b. Network simulation connection using star topology with using a wireless local area network (WLAN). As well as using the access point as a connecting device. Network simulation and distributed database schema is the design of flow design of the database system to be distributed, to solve the problems that exist in sbs endang fruit with using star topology and circular relationship replication model using a synchronous replication method that is applied to a point of sale to copy and distribute data. Synchronous replication method used in this study so that the two servers can be directly connected to each other real-time.
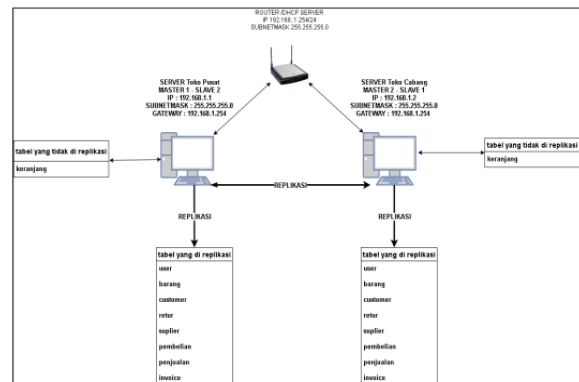

Figure 4. Network Simulation and Distributed Database Schematic

Both master server and slave server connected to each other in a network using the Star topology and to

Synchronize database in both directions to minimize data loss and the following database tables are replicated, namely the goods, customers, invoices, purchases, sales, returns, suppliers, bestsellers, and users. As well as tables that are not in replication is the cart table.

DFD level 0 explain that the owner can login into the system and the owner can view and manage user data, data customer data, goods data, sales transaction data, purchase transaction data and data return transactions, purchase reports, sales reports, returns reports, edit reports sales transactions, edit reports on return transactions while the cashier can only log in and can only enter sales transaction data, return transaction data and you can view sales transaction info, invoice info, and return transactions.
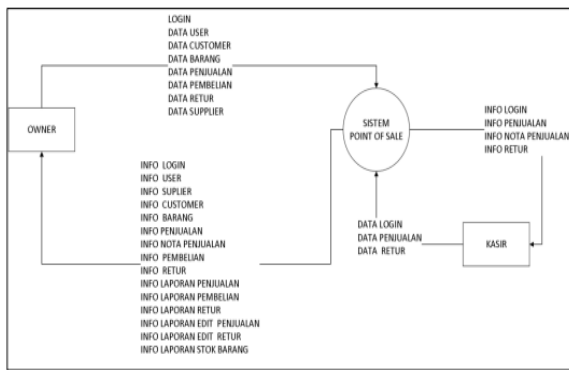

Figure 5. Context diagram

DFD level 1 includes 4 processes, namely the login process, the transaction master data process and the report process, as well as explain how the flow of all processes as a whole.
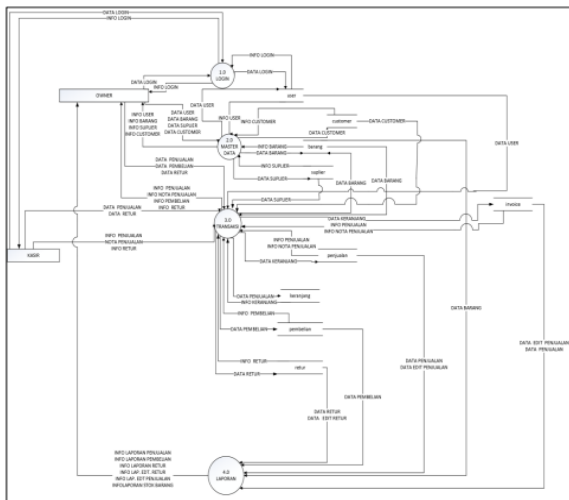

Figure 6. DAD Level 1

B. Implementation

System implementation is a continuation of design activities system and can be seen as an attempt to realize the system design. The steps of system implementation are a sequence of activities from the beginning to the activities carried out in realizing the designed system. The implementation process of the system design carried out in the previous chapter will be explained in this chapter. Implementation aims to translate software requirements into an actual form that is understood by computer or in other words, this implementation stage is a planning that has been done. In this study, the programming language used use for system implementation is PHP and DBMS to store database is MySQL.

As for the steps to implement replication synchronous in both directions is as follows:
a. Turn off windows firewall
this stage of turning off the windows firewall needs to be done so that the then run smoothly without any problems. As for the steps to turn off the windows firewall is as follows:
1. Press windows/start key + R
2. Type firewall.cpl then press enter
3. Next Turn of windows firewall on Private network settings and public network settings then click OK.

b. Connect 2 laptops with simulated WLAN network. At this stage the network simulation uses a star network topology to connect the two laptops. The following is the configuration of the star network used in this study.
  1. Router (DHCP Server)
  - IP address : 192.168.1.254/24
  - Subnet mask : 255.255.255.0
  2. Central store.
  - IP address : 192.168.1.1/24
  - Subnet mask : 255.255.255.0
  - Gateway : 192.168.1.254
  3. Branch store.
  - IP address : 192.168.1.2/24
  - Subnet mask : 255.255.255.0
  - Gateway : 192.168.1.254

To find out if both laptops are connected to the network WLAN (Wireless Local Area Network), then it is checked by ping command. The ping command is carried out from the central store to the branch store, namely by clicking windows/start + R then typing ping 192.168.1.2
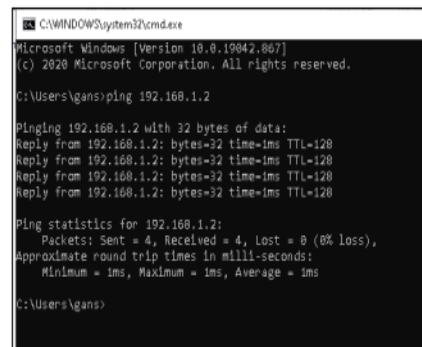

Figure 7. Ping Result from Central Store To Branch

and to find out if the branch store is connected to the central store can be found out by doing the ping process from the branch store to the central store.
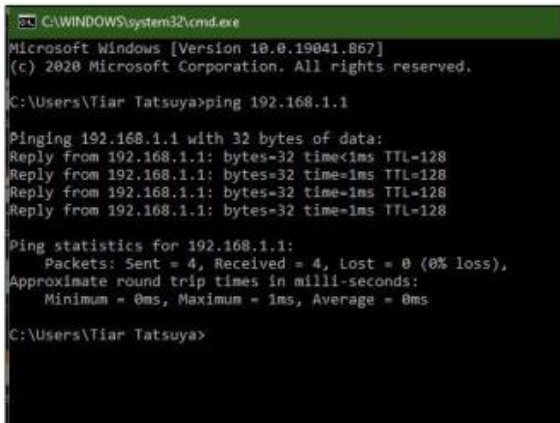

Figure 8. Ping Result from Branch to Central Store

Based on the configuration file my.ini above can be concluded as following, (server-id=) is the name of the master server based on the default id of MySQL, (binlog-do-db=) is used to filter the database to be downloaded replication by database name and (replicate-do-table=) is used for filter table to be replicated, and (replicate-do-table=) is used to filter unreplicated table whereas (log-bin=mysql-bin) is a special log of MySQL which serves to form a binary log file according to the index specified managed by MySQL, the binary log file can change it is happens changes to the master that will be sent to the slave, to find out the file binary log that has been formed is by making a query command.

Figure 9. Query Result Show Master Status

Connecting master with slave
- Change master to master_host = this query is used for change master by host.
- Master_user = Query used to access the current user have been made previously.
- Master_log_file = Query used to enter the log files from the master server that are viewed using the query command showmasters.
- Master_log_pos = Query used to enter the log pistoin from the master server that is viewed using the query command showmasters.
- Flush privileges = Query used to update and apply the new rules.
- Start slave = Query used to start configuration slaves that have been created.

The login page is the page that will be used by the user to login enter the system, after logging in. Users can perform activities in the system according to the access rights owned by the user on the login page will have two input fields, namely the email field and the password field
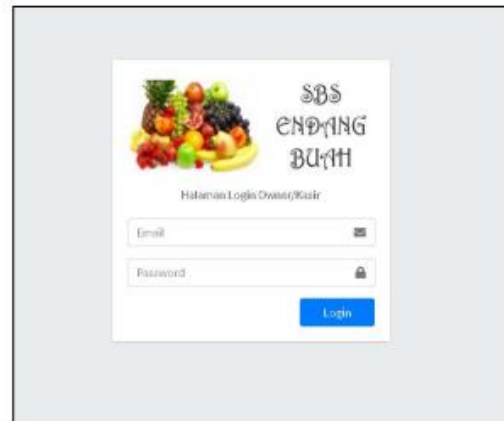

Figure 10. Login Menu

The dashboard page is the main page or the first page that will be accessed by the user, and the user will get features from the system depending on the access rights owned by the user, on the dashboard page later there will be a transaction page in which there are sales, purchases, and return master data page containing suppliers, customers, and goods and users and in the report menu there are sales reports, purchase reports returns, as well as transaction edit reports
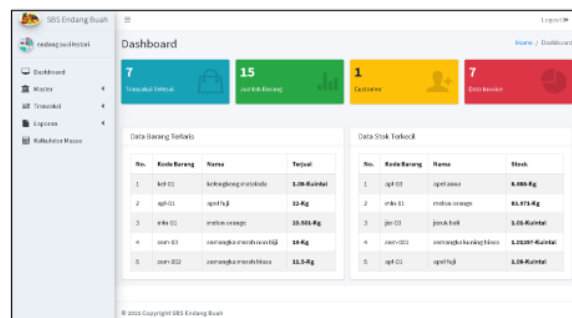

Figure 11. Dashbord Menu

The sales transaction page is a page that will be used by user with owner and cashier access rights to make sales transactions, which Later the owner/cashier can enter sales data by entering goods then enter the number of goods in grams and then count it, and choose customers
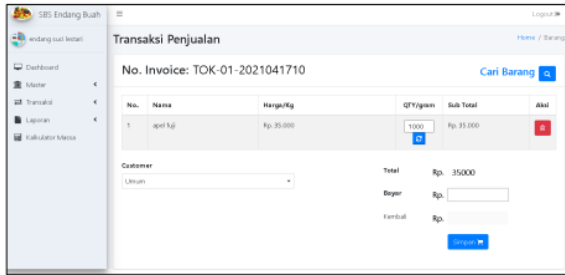
Figure 12. Transaction Menu

IV. FINDING DISCUSSION

Based on the results of system implementation and system testing, using the blackbock esting method, all the functions in the system is running well, the implementation of the system is in accordance with the design made. Based on the table of test results can be taken conclusion that the system that has been made is working according to its function. The system display will adjust to the access rights of each user,
and features in the system also adjust the user's access rights. Based on the results of the trial of synchronous replication in two directions on master server 1 – slave 2 on central store and master server 2 – slave 1 on store branch using WLAN (Wireless Local Area) network simulation Network) using a star topology can run well and data data which was inputted for duplication has also been successful.

V. CONCLUSION

Based on the whole process of analysis, design, and implementation that has been done, it can be concluded that the point of sale system created using the PHP programming language and using a DBMS MySQL and then implement a distributed database on the system uses synchronous replication in both directions. The data is already available synchronized in real-time. The data required by the agency to managing sales, purchases, returns can be distributed in real-time and always up to date. With the implementation of a distributed database with synchronous replication model can solve the problem of data delay and can provide consistent data recovery due to data synchronization awake to avoid data loss.

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