Lecture Notes in Electrical Engineering 365

Felix Pasila
Yusak Tanoto
Resmana Lim
Murtiyanto Santoso
Nemuel Daniel Pah
Editors

Proceedings of Second International Conference on Electrical Systems, Technology and Information 2015 (ICESTI 2015)

Springer

Lecture Notes in Electrical Engineering

Volume 365

About this Series

"Lecture Notes in Electrical Engineering (LNEE)" is a book series which reports the latest research and developments in Electrical Engineering, namely:

- Communication, Networks, and Information Theory
- Computer Engineering
- Signal, Image, Speech and Information Processing
- Circuits and Systems
- Bioengineering

LNEE publishes authored monographs and contributed volumes which present cutting edge research information as well as new perspectives on classical fields, while maintaining Springer's high standards of academic excellence. Also considered for publication are lecture materials, proceedings, and other related materials of exceptionally high quality and interest. The subject matter should be original and timely, reporting the latest research and developments in all areas of electrical engineering.

The audience for the books in LNEE consists of advanced level students, researchers, and industry professionals working at the forefront of their fields. Much like Springer's other Lecture Notes series, LNEE will be distributed through Springer's print and electronic publishing channels.

More information about this series at http://www.springer.com/series/7818

Felix Pasila · Yusak Tanoto
Resmana Lim · Murtiyanto Santoso
Nemuel Daniel Pah
Editors

Proceedings of Second International Conference on Electrical Systems, Technology and Information 2015 (ICESTI 2015)

Springer

Editors
Felix Pasila
Department of Electrical Engineering
Petra Christian University
Surabaya
Indonesia

Murtiyanto Santoso
Department of Electrical Engineering
Petra Christian University
Surabaya
Indonesia

Yusak Tanoto
Department of Electrical Engineering
Petra Christian University
Surabaya
Indonesia

Nemuel Daniel Pah
University of Surabaya
Surabaya
Indonesia

Resmana Lim
Department of Electrical Engineering
Petra Christian University
Surabaya
Indonesia

ISSN 1876-1100 ISSN 1876-1119 (electronic)
Lecture Notes in Electrical Engineering
ISBN 978-981-287-986-8 ISBN 978-981-287-988-2 (eBook)
DOI 10.1007/978-981-287-988-2

Library of Congress Control Number: 2015960766

Printed on acid-free paper

This Springer imprint is published by SpringerNature
The registered company is Springer Science+Business Media Singapore Pte Ltd.

Contents

Introduction

This book includes the original, peer-reviewed research papers from the 2nd International Conference on Electrical Systems, Technology and Information (ICESTI 2015), held during 9–12 September 2015, at Patra Jasa Resort & Villas Bali, Indonesia.

The primary objective of this book is to provide references for dissemination and discussion of the topics that have been presented in the conference. This volume is unique in that it includes work related to Electrical Engineering, Technology and Information towards their sustainable development. Engineers, researchers as well as lecturers from universities and professionals in industry and government will gain valuable insights into interdisciplinary solutions in the field of Electrical Systems, Technology and Information, and its applications.

The topics of ICESTI 2015 provide a forum for accessing the most up-to-date and authoritative knowledge and the best practices in the field of Electrical Engineering, Technology and Information towards their sustainable development. The editors selected high quality papers from the conference that passed through a minimum of three reviewers, with an acceptance rate of 50.6 %.

In the conference there were three invited papers from keynote speakers, whose papers are also included in this book, entitled: "Computational Intelligence based Regulation of the DC bus in the On-Grid Photovoltaic System", "Virtual Prototyping of a Compliant Spindle for Robotic Deburring" and "A Concept of Multi Rough Sets Defined on Multi-Contextual Information Systems".

The conference also classified the technology innovation topics into five parts: "Technology Innovation in Robotics, Image Recognition and Computational Intelligence Applications", "Technology Innovation in Electrical Engineering, Electric Vehicle and Energy Management", "Technology Innovation in Electronic, Manufacturing, Instrumentation and Material Engineering", "Technology Innovation in Internet of Things and Its Applications" and "Technology Innovation in Information, Modeling and Mobile Applications".

In addition, we are really thankful for the contributions and for the valuable time spent in the review process by our Advisory Boards, Committee Members and Reviewers. Also, we appreciate our collaboration partners (Petra Christian

University, Surabaya; Gunadarma University, Jakarta; UBAYA, Surabaya, University of Ciputra, Surabaya, Institute of National Technology, Malang and LNEE Springer, Germany), our supporting institution (Oulu University, Finland, Widya Mandala Catholic University, Surabaya and Dongseo University, Korea) and our sponsors (Continuing Education Centre, Petra Christian University, Surabaya and Patrajasa Resort Hotel, Bali).

On behalf of the editors Felix Pasila

Chapter 64
Securing Client-Server Application Design for Information System Inventory

Ibnu Gunawan, Djoni Haryadi Setiabudi, Agustinus Noertjahyana and Yongky Hermawan

Abstract This paper will discuss how to design a client server application for the building supply store located at 3 different locations along with the networking system design as well as how to secure it. Santoso Building Stores is a company engaged in the sale of construction materials. The current system for the inventory in the store is still done manually, making frequent errors in the data and the resulting delay in presenting information. Based on these problems, the company needed a system to record the inventory through purchase and sale transactions, so that the report can be presented quickly. In order to meet these needs, it developed an application to support the activities of the company so that all inventory record scan be performed quickly and report scan also be presented in real time. Applications are developed using Microsoft Visual Basic 2010 and SQL Server 2008 R2 includes SQL Encryption feature. The experiments results showed that the application was able to meet the needs of the company, inventory system that is accurate, fast and safe.

Keywords Client-server · Encryption · Inventory · SQL server · Visual basic

64.1 Introduction

The company carries out business activities by recording the sales process, purchasing, etc. manually. The company carries out recording by using paper. Activity recording the purchase and sale transaction has experienced an error. Staff often makes mistakes in the calculation process, causing the company losses. In the sales process, the staff simply records the transaction in a note. When it goes on sale in

I. Gunawan (✉) · D.H. Setiabudi · A. Noertjahyana · Y. Hermawan
Faculty of Industrial Technology, Department of Informatics Engineering,
Petra Christian University, Surabaya, Indonesia 60236
e-mail: ibnu@petra.ac.id

F. Pasila et al. (eds.), *Proceedings of Second International Conference on Electrical Systems, Technology and Information 2015 (ICESTI 2015)*,
Lecture Notes in Electrical Engineering 365, DOI 10.1007/978-981-287-988-2_64

small quantities and the customer does not ask for a receipt, the staff did not report these sales transactions.

In the process of purchase, owners often order goods that are still in stock. This happens because the inventory can't be calculated precisely. When the ordered items arrive, the owner did not record the details of goods coming and when the due payment of goods. This causes frequent delays in the payment process.

In the process of inventory of goods also take a long time, because it does not have data on the number of stock. The company is still conducting an inventory manually so it takes a long time to complete. Owner of the company had plans to open branches in different locations. Certainly each branch must have accurate information about inventory, either from a warehouse or center. Given these problems, it is suitable for the company to use Client-server platform as similar as a system built by Kumar [1].

The server will be placed at the head office and branches can access directly via the connected network. The process is the server receives a client request and will respond with the right result. In the client-server system design has not forgotten aspects of data security. While sending data from the server to the client, the data must first be encrypted so it can't be read by unauthorized parties [2]. Applications developed will help the staff to keep records of all sales and purchases, as well as perform automatic inventory adjustment, so that errors in the calculation of stock can be minimized. Reports can also be directly presented to owner and accurately.

64.2 Client Server System

Client/server system usually runs at least two different computer systems. One computer acts as a client and the other as the server. But the client and server can reside on a single computer system. A server usually serves multiple client computer. Although there may be also that only serve one client only. This server functions normally performed by a file server, except when maximum performance is required it is used a special server that the client is usually in the form of a desktop computer that is connected to the network.

If the user wants to retrieve or store information, part of the client application will issue a demand that would send (usually over a network) to the server. The server then run the query and sends the information back to the client. A database cannot replace the client/server system, although the system is a client/server often use the database server to perform the activity. Applications designed to use Microsoft Access, Microsoft FoxPro, Paradox, or other database program is not a client/server system (even if the database is in network server). All are examples of network database application because all processing is done by the client [3].

64.3 Encryption in SQL Server 2008

Encryption demands have increased over the past few years. For instance, there has been a demand for the ability to store encryption keys "off-the-box" physically separate from the database and the data it contains. Also there is a recognized requirement for legacy databases and applications to take advantage of encryption without changing the existing code base. To address these needs SQL Server 2008 adds the following features to its encryption arsenal:

- *Transparent Data Encryption (TDE)*: Allows you to encrypt an entire database, including log files and tempdb database, in such way that it it transparent to client application.
- *Extensible Key Management (EKM):* Allows you to store and manage your encryption keys on an external device known as a hardware security module (HSM).
- Cryptographic random number generation functionality.
- Additional cryptography— related catalog views and dynamic management views.
- SQL Language extensions to support the new encryption functionality.

SQL Server 2008 represents the most advanced SQL Server encryption capability to date, and you can leverage even more encryption functionality using other tools. For example, you can encrypt an entire hard drive with SQL Server database on it via Windows BitLocker technology. You can also use SSL to encrypt your SQL Server communication, protecting your data in transit [4]. We can see the architecture of SQL server 2008 encryption in Fig. 64.1

64.4 System Analysis

This section will discuss one business process to be analyzed as purchase returns. Purchase returns process happened when the goods are received in damaged condition or disability. If the goods are defective or damaged, it can be returns back. If the goods are damaged, then also the number of items in the original sales notes and it's duplicate copies will be reduced, according to the quantity of goods with damaged or defective condition. The store owner could only exchange goods with the same type and size. Document flowchart purchase returns process can be seen in Fig. 64.2.

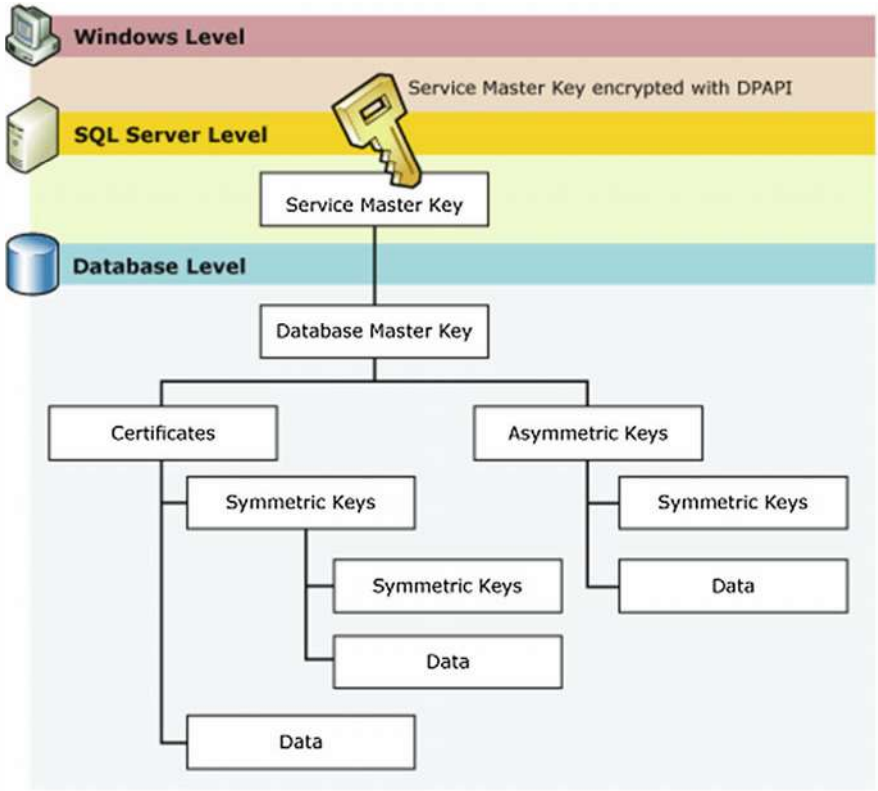

Fig. 64.1 SQL server 2008 encryption architecture

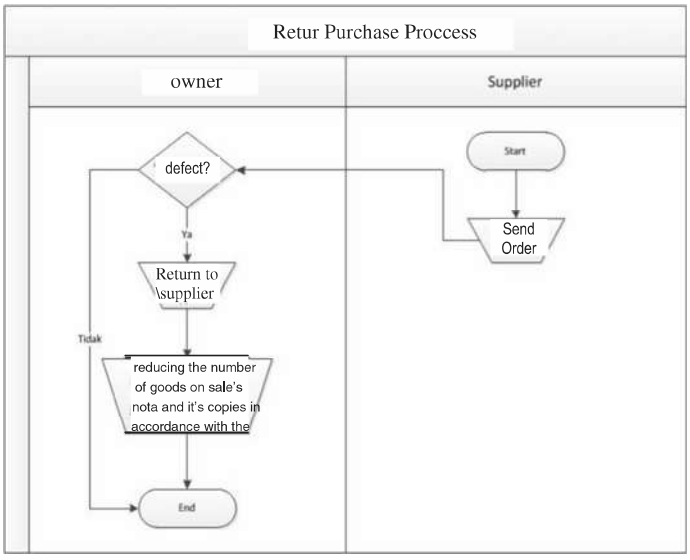

Fig. 64.2 Purchase return process

64.5 System Design

As we stated earlier in this paper, we will make a client server application for the building supply store located at 3 different locations along with the networking system design as well as how to secure it. Firstly, we designed a context diagram to show the whole process of the system. Context diagram on the buyer's side describes the process of purchasing data and payment, as well as the purchase invoice and payment. The supplier side shows purchasing data and payment process, order, and data charges for purchases and payments. The last side is owner who can look at reports such as purchasing reports, sales reports, report card stock and income statement. The context diagram is presented in Fig. 64.3.

Secondly, we attempt to encrypt the feature for SQL Server 2008 encryption by using the symmetric keys. For example, we create the sales.customer table using this syntax as in Fig. 64.4. Finally, we encrypt the data as in Fig. 64.5 and while it is on the client, we can see the syntax for decrypting the data. It can be seen in Fig. 64.6.

64.6 System Testing

In this paper, we present one of many screens since the program was built in Indonesian language. One of them is a program user interface of sale screen that we can see in Fig. 64.7.

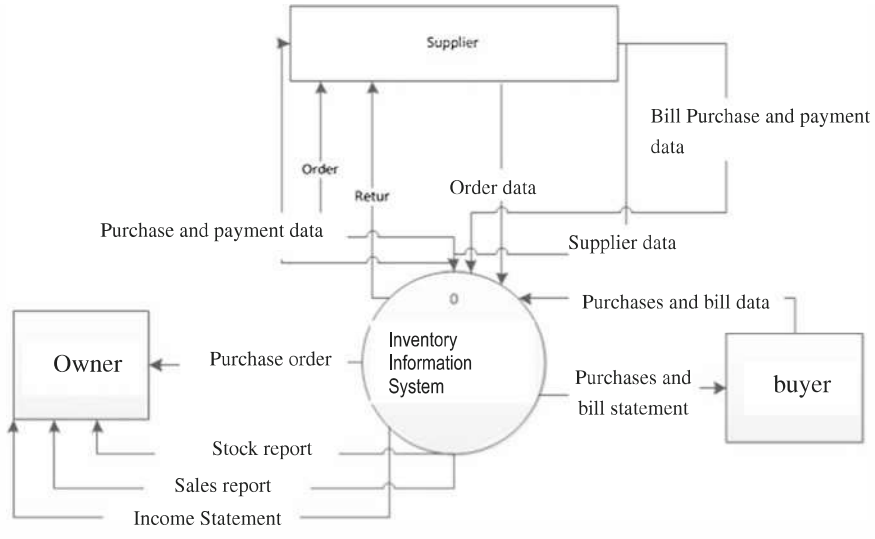

Fig. 64.3 Context diagram

Fig. 64.4 Creating sales.customer table

```
CREATE TABLE SalesLT.EncryptedCustomer
(
 CustomerID   int NOT NULL PRIMARY KEY,
 FirstName    varbinary(200),
 MiddleName   varbinary(200),
 LastName     varbinary(200),
 EmailAddress varbinary(200),
 Phone        varbinary(150),
 rowguid      uniqueidentifier
);
GO

CREATE CERTIFICATE Cert1_Sales
WITH SUBJECT = N'Sales Certificate',
START_DATE = N'2009 -01-01',
EXPIRY_DATE = N'2018 -12-31';
GO
CREATE SYMMETRIC KEY SymKey1_Sa  les
WITH ALGORITHM = AES_256,
 IDENTITY_VALUE = N'Barbarians at the Gate',
 KEY_SOURCE = N'We will leave the light on for you'
ENCRYPTION BY CERTIFICATE Cert1_Sales;
GO
```

Fig. 64.5 Encrypting the data

```
-- First wipe out the target table
TRUNCATE TABLE SalesLT.EncryptedCustomer;
GO
-- Open the key that's protected by certificate
OPEN SYMMETRIC KEY SymKey1_Sales
DECRYPTION BY CERTIFICATE Cert1_Sales;
GO
-- Encrypt the data
INSERT INTO SalesLT.EncryptedCustomer
(
 CustomerID,
 FirstName,
 MiddleName,
 LastName,
 EmailAddress,
 Phone,
 rowguid
)
SELECT
 CustomerID,
 EncryptByKey(Key_Guid(N'SymKey1_Sales'), FirstName),
 EncryptByKey(Key_Guid(N'SymKey1_Sales'), MiddleName),
 EncryptByKey(Key_Guid(N'SymKey1_Sales'), LastName),
 Encrypt ByKey(Key_Guid(N'SymKey1_Sales'), EmailAddress),
 EncryptByKey(Key_Guid(N'SymKey1_Sales'), Phone),
 rowguid
FROM SalesLT.Customer;
GO
-- Close the key
CLOSE SYMMETRIC KEY SymKey1_Sales;
GO
```

```
-- Open the key that's protected by certificate
OPEN SYMMETRIC KEY SymKey1_Sales
DECRYPTION BY CERTIFICATE Cert1_Sales;
GO
-- Decrypt the data
SELECT
  CustomerID,
  CAST(DecryptByKey(FirstName) AS nvarchar(100)) AS DecryptedFirstName,
  FirstName
FROM SalesLT.EncryptedCustomer;
GO
-- Close the key
CLOSE SYMMETRIC KEY SymKey1_Sales;
GO
```

Fig. 64.6 Decrypting the data

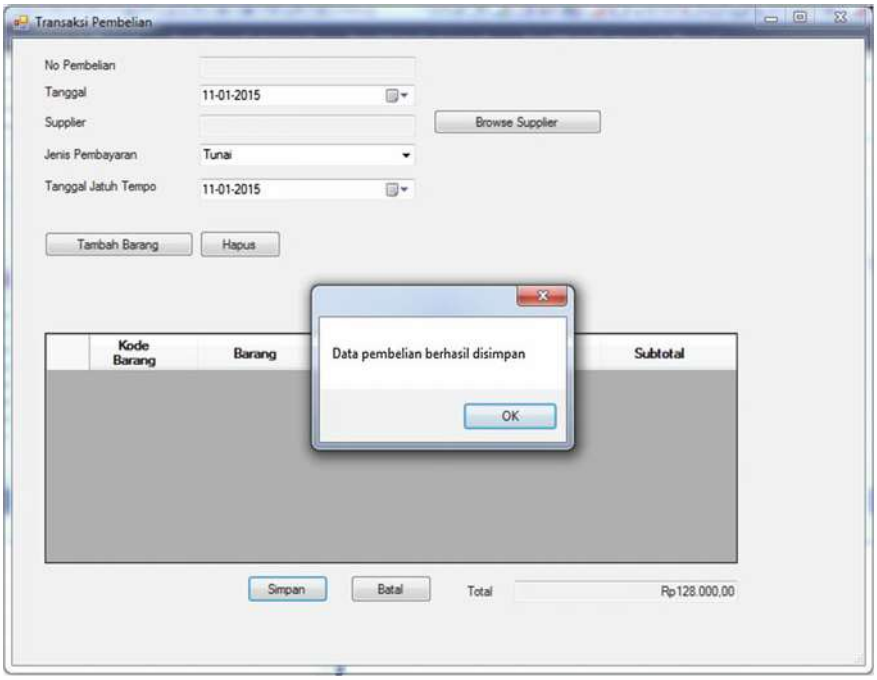

Fig. 64.7 Sales program screen

64.7 Conclusion

Based on the results and system test, we conclude as follows:

- Store 2 as the branch can connect to the database server is like being in one central store network.
- The application can generate reports so as to facilitate the user for getting the needed information, such as reports purchasing, sales, inventory and others.

References

1. Kumar, A.: Thin client web-based campus information systems for Fiji National University. Int. J. Softw. Eng. Appl. (IJSEA) **2**, 1 (2011)
2. Qureshi, D., Desmukh, D.: Transparent data encryption—solution for security of database contents. Int. J. Adv. Comput. Sci. Appl. (IJACSA) **2**, 3 (2011)
3. Corporation, I.S.: Information Systems Essentials, 2nd edn. InterBase Software Corporation, California (1998)
4. Landrum, R., Coles, M.: Expert SQL Server 2008 Encryption. Apress, New York (2009)