An Enhanced Document Management System for SME

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***Abstract*—** This paper provides the design and implementation of a Document Management System with certain 'enhanced' features in terms of Security, Compression, Abstraction (of Level of file View) and File versioning. This system is designed for small to medium scale enterprises and would provide a good solution for their needs.

***Keywords*—** document management system; security; compression; level of abstraction; file versioning

I. INTRODUCTION

The Enhanced Document Management system is a document management system for small to medium organizations for efficient management of electronic documents in their organization.

Up till now, there has not been a proper solution for managing documents that is affordable for small and medium sized enterprises. Documents are still transferred from one department to another by physical means (such as pen-drives and cds), or are mailed via some web services (Email, file sharing solutions etc). Even if the organization has a file-server and a LAN setup, it still is not the most efficient way to manage the documents.

Thus, there arises a need for a "Document Management System"[1]for effective document management for various enterprises and government agencies. Various software solutions like documentum (from EMC Corporation) and sharepoint (from Microsoft) came into existence to solve this need.

However these existing systems are all web based and don't offer many benefits in terms of security, abstraction (level), compression[2][3][4], and affordability for small and medium scale organization.

Thus, in our project, we are designing and implementing an efficient Document Management System as solution that addresses the needs of the organizations in today's competitive world.

II. ARCHITECHTURE

In the following Architecture diagram we show how client machines are connected to the central server in order to perform different functionality for "EDMS" .The clients machine may be connected through wireless connection or wired connection to the server .The central server contain different module such as web server, database, third party server and secondary storage.

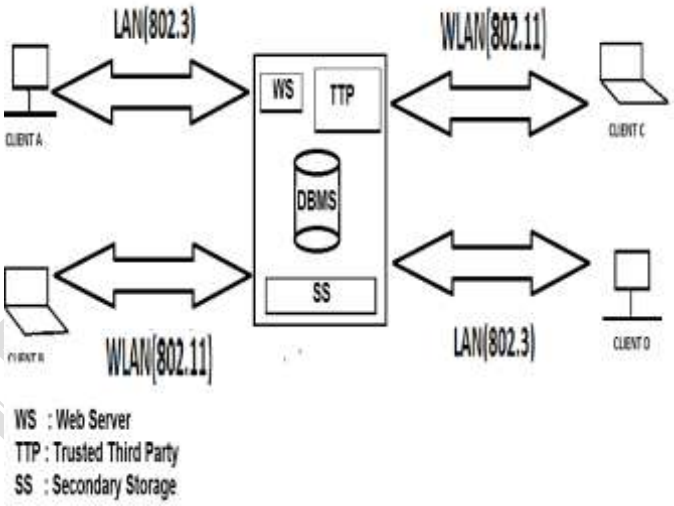

Fig A.1 Architecture Diagram of the EDMS

Although a simple Client/Server Model has been followed for the architecture, some of the features that are provided to enhance its capability will make it a unique and affordable system for the SME enterprises

III.SPECIAL SYSTEM FEATURES

The core task of any Document Management System is the storage and retrieval of documents from one or various sources in a centralized manner. The EDMS improves on this basic model by providing certain other features that are very important in today's world.

A. Encrypted Data Transfer

This feature allows the client machines to send their documents over to the main server for storage purposes in the organization. However, before the file can be transferred it must be encrypted for security purposes[5]. This is one of the most crucial functions of the system.

The technique of Digital enveloping is used for this feature. The Document(s) chosen for the transfer are themselves encrypted using a symmetric encryption algorithm which we have developed ourselves for quick and secure encryption. The symmetric key itself shall then be encrypted by RSA encryption technique[6][7] which is an asymmetric key algorithm.
We shall elaborate on this below.

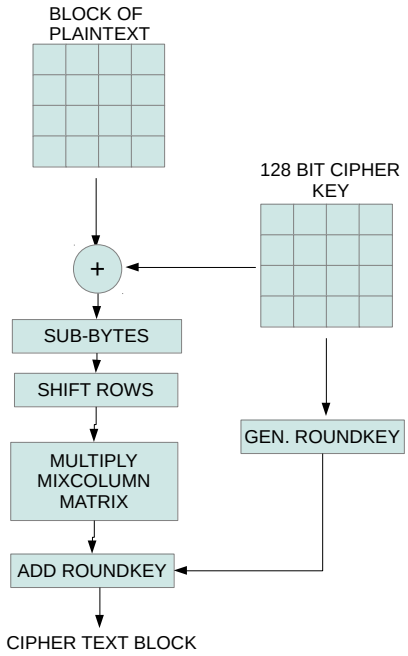

Fig A.2 The Quick-Crypt Encryption Technique

Our Quick-Crypt Technique is based on the same basic principle of the AES technique. We are performing Block Ciphering; Each Block of Plaintext as well as that of the Cipher Key is 128 bits.

16 characters from the file (which is to be encrypted) are taken in a block and are converted into their respective ASCII representation. It is then transformed into the Cipher text by:

1. XORing each cell of the Block with the respective cell of the cipher key.
2. Perform the Sub-bytes operations on each cell as done in AES.
3. Shift the rows; Left Rotate 2nd row once, Left Rotate 3rd row twice and Left Rotate 4th row thrice.
4. Perform a simple matrix multiplication between Rijndael mix column matrix and the current block.
5. Generate the round key (directions given below) and XOR with each cell of the block.

After performing these 5 Steps, we receive a block of the cipher text (in Unicode). Only one round is applied for each block.

We are also providing a chaining mechanism by sending the current round key to be the cipher key of the next round.

The method to generate the round key is as follows:

1. Swap the first and last columns of the cipher key.
2. Right rotate 2nd row of the cipher key once.
3. Left rotate 3rd row of the cipher key twice.
4. XOR First and last rows of the cipher key.

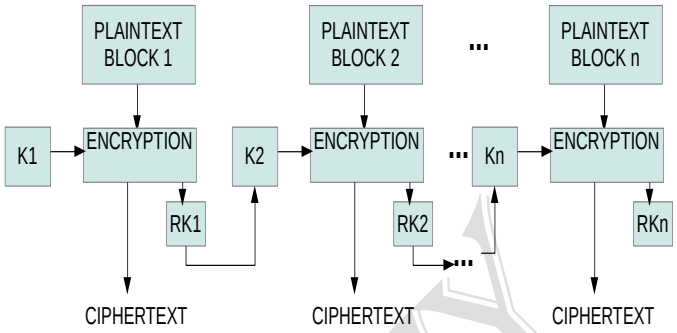

Fig A.3 Block Diagram of the Quick Crypt Encryption

As seen in Figure 3, the mode of operation is slightly different from the usual modes. Since we have to compensate for the less number of rounds that each block of plaintext undergoes, we are sending the round key of the last round to be the cipher key of the next round. Thus a level of pseudo-randomness is generated amongst the entire text. A Crypt analyst would find different Cipher text for the same plaintext repeated in the course of document[8].

B. Data (file) Compression

This feature shall compress the size of the encrypted file which resides over on the server. The encrypted file has a size that is larger than the plaintext file. Thus compression shall allow us to optimize the size of the encrypted document.

The system uses the gzip compression technique as it gives us a fair ratio of the size of the data (file) and the time required to compress it when compared with other popular compression techniques.

C. Level of Abstraction

This feature ensures that the document access is restricted to the authorized department (even within the organization) and for the authorized employee only.

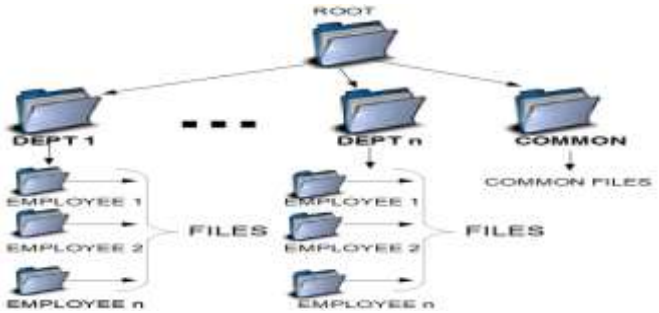

Fig A.4 Hierarchy of the Directories used for storing files on server

Fig.4 shows the fundamental structure of directories for the central server used for the purpose of file storage.

An Employee working on a client machine will store and retrieve documents within his/her own directory stored inside the department. The system allows an employee access to only

his/her files and not of any other employee. Also files from one particular department will not be authorized for employees of the other department. Documents that are common to all departments should be put in a common directory to which every employee has access.

For E.g.: A Marketing employee cannot access files from the Engineering Department of an organisations. However files containing public information must be put in the common directory folder, so that all the employees from all the departments can have access of it.

D. File Versioning

This feature of the system keeps the track of the versions of a particular document over time[9][10]. Employees working on a particular document over a period of days may want to revert to a previous version of the same file. For this the server will keeps multiple copies of the same file on it.

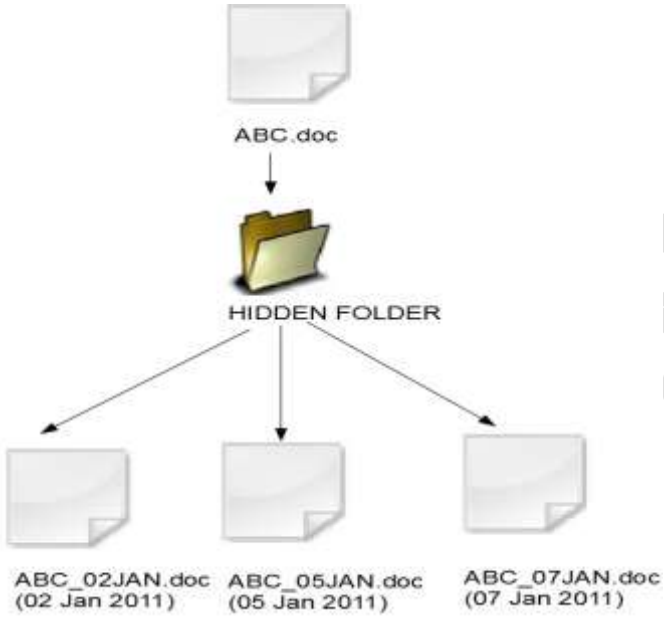

Fig A.5 Directory structure for File Versioning

Fig.5 shows the directory structure which provides the file versioning capability. Every Document has a hidden folder (in the same parent directory) of the same name. Whenever the user posts a fresh version of a particular file, the system not only replaces the old file but also places a copy of the file in the hidden folder associated with that particular file. The files inside the Hidden Folder maintain the versions of the file with the date of posting concatenated with the actual name of the file.

IV. GENERAL SYSTEM REQUIREMENTS

The requirements for the system were based on the findings of the literature review done as well as from the interview sessions done. After a careful analysis of the data collected, the findings of the analysis is used to derived the following application requirements:

1. The Client Application must be a desktop application that must have web browser integration.
2. The Server Application would be a combination of a DBMS, a webserver and a third party server (to generate RSA keys).
3. The Client and the Server Machines must be connected via the 802.3 or 802.11 standards.

V. CONCLUSIONS

In this paper, the authors wish to design and implement a document management system for a small to medium scale organization. This paper acknowledges the fact that merely having a simple storage/retrieval system is not enough, and hence we have stressed upon some features to enhance the basic DMS that are very useful in terms of security, optimal disk usage, level of abstraction and productivity of the employees within an organization.

In summary we provide a collection of features that enhance the traditional document management systems in such a way that is relevant to today's organizational needs.

ACKNOWLEDGMENT

It is a great pleasure that we are presenting this project report on "ENHANCED DOCUMENT MANAGEMENT SYSTEM". This report aims to explain the project, along with its goal, in a simple language. Firstly, we would like to thank all people who have contributed to this effort. We are deeply indebted to our Principal Dr. S.D.Lokhande for providing us all the required facilities. We are thankful to our Head of Department Prof.P.R.Futane for his support. We owe our sincere gratitude to our project guide Prof.M.K.Kodmelwar, for his valuable Guidance and co-operation. He has been of great help with his valuable and timely inputs to the Project .Last but not the least we would like to thank all the staff members from department and my colleagues for their indispensable help all time.

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