IMPROVEMENT OF NETWORK SECURITY AND PERFORMANCE USING MATRIX SPLITTER BEFORE ENCRYPTION IN DIGITAL IMAGE PROCESSING SYSTEM

Deepti Agrawal[1], Nisha Charaya[2]

[1] P.G. Student, Department of Computer Science & Engineering, OM Institute of Engineering & Technology, Hisar, Haryana, India

[2] Academic In-Charge, Department of Computer Science & Engineering, OM Institute of Engineering & Technology, Hisar, Haryana, India

(E-mail: deepti.agrawal54@yahoo.com, charaya.nisha@gmail.com)

***Abstract*—**nowadays it is very essential to improve the security and performance of network in digital image processing system. For this purpose the matrix splitter before encryption has been used in the research work. Here the Encryption and Decryption are used to secure the processing. The Research work has determined the review of Socket and Port programming. The user defined port is set to initialize the connection. The performance comparison has been made with both transmission techniques. This comparison has been made on the basis of some factors. The factors that are considered here such as speed, security along with overall performance. Thus there are several existing cryptographic techniques and have been reviewed by the research.This research has the capability of providing security and makes comparison with the existing mechanisms. The Design of Data Sender Module for Fog and end user module is implemented here. In this research work, a modified image compression mechanisms has been proposed with splitter. The Comparative Analysis of Packet Dropping has been presented in Traditional and Proposed Work. The proposed work is also concentrated on Threats to security, Nature of attacks, and Delay in pre-processing. It also focused on Delay during the process of encryption and decryption, Image Quality.

Keywords*—*Port No, Encryption, Decryption

I. INTRODUCTION

Digital image processing [1] has been considered a process. In this process the computer algorithms are used in the field of computer science. It is applied to carry out the processing of image on digital graphics. Digital image processing (DIP) has been considered a subcategory of digital signal processing. It has numerous features in analog image processing. It provides us a huge package of algorithms. These algorithms are useful on input data. It has the efficiency to minimize the challenges. These challenges may be the build-up of noise and signal distortion. These issues grow up when the image processing take is executed. The images are defined over two dimensions. There is the possibility that these dimensions either two or more. The digital image processing is modeled as systems. These systems have many dimensional.

The phase "Network security" is showing the meaning of itself. This phase meaning is the security of network. It has been considered an activity. It is created in order to protect the uses and integration of network along with data. The Hardware equipments as well as software equipments have same importance in the security of network. An efficient network security system is capable to manage the complete network. It carries an objective. The objective is that it observes all threats. It avoids the network to enter or spread in the network.

Encryption [11] is a process. This procedure encodes the message or information by a specific manner. After the encryption of data, merely the authority obtain person can achieve the data. In encryption, the plaintext is the simple message or information. Encryption algorithms are used to encrypt the plain text. The cipher is an encryption algorithm. It secures the data by converting it into cipher text. It can be understand only after the decryption. Normally the pseudo-random encryption key is applied to resolve the technical challenges. It has been created using an algorithm. According to principle, it is impossible to do the decryption of data without possessing the key. On other side, it has been proved that the capable computational resources with skills are required to create an efficient encryption system. Only authorized recipient will have the capacity of decryption of data. The decryption will be with the key.

Decryption is working similar with small changes. Thus, the key is applied for decryption of block of information. After that the information will work again with initialization vector. The plain text is decrypted form of the cipher text.

II. LITERATURE REVIEW

A number of researches are there in the sector of image processing with security. In which most of them have been mention below.

In 2006, M. Klima, et al [1] stated the research to enhance the security of image. To maintain the quality of the graphical content or video information has become a growing issue. Their research works have done the evaluation of the influence of edge-increasing operators.

In 2009, Y. Musheng et al [2] did research on Intelligent Monitoring System. The discussed paper is based on digital graphical processing. Video monitoring architecture has important roles in the many fields. Therefore, the existing monitoring system includes several shortcomings. The proposed work is the research of the intelligent monitoring system based on digital image in the research work a lot of detecting techniques are discussed.

In 2010, H. Zhao, et al [3] analyzed the teaching reform and also made analysis of the innovation of Digital image processing (DIP) experiments. Digital image processing (DIP) is an interdisciplinary course. It requires the strong background of student in mathematics. The attached platform of experiments involves to the TI DSP experimental box. Three types of programming languages are also included in it.

In 2012, Sangeet Saha [4] wrote on journey of hardware developments. The research work is related to image processing. The applications of image processing on cryptography also considered in the research work. The significance of embedded applications on image as well as video processing has been taking a large size in this research. The communication and cryptography domain are also mentioned here. Upgradation of graphical data for betterment of human perception is like deploring, de-noising in a lot of fields. These fields may be satellite imaging, medical imaging etc. These have been discussed in this research; particularly they have like to express their experience on importance of computer vision. It has been considered as one of domains. Here the hardware used algorithms executes better as compare to employ through software.

In 2012, Pinaki Pratim [5] studied the Image Edge Detection Using Gradients. This paper has provided a review on graphics edge detection. They have used the gradients. In the process of image processing; the edge detection has been considered the most general operations. Edge/borders create the outline of an object. Along with this it has been considered a border between an object and background. To capture an accurate edge is essential. It is important to analyze the basic properties. These Basic properties are connected to an image. These may be rea, perimeter and shape. The Software needed is MATLAB 7.0.

In 2013 Rupam, Atul Verma et al [6] provided an approach. This concept is capable to detect packets by packet sniffing. Packet sniffer has been formulated to capture the packets.

In 2013, **Sharmin Rashid et al [7]** defined the IP spoofing as a method of attacking a network. It has been used to get the unauthorized entry in a system. It has been proved by the proposed technique that in future it will be assist in order to detect and stop IP spoofing. It would be able to provide a safe transmission system.

In 2014, Jhilam Biswas et al [8] provided the research work on Wireshark. It has been known as packets sniffing software available in the present time. It has been used as tool in order to explain the detailed analysis of network traffic. To resolve an issues first step is the evaluation of the problem location in a network.

In 2015, **Blessy Rajra et al [9]** discussed on **n**etwork security. For the research it is an important field as it is gaining attention rapidly parallel to the increment in internet uses.

In 2015, **Ziqian Dong et al [10]** proposed a novel method. The proposed work is capable and efficient to capture the Man in Middle attack between two nodes. It has been done to analyze the measured round-trip time. In order to evaluate the efficiency of proposed technique, the researcher has used a fixed wireless network test bed which comprises of client, server and attacking machine in a test environment.

In 2018, F. Ergün et al [11] provided the Network Security. In the research work the Steganography has been used on Digital Images. For the previous decade the steganography has been known as secure encryption technique. It has been used in communication networks security all around the world. The high security message has been include in it. the text hiding algorithm has been applied with image processing methodology. In the research work the secret messages of recipient has been formulated. It has been done with the use of are created shorthand security.

In 2019, Sukhjinder singh [12] did comparative study and implementation of image processing techniques using Matlab. Graphic increment objectives are the progressing of graphic quality. It has been done for better visualization. The review provides three ways to enhance the picture. These methods may be - GHE, LHE & DSIHE. These methods are capable to grow up the visual quality of graphics. This review has implemented and examined the effect of above defined methods. These methods are dependent on objective and subjective graphics quality parameters. These graphics quality parameters are PSNR, NAE, SC, and AE & MOS. These are used to estimate the quality of gray scale. A comparative evaluation is also defined here.

III. OBJECTIVE

The research objective has been mentioned below:

1. To reduce the probability of data loss as the transmission has been made from multiple paths.
2. To improve the overall performance and security of network using matrix splitter with the help of digital image processing.
3. To provide more secure and reliable mechanism to secure the graphical data due to transmission over network. There would not be complete loss of data

because information has been transferred from two different paths.

4. To maximize the security and minimize the limitation of traditional security techniques as proposed work would increase the security of matrix using encryption mechanism after splitting digital information in two matrixes.
5. To make appropriate use of parallel computing at the time of securing graphical contents because the graphical content are available in form of matrix. This matrix would be split using proposed mechanism.
6. To minimize chances of loss of data at the time of transmission as data is transmitted from multiple paths in proposed work.
7. To minimize time consumption. This time consumption would be reduced during overall procedure of graphical image processing along with secure information transmission. Less time would be taken because both matrixes are transmitted in same time instance on different path.

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IV. IMPLEMENTATION AND RESULTS

Here the updated image compression algorithm has been used to compress an image. Here jpeg image has been taken and MATLAB script has been applied on it.

Figure 1 Original image

Size of image after applying compression and decompression algorithm has been presented below:

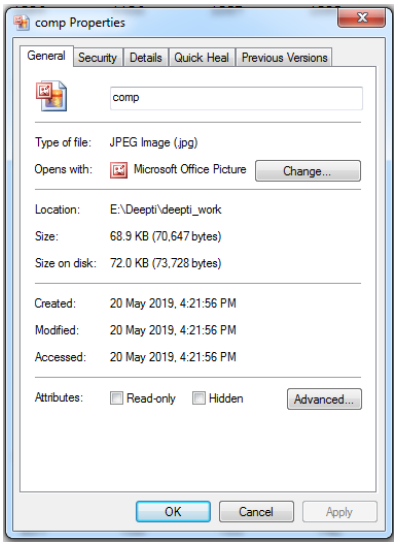


Figure 2 Size of image after compression
Elapsed time is 997.125608 seconds

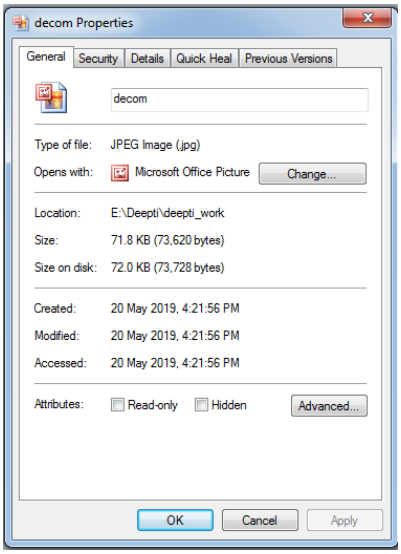


Figure 3 Size of image after decompression
Elapsed time is 0.128007 seconds

Proposed implementation has been made here. The Image Compression has been made using Splitter:

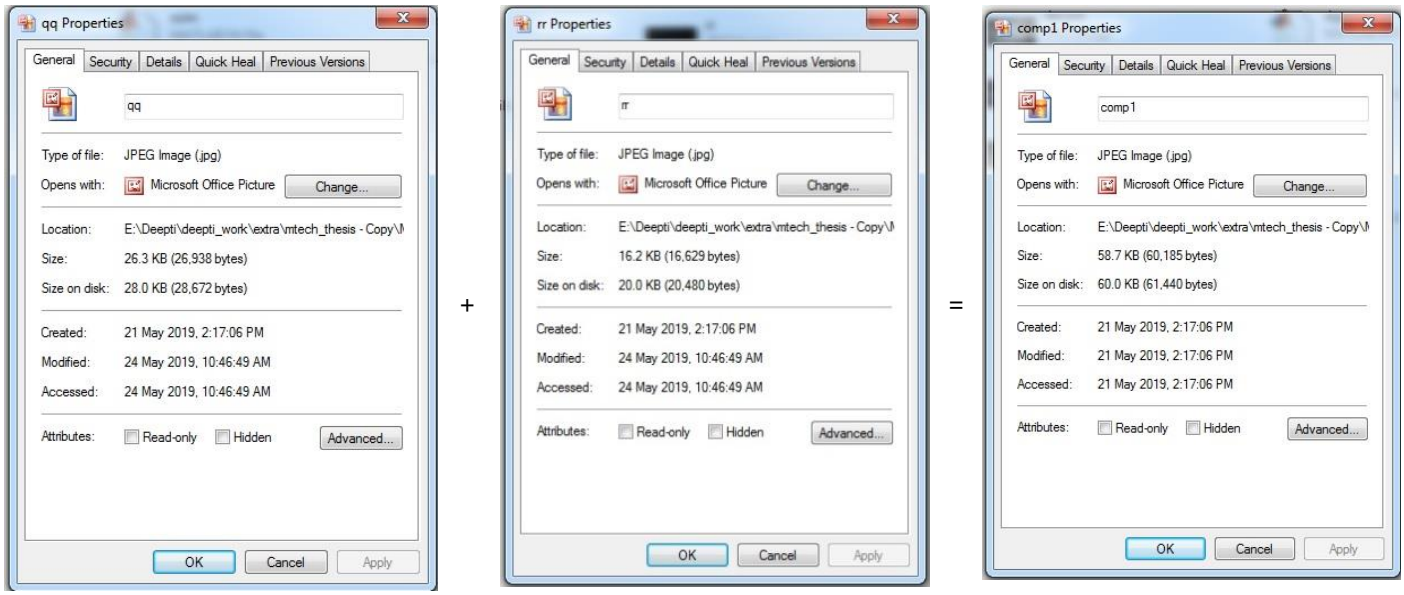


Figure 4 Image Compressed using Splitter
Elapsed time is 1.024675 seconds

Here the original image has been splitted into two images and then combined to get a single image. In this way the time taken to compress an image is much less as compared to the previously compressed image.

The design view of GUI interface for Lossless image compression has been shown as below:

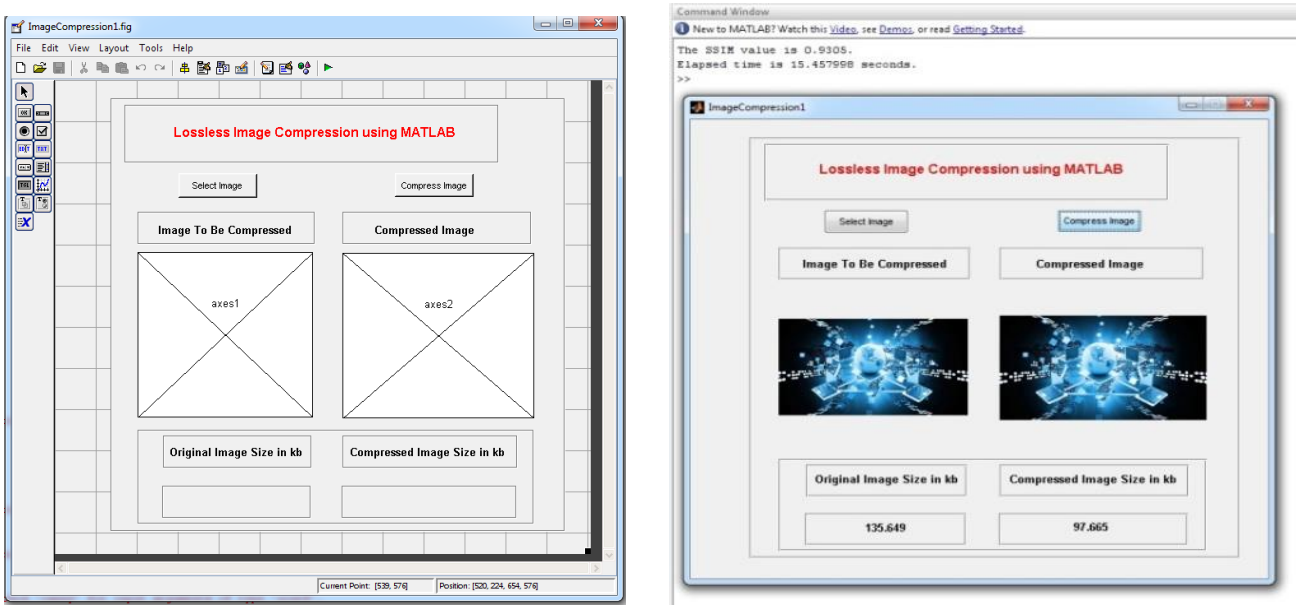
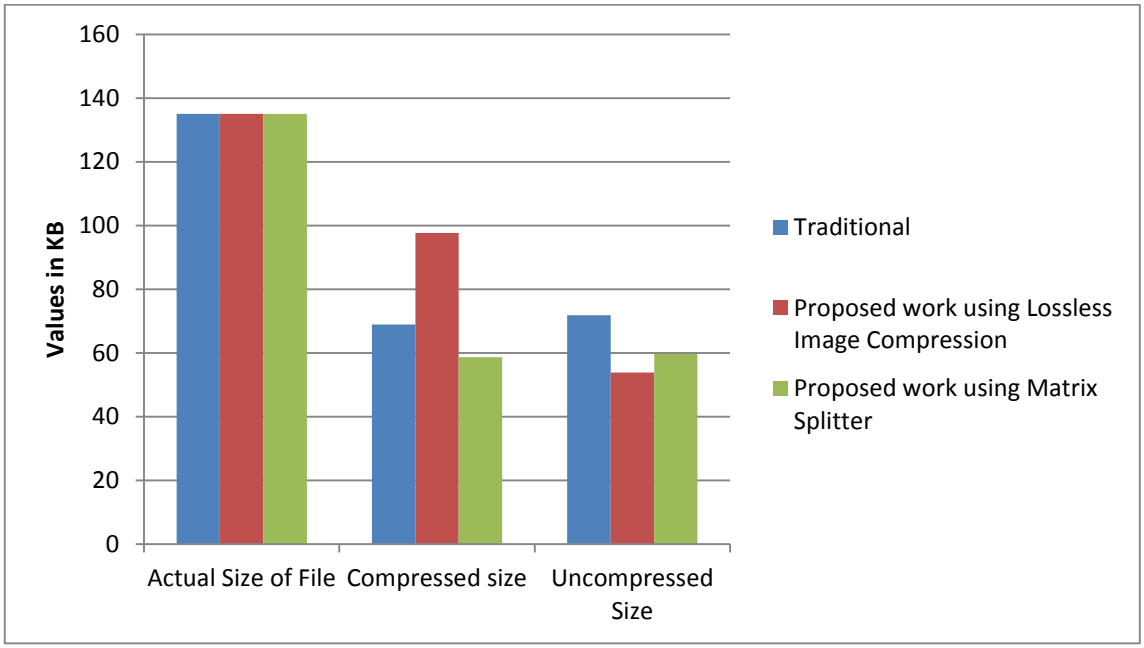


Figure 5 GUI Interface for Lossless Image Compression

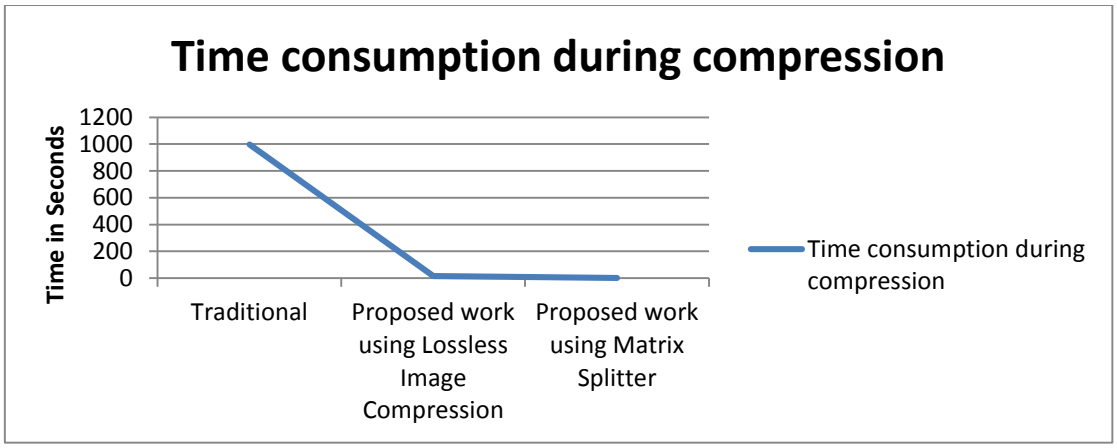
Table 1 Matrix chart to compare the traditional and proposed (implemented) work

Parameters	Traditional	Proposed work using Lossless Image Compression	Proposed work using Matrix Splitter
Actual Size of File	135KB	135KB	135KB
Compressed size	68.9KB	97.6KB	58.7KB
Uncompressed Size	71.8KB	53.8KB	59.7KB
Mean square error	0.0063	0.00246 (average)	0.00263 (average)
PSNR	70.2002	74.3182 (average)	73.9843 (average)
Time consumption during compression	997.125608 seconds	15.457998 seconds	1.024675 seconds
Extension of File	.jpg	.jpg	.jpg

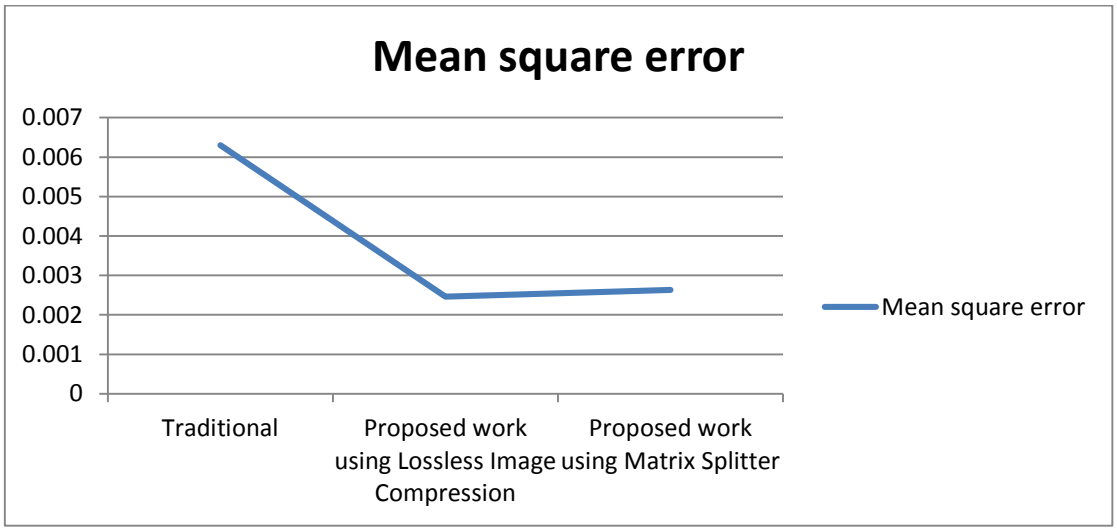
This table compares the various parameters of traditional and implemented work and found that the implemented work is better than the traditional work.



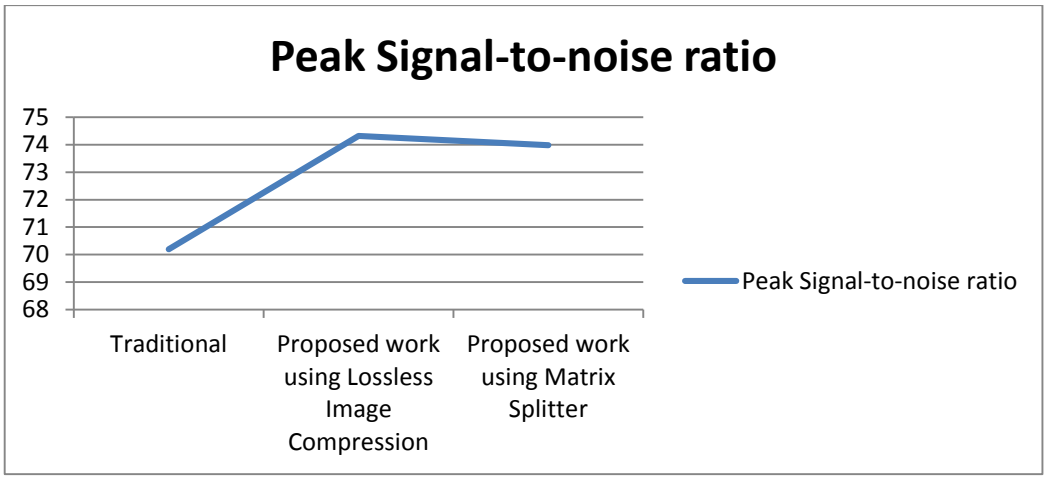
Graph 1 Graph showing comparison in image size



Graph 2 Graph showing comparison of Time consumption during compression of images



Graph 3 Graph showing comparison of Mean Square Error of images



Graph 4 Graph showing comparison of Peak Signal-to-noise ratio of images

File Splitter

The File splitter would break data in two different data file and put first on cloud and second on Fog. The name of file is specified along with authentication code file is broken and distributed in two different location one for cloud and second for fog. This makes transmission more secure and reliable.

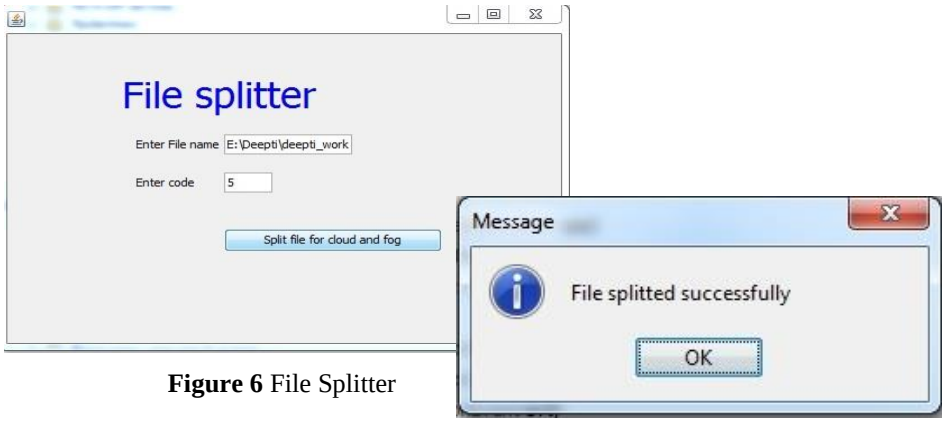


Figure 6 File Splitter

Design of Data Sender Module for Fog and Cloud

The design of data sender module for Fog and Cloud has been represented in following figure. There are three input box. First input box would get port number, second would get server IP address, third input box would get authentication code to encrypt data to be sent.

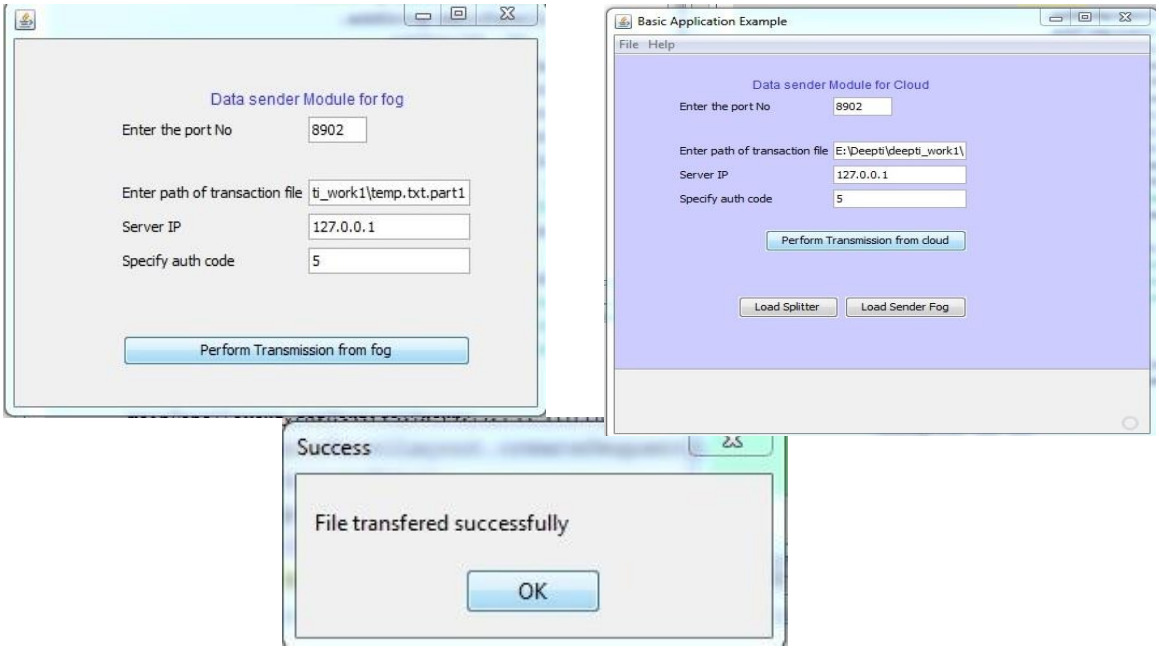


Figure 7 Design of Data Sender Module for Fog and Cloud

End user module has been divided in three parts.

1. **Ready to receive from fog:** This section opens port for fog and allows data to be captured sent from fog side. The port should be common at both sides. The common authentication code would be same so that data could be decrypted that has been sent from fog side.

2. Ready to receive from Cloud: This section opens port for cloud and allows data to be captured sent from cloud side. The port should be common at both sides. The common authentication code would be same so that data could be decrypted that has been sent from cloud side.

3. Merge and Decode: This section would merge received data and decode it according to authentication code.

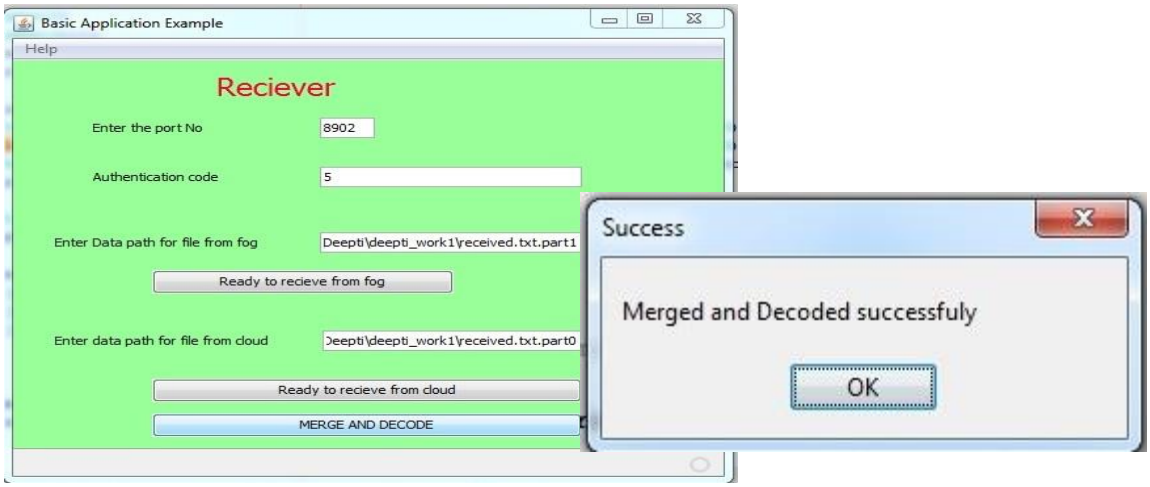


Figure 8 End User Modules

Table 2 Comparative Analysis of Packet Dropping in Traditional and Proposed (Implemented) Work

No. of Packets send	Packets dropped during Traditional work	Packets dropped during Proposed work
100	5	3
200	10	6
300	15	9
400	20	12
500	25	15
600	30	18
700	35	20
800	40	23
900	45	26
1000	50	29

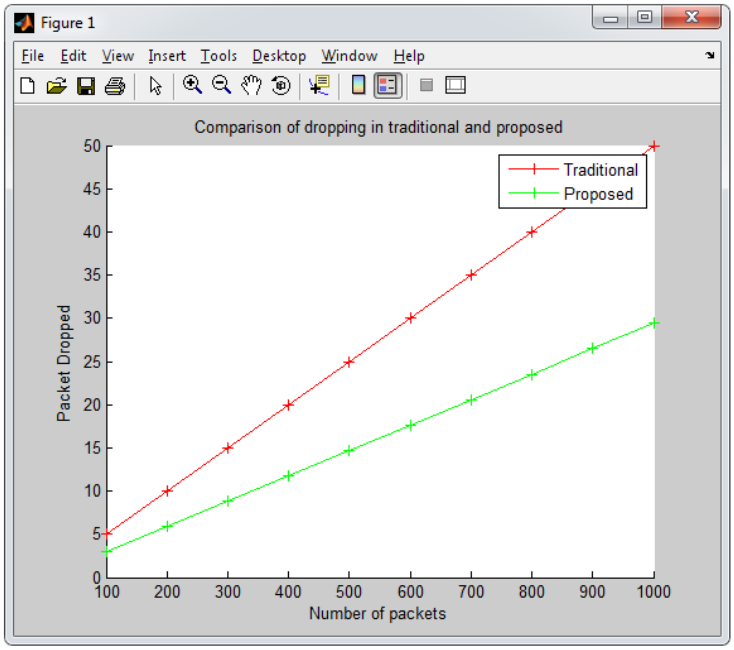


Figure 9 Comparative analysis of packet dropping in traditional and proposed (implemented) work

V. CONCLUSION

The Proposed mechanism is more secure and reliable to secure the information present in the form of graphic. The security of data is provided at the time of transmission over network. Present work is increasing the protection of data. It is capable to decrease the limitation of already present security techniques. This research is capable to overcome the time consumption at the time of graphical image processing with security of transmission. The proposed work has been utilized the parallel computing while securing the graphical contents. To secure the content, the contents are spitted in two separate matrixes. This research has been proved useful to reduce the probability of information loss at the time of transmission.

VI. FUTURE SCOPE

The research work would maximize the security and minimize the limitation of traditional security techniques. It would increase the security of matrix using encryption mechanism after splitting digital information in two matrixes. The research work would also make appropriate use of parallel computing at the time of securing graphical contents. This matrix would be split using proposed mechanism this research would opt to minimize chances of loss of data at the time of transmission as data is transmitted from multiple paths in proposed work. This time consumption would be reduced during overall procedure of graphical image processing along with secure information transmission. The Proposed research would reduce the probability of data loss as the transmission has been made from multiple paths. It would improve the overall performance and security of network using matrix splitter with the help of digital image processing. It would provide more secure and reliable mechanism to secure the graphical content.

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