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Scecure Image Transmission Using SHA and Route Security Methdos in MANET

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Abstract *Mobile Ad-hoc Network (MANET) grappled the interest of researchers in last two decades as it offers the robust transmission environment for multimedia content. Constraints in MANET such as lack of centralized monitoring, scaling, capacity planning (processing and power) and security necessitate be monitoring and enhancing prior to public utilization of such networks. MANET exploits wireless channel and exercise ad-hoc routing for establishing end-to-end connectivity and requires an image compatible with the wireless channel characteristics. Here, we propose a novel approach for secure transmission of image by first compressing and converting it into variable length segments followed by SHA-1 encryption. Further, route security has been achieved by collaborative security methods inspecting the neighborhood activity and catching route attacker nodes. The route attackers may bluff the source nodes and partially drops the data. The attack type is considered as gray hole. The collaborative monitoring mechanism checks the malicious behavior of gray hole attack, in such a manner that they may not participate in route and hence securing forwarded data packets. The simulation has been performed on Network Simulator-2 (NS-2). The foreman image is used for transmission in three scenarios, the gray hole attack, attack with SHA-1 and combination of gray hole attack, SHA-1 and route security. The results infer that dual security SHA-1 and route security is more secure for image transmission with respect to image reformation at the destination node. As some of the segments may be corrupted or dropped by malicious node.*

Keyword: AODV, Gray hole, Image, Segment, SHA-1, MANET, Security.

I. INTRODUCTION

In the digital world, images are important information. So far in cryptography plenty of work has been carried out pertaining to text information. Encryption techniques so far been applied for text data may not be suitable for visual data. Digital images are attractive data types with widespread use and many users are interested to implement content protection on them to keep secure from copyright, preview or malfunction. On systems such as military image databases, ensuring security is a must. It is very important to protect confidential image data from unauthorized access. Encryption is the preferred technique for protection of the transmitted data [1]. However, there lies number of other techniques instead of encryption for converting valuable piece of information into such a form where access is prohibited for unauthorized users. There are various encryption systems for encrypting and decrypting of images are available. In information systems, aspects of security like confidentiality, security, privacy and non-repudiation need to be achieved. Cryptography is the method for providing encryption and decryption. Cryptography is the art and science of protecting information from undesirable individuals by converting it into a form non-recognizable by its attackers while stored and transmitted. Data cryptography mainly is the scrambling of the content of data, such as text, image, audio, video and so forth to make the data unreadable, invisible or unintelligible during transmission or storage called Encryption. The main goal of cryptography is to keep data secure form unauthorized attackers. The reverse of data encryption is data decryption, which recuperate the original data. Since cryptography first known usage in ancient Egypt it has passed through different stages and was affected by many major event that affected the way people handled information. In modern days cryptography is no longer limited to secure sensitive military information but recognized as one of the major components of the security policy of any organization and considered industry standard for providing information security, trust, controlling access to resources, and electronic financial transactions. The original data that to be transmitted or stored is called plaintext, the one that can be readable and understandable either by a person or by a computer Widely there are two types of cryptographic methods are available namely, symmetric key and asymmetric key cryptosystem. Symmetric key cryptosystem enjoys widespread use when it comes to protecting digital data in networks. Here, a same secret key is used for both encryption and decryption process. This secret key is only shared by the sender and receiver of the communicating parties and kept confidential to other entities. The secrecy of the message will be protected well, when the secret key is kept confidential and distributed securely [2].

II. IMAGE PROCESSING

Image processing in its broadest sense is an umbrella term for representing and analyzing data in visual form. Image Processing is the manipulation of numeric data contained in a digital image for the purpose of enhancing its visual appearance. Through image processing, faded pictures may be enhanced, medical images be clarified, and satellite photographs be

calibrated. Image processing software also translates numeric information into visual images so as image be edited, enhanced, filtered, or animated in order to reveal relationships previously not apparent. Image analysis involves collecting data from digital images in the form of measurements that can then be analyzed and transformed. Image analysis provides an accurate digital substitute for rulers and calipers. Images are categorized according to their source e.g. visual, X-ray and so on. The principal energy source for images is the electromagnetic energy spectrum. Other sources of energy include acoustic, ultrasonic and electronic. Synthetic images are used for modeling and visualization is generated by computer [3]. Digital Images are electronic snapshots taken of a scene or scanned from documents, such as photographs, manuscripts, printed texts, and artwork. The digital image is sampled and mapped as a grid of dots or picture elements or pixels. Each pixel is assigned tonal value i.e. black, white, shades of grey or color [4], which is represented in binary code as zeros and ones. The binary digits or bits for each pixel are stored in a sequence by a computer and often reduced to a mathematical representation called compressed. The bits are then interpreted and read by the computer to produce an analog version for display or printing. The fundamental steps in digital image processing include:

- Image acquisition
- Image enhancement
- Image restoration
- Color image processing
- Wavelets and multi resolution processing
- Compression
- Morphological processing
- Segmentation
- Representation and description
- Object recognition

Digital Image Processing and Analysis are used in a wide range of industrial, artistic, and educational applications [5]. Software for image processing and analysis is widely available on all major computer platforms. Applications of Image Processing are biotechnology, In Medicine, In Environmental Science, In Art.

III. Security in MANET

Security in MANET is one of the major concerns with respect to safe and healthy communication among communicating nodes in an unfriendly environment. Communicating nodes in an ad hoc network do not follow any infrastructure, instead they organize themselves dynamically which results in emergence of new challenges for the basic security in applied architecture. Due to this sensitive infrastructure, MANET is vulnerable to direct attacks by hackers. By violating network confidentiality, eavesdroppers can approach secret information. Furthermore, as mobile ad hoc networks are normally designed for particular environment, security solutions designed for wired network may not be suitable for them. In contrast with traditional networks, where dedicated routers are placed to perform the basic functionality of network, MANET relies on respective nodes in order to achieve the required connection among nodes. All basic functions like routing, data forwarding and network management are performed by all alive nodes. Therefore, every node must be ready for encounters every time it desires to communicate. Encounters by compromised nodes are much more destructive because detection of compromised nodes is hard to achieve.

Providing the essential security services, for instance; confidentiality, availability, integrity, and authentication to mobile users, is the utmost aim of security solutions in MANET [6]. To accomplish these goals, secure protocols should be designed and some access control mechanism must be applied to provide a secure network for mobile device in an organization. Hence enormous research work has been lies in the security and access control mechanisms areas.

IV. Literature Survey

Ms. Prakruti Bisen, Prof. Dipak Wajgi [1] “An Approach for Secure Image Transmission” In this title an approach is presented for secure image transmission through network. Technique of encryption along with segmentation is proposed for greater security.

Ali Soleymani, Zulkarnain Md Ali and Md Jan Nordin [2] “A survey on principal aspects of secures image transmission”, this title is a review on the aspects and approaches of design an image cryptosystem. First a general introduction given for cryptography and images encryption and followed by different techniques in image encryption and related works for each technique surveyed. Finally, general security analysis methods for encrypted images are mentioned.

Rucha R. Raut, Prof. Komal B. Bijwe[7] “An Enhanced Technique for Secure Image Transmission Via Visual Cryptography and Secret Fragment Visible Mosaic Images” In this title a new type of computer art image called secret fragment visible mosaic image is proposed which transforms automatically a given large-volume secret image into a so called secret fragment visible mosaic image. The mosaic image, which looks similar to an arbitrarily selected target image and may be used as a camouflage of the secret image, is yielded by dividing the secret image into fragments. The information required for recovering the secret image is embedded into the created mosaic image by a lossless data hiding scheme using a key. Shamir secret sharing algorithm plays an important role in this project. Shamir’s secret sharing is an algorithm that divides a secret into shares. For encryption of secret image Shamir Encryption method is used and for decryption process Shamir Decryption algorithm is used. Secret can be recovered by combining certain numbers of shares. An additional measure to enhance the embedded data security is also proposed.

Asmaa Sabet Anwar, Kareem Kamal A. Ghany, Hesham El. Mahdy, [8] “Improving the security of images

transmission" In this title we can use an encryption scheme for encrypt medical image. Only the authorized person can decrypt this medical image and can obtain the original image. The ownership of these medical images is very important to improve. We can identify the ownership of any medical image by using watermark related to the owner of this medical image. We used name of the patient and serial number. Capture the ear image of the owner then extract features from ear after that encrypt those features then used it as watermark. The size of the medical image is very effective point in transmitting via internet. Because of this the proposed system used mix of compression techniques applied on medical image before sending via internet. Run time is very important in any system and complexity is very important aspect in computer science. To reduce run time and complexity of the proposed system, we can use DWT to separates an image into approximation image LL, HL LH and HH.

Dr.Raman Chadha, Mr. A. Aushik [9] "Original Approach with Image Processing For Securing Ad-Hoc Network" In this article we assess security threats and summarize representative proposals in the context of ad-hoc networks. Here, we review the state of- the-art for original to providing security for wireless networking, namely mobile ad-hoc networks. We recognize the security threats as well as observe the present solution. We additional sum up education erudite, talk about open issues, and recognize future instructions. Mobile ad-hoc network are being expansively deployed at present since they provide some features which are difficult or impossible to be emulate by predictable networks. Due to the significance attached to the applications of MANET, security in ad-hoc networks is an important aspect. This title is focused on using image processing for securing Ad-hoc network.

Suresha D, Dr. Prakash H N [10] "A Novel Approach Using Image Processing for Securing Ad-Hoc Networks" This title is focused on using image processing for securing MANET. Mobile ad-hoc networks are being extensively deployed currently since they provide some features which are difficult or impossible to be emulated by conventional networks. The applications range from the defense sector (sensor nodes in hostile territory) to general transportation (gadgets used to communicate traffic congestion while traveling) for providing useful infrastructure during disaster recovery. Due to the significance attached to the applications of MANET, security in ad-hoc networks is an important aspect.

Sarika S, Pravin A, Vijayakumar A, Selvamani K,[11] "Security Issues In Mobile Ad Hoc Networks" In this title, the various vulnerabilities, attacks and security mechanisms are discussed for mobile ad hoc networks (MANETs) in detail. In wired networks, there are lots of protections while communication occurs. In these networks, the intruders are pass through the firewalls and secured gateways for safe and secured communications. Moreover, the wired networks ensure the secured communications. But, in the case of wireless mobile ad hoc networks, the nodes are dynamic and the topology based and also needs more power consumptions. Because of mobility in wireless mobile ad-hoc networks, also there are lots of vulnerabilities when the attackers wish to collapse the partial or entire networks. Hence, there are lots of requirement for an understanding of the various problems associated with the wireless mobile networks.

Md. Abdul Kader, Farid Ghani, and R. Badlishah Ahmad [12] "Image Transmission over Noisy Wireless Channels Using HQAM and Median Filter" in this title considers the use of unequal error protection and median filtering for transmission of images over poor wireless channels usually encountered over cellular mobile networks. Hierarchical Quadrature Amplitude Modulation (HQAM) that provides Unequal Error Protection (UEP) to the transmitted image data is used at the transmitter. In HQAM, non-uniform signal constellation is used to provide different degrees of protection to the significant and non-significant bits in the image data at lower channel Signal to Noise Ratio (SNR). Median filter is employed at the receiver to remove the impulsive noise present in the received image. Simulation results show that the use of HQAM and median filtering provides a gain of PSNR over the more conventional Quadrature Amplitude Modulation (QAM).

Hanaa S. Ali, • Asmaa M. Atallah, • M. I. Abdalla [13] "An Efficient Source–Channel Coding for Wireless Image Transmission over Underwater Acoustic Channel" In this title, a complete system for image transmission in harsh underwater environment is proposed. The key to increase the performance of the system is the use of an efficient image compression algorithm with a bandwidth-efficient modulation technique. The wavelet packet (WP) decomposition is used to get the best image representation and the set partitioning in hierarchical trees is applied on the WP coefficients. The parental conflicts are resolved, the parent–child relationships are adapted and thus the similarities between cross-sub bands are preserved. Reed–Solomon is used for forward error correction to combat with the errors in wireless transmission. Orthogonal frequency division multiplexing with differential quadrature phase shift keying is used to transmit the generated bit stream. Effective image quality metrics are used for objective evaluation.

Mahesh Chandra, Diwakar Agarwal and Atul Bansal [14] "Image Transmission through Wireless Channel: A Review"
In this title various compression techniques and communication models are analyzed. Various noises introduced during image acquisition and in channel. These noises are required to be reduced during image

formatting and de-formatting process at transmitter and receiver respectively.

Dharavathu Krishna Dr. M.S. Anuradha [15] "Image Transmission through OFDM System under the Influence of AWGN Channel" In this title, one such kind of a digital data corresponding to a two dimensional (2D) gray-scale image is used to evaluate the functionality and overall performance of an OFDM system under the influence of modeled AWGN channel in MATLAB simulation environment. Within the OFDM system, different configurations of notable modulation techniques such as M-PSK and M-QAM are considered for evaluation of the system and necessary valid conclusions are made from the comparison of several observed MATLAB simulation results.

V Proposed Work

Secure image transmission via mobile ad-hoc network is a challenging issue as MANET form the dynamic network due to node mobility and less security. We have taken the foreman image for transmission and applied the source encoding technique for compression. Compressed data is then converted into variable length segments and attached with UDP protocol and passed to routing layers and propel from source to destination mobile nodes. During network communication data packets are vulnerable to various attacks result in the loss of data packets or packets may simply drop. Secure Hash Algorithm-1 (SHA-1) provides the data security using cryptographic mechanism that uses hash function designed by the United States National security and a U.S. federal information processing. SHA-1 is an encryption technique useful for data security as no one can access or modify the data without decryption key. It's a presentation layer security mechanism for communication but data packets are not secure from routing layer attacks such as grayhole, wormhole or blackhole attack. In the proposed approach we have applied dual layer security, presentation as well as routing layer. The mechanism prevents data packet and defends from route modification. For the analysis of grayhole attack, attacks are taken under SHA-1 algorithm and another scenario grayhole with SHA-1 and collaborative route security mechanism. Grayhole attack is extension of blackhole attack, deceive the source node and partially forward the packets to destination nodes. Grayhole nodes behave like a genuine node and try to participate into full communication. Attack occurs during the route discovery process and it updates the source node route table as shortest path. Afterwards source always consider malicious node as next hop node and forward data packet to the same. But it simply drop the partial data packets and it is critical to detect these attack. So in the proposed collaborative security method actively watch the activity of its neighbors during the route discovery and if monitor node found that any of the neighbor node generate the higher sequence number and spoof the source node, also gives the shortest path then monitor node block the particular malicious node and send the report to source node for new route search generation where detected malicious node not participated in future. After the fresh route searching the encrypted image segmented data sends via trusted path and improves the reliability of the network services. Monitor node also passively watch the selected path for further miss-activity occurrence in the network and if found the malicious behavior of any of the node then multiple monitor nodes collaborative take the decision and block the attacker nodes.

VI Proposed Algorithm

This section describes the algorithm for secure image transmission using SHA algorithm and route security method in mobile ad-hoc network. Algorithm provides the step by step process from image conversion to data receiving by the receiver under attack prevention mechanism. During the image segmentation, encrypt the segmented image data using SHA-1 algorithm and built a frame using UDP protocol and transmit through defined shortest path by AODV routing. Algorithm defines the route security module using neighbor monitoring mechanism and improves the network reliability in terms of network performance parameters. For the case study take the grayhole attack impact and its defensive mechanism for securing the communication backbone and delivery the data in secure manner under MANET.

Algorithm: Scecure Image Transmiison Using SHA and Route Security methdos in MANET

Input: image data
Network paramters
- *M: mobile nodes*
- *S: source node*
- *R: receiver node*
- *I: intermediate nodes*
- *SHA: encryption standard*
- *A: attacker node*
- *D: monitor nodes*
- *P: set of D nodes*
- e_{data}*: encrypted data*
- *Ψ: Radio Range*
- *AODV: routing protocol*

Output: Data packet sends, receives, PDR, throughput, overhead and delay
Step1: Image data compress and encrypt by SHA-1 algorithm
Split in segment form
Step2: S execute AODV routing (S, R, Ψ)
If M in Ψ & M != R Than
If M == Normal Than
$M_t \leftarrow$ *generate route table*
Route packet forward to next hop
Else
$M \leftarrow$ *generate* h_{seq}
M send reply message to S
M activity watch by D neighbour node
M set as A node

A node block by D node
End if
Else if M in Ψ & M == R Than
R_{table} ← prepare route table
R_{rep} ← Send Reply to S node
S send_data(S, R, e_{data})
End if
Send_data (S, R, e_{data})
S encrypt image segmented data by SHA-1 algorithm
Create UDP agent
Encapsulate e_{data}
Send encrypted data to next hop I
e_{data} receives I node's
D ← watch I node activity
If I drop partial data e_{data} or capture the partial data e_{data} than
I set as suspicious node S_p
D monitor I node
If D found data drop abnormality then
Sends report to Collaborative decision system P
Else
I data drop by other network reason
End if
I Send edata to R node
End if
Prevention P (Sp, profile, activity, time)
If profile! = normal, activity! = normal and route modified than
Sp node block
Re-route search without participation Sp Node
End if

VII Simulation Parameters

The simulation parameters are considered for simulation of Attack, SHA security and Routing security are mentioned in Table 1. The number of nodes is 10 and all nodes are continuously moves in limited area with random mobility speed. The image is first segmented and then transmitted in network and in communication the intermediate node attacker is modified the routing performance by that actual data is not received at destination. The number of nodes drop packets are the attacker and these nodes are block by proposed security scheme.

Table: 1 Simulation Parameters

Number of nodes	10
Dimension of simulated	800×800
Routing Protocol	AODV
Simulation time (seconds)	100
Transport Layer	UDP
Data Type	Image
Application Security	SHA
Routing Attack	Gray hole
Routing Security	Neighbour
Antenna Type	Omni Antenna
Node Speed (m/s)	Random

VIII Result

A.Transmiited Image

The actual image is considered for sending in network in between sender and receiver is mentioned in figure 1. This image is first segmented and then is transmitted in network because the while image is necessary to split in to matrix form and this matrix values is contain the data of image. If the data of image is drop by attacker in network in network then the image quality is distorted and the image is blurring and the image quality is warped.

Fig.1 Image Consider for Simulation

B.Data Packets Sending Analysis

In network the sender is sending number of packets in network and the packet sending in network is proper if the no noise is created and data is successful receiving in network. In this graph the data packets sending in all three different protocols are almost same in dynamic network. The packets sending in network is shows the all senders are properly work and having no problem in image composition in pixel foam and these pixel are sending in network in bits foam and same data is expected to be receive in destination.

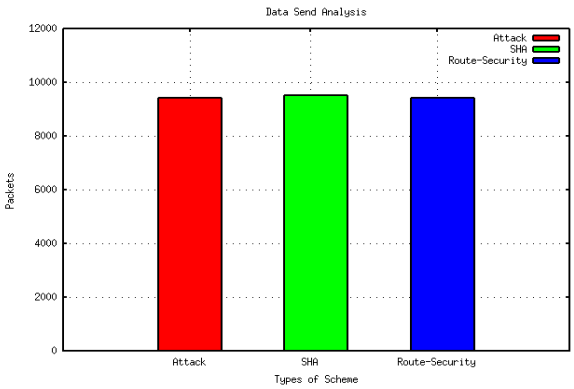

Fig.2 Data Sending Analysis

*C.*Data Packets Receiving Analysis

The performance of network is measurable through number of packets receiving at destination. The data is actual image is first necessary to segmented in matrix foam and then sends in network. The number of receiver nodes is receiving data through intermediate nodes and forward confirmation of successful data to receiver. In this graph the same performance of attacker and security scheme SHA and routing security

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is evaluated and the performance of packet receiving in routing security is more because here both the Route-Security (SHA+IDS) is work to secure the image in MANET. The packet receiving in presence of malicious attack is showing the poor or dump performance and SHA is secure network but their recovery is not much better as Route Security.

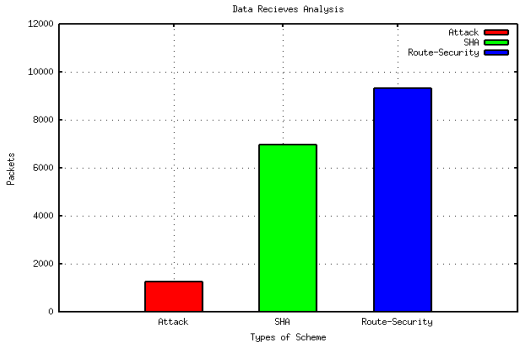

Fig.3 Packets Receiving Analysis

D. Routing Packets Overhead Analysis

The image is sending in network in the foam of data packets and finally it converted in to bits in network. The data packets are contain the image data and these packets are received at destination and gain the same image is received. The sender in network is first establish connection in between sender and receiver and the receiver is confirm the possibility of data accepting in network after that the sender is start sending data packets in network. In this graph the number of routing packets is flooded in presence of SHA is more as compare to attack and Routing -Security scheme. Here in proposed Route-Security the data receiving is also highest because of that the routing packets overhead is more and showing the more reliable in term of data receiving. In case of attack due to delay the routing packets are flooding after time out of receiving confirmation because of that flooding is low but receiving is also very poor.

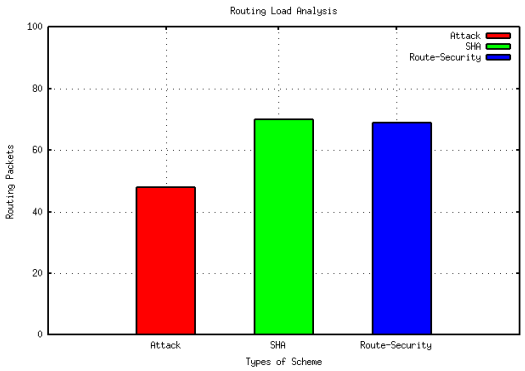

Fig.4 Overhead Analysis

E. End to End Delay Performance Analysis

The delay in network is only occur in network if the sender is take time in sending or receiver is not sending receiving confirmation in proper time. In MANET the topology of network is rapidly changes and this change is reflected in routing performance also because due to link breakage or due to attacker misbehavior the data is not received at destination and receiver is waiting for that data packets. In this graph the performance of attacker is very poor showing highest delay in network and this delay is showing the degradation in network performance. The delay in SHA is also high but in case of proposed Routing-Security delay is minimum that shoes the proper image received data and this data is completely secure from attacker.

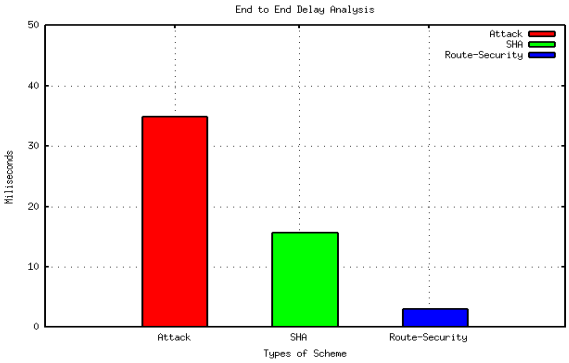

Fig.5 Delay Analysis

F. PDR Performance Analysis

The PDR performance in network is actually calculating the percentage of successful data packets receiving in between sender to receiver in MANET. The malicious nodes in MANET are easily pretentious normal communication of nodes. In this graph the PDR performance in presence of attacker is slight and only counted up to 40 seconds about 30%. The image data is drop by attacker and because of that all segments of images are corrupted but security scheme is able to recover it. It is the percentage ratio and ratio is not depending on the values are higher, the same ratio is also counted in less value but increment or decrement both are permissible in sending and receiving. The performance of SHA security scheme is better and provide about 73% performance but performance of proposed protocol is provides more than 98% performance in MANET. The performance of proposed protocol provides better performance.

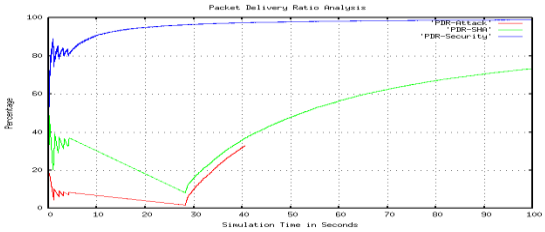

Fig.6 PDR Analysis

*G.*Throughput Performance Analysis

The data at the physical layer is converted in binary codes and after layer to layer transfer the format of data are changed. The throughput data is measure in pks/seconds. The images segmented and all data is converted in matrix and data in the foam of matrix easily recognized. In this graph the performance of proposed security SHA with IDS is better to block attacker malicious activities. The throughput of attacker is almost negligible because attacker/s is not

forward destination information of image. The performance of SHA security is better and throughput is about more than 3 packets/seconds but the proposed SHA with Routing-Security performance is not doubtable because recovered network conditions are showing better performance.

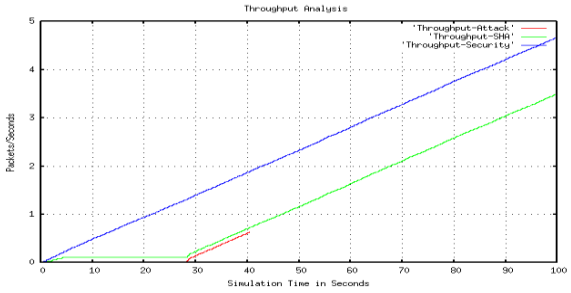

Fig.7 Throughput Analysis

VIII Conclusion

Mobile ad-hoc network is a collection of movable nodes who's capable to form dynamic topology in temporary manner. It capable to provide any where any time network without intervention of centralized controller means each node independent self decision making capability. Image transmission through wireless mobile ad-hoc network is a challenging task because convergent of image into wireless characteristics is complex task. Before transmission it converts into compressed form than segment and packet form. In this paper take the ten mobile nodes in the 800*800 grid area and base routing use AODV routing that provide shortest path from source to destination node. For the image data security apply the SHA-1 algorithm and for the routing security, use the collaborative monitoring and security system for reliable path discovery process. In this paper transmit the encrypted image through secure routing manner and improve the network efficiency in all respect of network parameters. During the simulation image data transmitted by UDP datagram that is acknowledgment less method but provide fast transmission from source to destination. In the simulation scenario three different structure is design i.e. attack, attack with SHA-1 and attack, SHA-1 and route security mechanism, at the end found that result in different parameters like no of data packet sends, packet receives, percentage of data receives, average end to end delay, throughput etc. through the outcomes conclude that SHA-1 with route security is more reliable as compare to only SHA-1 security, so that cannot ignore the route attack from the network while the network under dynamic circumstances. Means not only encryption we secure the image data while sends from source to destination through mobile ad-hoc network.

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