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A Survey of Intrusion Detection System in Manets using Security Algorithms

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Abstract

MANETs are very dominant field in wireless networks .Matured concept of MANETS and its popularity in industrial and military applications makes security in MANETS vital. In MANET, intrusion detection system is unable to percept the malicious attacks by watchdog scheme. As a result it leads to being an inferior performance of a network. This paper describes intrusion detection system on MANETs with the collaboration of three IDS approaches. In this paper, we areperforming asurvey on various schemes to analyze and enhance the intrusion detection system with better throughput and security.

Keywords:-Digital Signature,Hybrid Cryptography, Route Discovery.

INTRODUCTION

Real world requirements are forcing us to move from wired to wireless networks.Mobile ad hoc network (MANET) is by virtue unreliable so securitymeasures are to be incorporated inMANETS. MANET is a collection of mobile nodes which communicate via wireless radio links and nodes without any central base station. Each node in the network acts as a router that forwards data packets for other nodes. A node may leave the network or rejoin, and free to move in any direction for the dynamic topology. It is not easy to route the packets towards the adjacent nodes in the network which is more vulnerable to the malicious attacks because of its flexibility and adaptability nature. The routing protocol should be designed in such a way that leads to high reliability, security, power efficient with less overhead which provides the quality of service [1, 3]. Authentication is essential to identify the intrusion as the primary defines. Each network needs the best security policies to lead the better performance. Intrusion detection system (IDS) usually detects any type of malicious threat that protects the system from various types of security issues. Low-levelsecurity in a network facilitates the intruder to interrupt the transmission of data which results in more energy consumption in data transmission that affects the mobile nodes. Authentication system with ElGamal algorithm is focused in this paper. One of the main attacks against ad hoc networks affecting their routing protocols is named routing-disruption attack. Such type of situation can be overcome by using the proposed authentication system.

BACKGROUND

Watchdog is one among the intrusion detection techniques for MANETs. It improvesthe output of network with the presence of malicious nodes. Its aim is to find malicious nodes misbehaviors within the network. Watchdog finds the malicious activity by listening to its next node's transmission. to stay the record of malicious node it's its own failure counter that gets increase once watchdog finds that its next node fails to transmit the info at intervals given thequantityof your time.

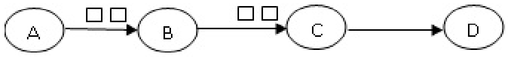

Figure 1: Flow of packets

And once failure counters of given node meets its most capability purpose then watchdog reports it as amalicious node. the most blessings of watchdog scheme: one. Ambiguous collision, 2.Receiver collision, 3.restricted transmission power, 4. False actuaries report, 5. Collusion and 6.Partial dropping.

The main of the watchdog mechanism is to boost the output of the network with the presence of malicious nodes. The watchdog theme is of 2 sorts specifically watchdog and pathrater. Watchdog function intrusion detection for Mobile Adhoc Network and accountable for police work malicious node actusreus within the network. Watchdog detects malicious node misbehaviours by promiscuously taking note of its next hop’s transmission. If a Watchdog node overhears that its next node fails to forward the packet inside a predefined fundamental measure, it will increase its failure counter. Whenever a node’s failure counter exceeds a predefined threshold, the Watchdog node reports it as misbehaving. At constant time, watchdog maintaining a buffer of recently sent packets and comparison every overheard packet With the packet within the buffer. a knowledge packet is cleared from the buffer once the watchdog overhears constant packet being forwarded by the next-hop node over the medium. If a knowledge packet remains within the buffer for too long, the watchdog theme accuses the next-hop neighbour to be misbehaving.

Intrusion detection system in Manets has good scope for research.One of such IDS proposed is EAACK.It targets higher rates of malicious behaviour detection,without degrading the network performance.This scheme prefers digital signature for authentication.EAACK schemes depend upon acknowledgement packet to detect malicious nodes within the network. thus this causes each package to be verified and stainless. And if the assailant is sensible enough to forge acknowledgement packets, then of these schemasar useless. For this reason during this paper planned to adopt digital signature system. so as to stay integrity of IDS and EAACK wherever it'll want all acknowledgment packages to be signed digitally before they're sent out and verified until they're accepted. EAACK technique relies on acknowledgement thus it's terribly necessary to acknowledge packets in EAACK and authenticate them. EAACK need all acknowledged packets are digitally signed before they sent out .Thus this paper has few positive results to secure from the attacks like DOS attacks, part Attack, grey Hole Attack altogether the results of this paper has positive over the normal secure system like watchdog. whereas TWOACK, AACK in IDS has negative ends up in care of receiver collision, restricted transmission power and false report.

EAACK is consisted of 2 major components, namely, secure ACK (S-ACK), and misbehaviour report authentication(MRA). Introduction of digital signature within the EAACK to forestall the assailant from formation acknowledgment packets.

Ack

ACK is essentially AN end-to-end acknowledgement theme. It acts as a district of the hybrid theme in RRACK, going to cut back network overhead once no network misbehaviour is detected. If ACK theme fails the node can switch to SACK mode by causation out AN S-ACK knowledge packet to find the misbehaving nodes within the route.

S-ack

S-ACK theme is AN improved version of TWOACK theme. The principle is to let every 3 consecutive nodes add a bunch to find misbehaving nodes. for every 3 consecutive nodes within the route, the third node is needed to send AN S-ACK acknowledgement packet to the primary node . The intention of introducing S- ACK mode is to find misbehaving nodes within the presence of receiver collision.

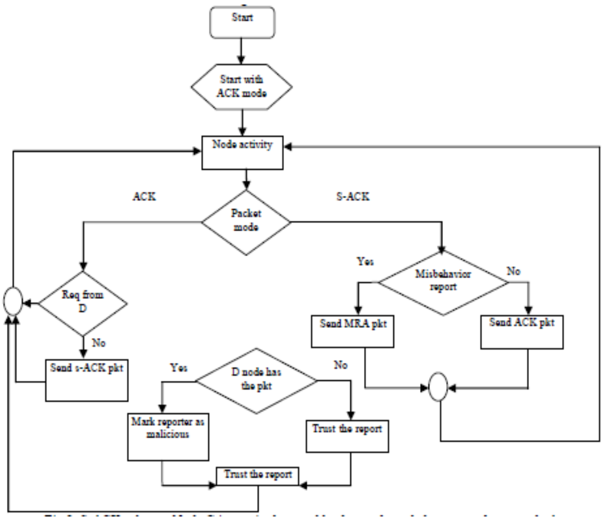

Figure 2: Flow Chart for the projects

Mra

The misbehaviour Report Authentication (MRA).theme is meant to resolve the weakness of Watchdog once it fails to find misbehaving nodes with the presence of false misbehaviour report. The core of MRA theme is to certify whether or not the destination node has received the according missing packet through a unique route. By adopting an alternate route to the destination node, the misbehaviour newsman node.once the destination node receives Associate in Nursing MRA packet, it searches its native cognitive content and compare if the according packet was received. If it's already received, then it's safe to conclude this is often a false misbehaviour re-port and whoever generated this report is marked as malicious. Otherwise, the misbehaviour report is trusty and accepted.

Digital Signature

EAACK is Associate in nursing acknowledgment-based IDS. All of them think about acknowledgment packets to discover misbehaviours within the network. Thus, it's very vital to make sure that everyone acknowledgment packets in EAACK area unit authentic and unsullied. so as to make sure the integrity of the IDS, EAACK needs all acknowledgment packets to be digitally signed before they're sent out and verified till they're accepted.

All the higher than schemes area unit supported acknowledgement. These acknowledgements may well be uncertain and should be checked for his or her justice. we tend to use digital signature so as to take care of integrity of the system. If we tend to don’t use digital signature the higher than mentioned three schemes are going to be de-fenceless. we are able to use DSA or RSA algorithms to implement digital signature schemes.The migration to wireless network from wired network has been adopted within the past few decades. MANET, mobile ad-hoc network is one in all the foremost vital applications of wireless network. painter could be a unendingly self-configuring, infrastructure-less network of mobile devices connected while not wires. MANETs area unit utilized in applications like military and in natural disasters. Security measures play a very important role all told these applications .Hence it's necessary to incorporate intrusion-detection system for MANETs. There are a unit varied IDS projected by researchers. one in all them is EAACK (Enhanced adaptive Acknowledgement) that demonstrates higher malicious behavior detection rates whereas doesn't greatly have an effect on the network performances. EAACK theme has used digital signatures for authentication method. All the acknowledgements area unit digitally signed. EAACK worked by implementing each DSA and RSA rule. however EAACK doesn't offer coding to the info packets. It causes the network overhead once the malicious nodes area unit increased .to boost EAACK, we tend to propose a hybrid cryptography theme that uses isosceles also as uneven cryptanalytic techniques. Hybrid theme is enforced exploitation isosceles cipher Triple DES and public key cryptography RSA with hash operate MD5. The Triple DES rule provides confidentiality, the hash operate provides the integrity and RSA can make sure the authentication.

Hybrid Cryptography

Cryptography is that the study of techniques for secures communication within the presence of third parties. Cryptography may be a methodology of storing and transmittal information in an exceedingly specific kind in order that solely those for whom it's meant will browse and method it. A hybrid cryptosystem is one which mixes the convenience of a public-key cryptosystem with the potency of a symmetric-key cryptosystem. A hybrid cryptosystem will be made mistreatment any 2 separate cryptosystems:

- key encapsulation theme, that may be a public-key cryptosystem, and
- data encapsulation theme, that may be a symmetric-key cryptosystem.

The planned system of this paper is

1. EAACK

- Acknowledgement (ACK).
- S-Acknowledgement (S-ACK).
- Misbehavior Report Authentication (MRA).

2. HYBRID cryptography AND coding

Encryption method

1. MD5 formula computes 128 Bit MD5.
2. cut back 128-bit message digest to 112 bits by discarding each range that's a multiple of 8-bit used for parity. This output is named as MD’.
3. Triple DES formula encrypts the first Message (M) with facilitate of MD’ as symmetrical key employed in triple DES, and so turn out a cipher text (CT).
4. The MD’ Encrypted by RSA formula with receiver Public key BPK and turn out Cipher Text of Key (CK).
5. mix a Cipher Text (CT) and Cipher text of Key (CK), produces a posh Message (CM).Complex Message (CM) is distributed to the Receiver B.

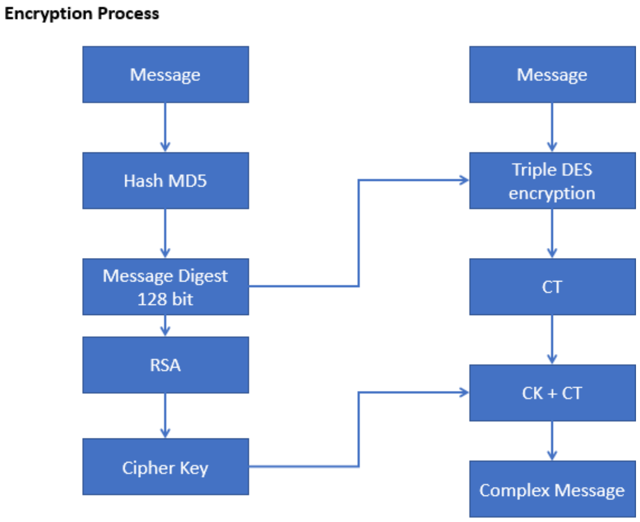

Figure 3: Encryption Process

1. The receiver B received cipher text CT into 2 elements, one is cipher text of key CK from the RSA formula cryptography, and therefore the alternative is cipher text CT from the triple DES formula cryptography.

2. The receiver B decrypts cipher text of key CK by their own personal key BSK, and retrieve the key K, then decode the cipher text CT to the first M by key K that's MD’.

Packet-dropping attack has continually been a significant threat to the safety in MANETs. In our planned system, a unique IDS named Intrusion detection system mistreatment hybrid cryptography specially designed for MANETs and can compare it against existing mechanism in numerous situations through simulations. the issues of receiver collision, restricted transmission power, and false misconduct are eliminated. to stop the attackers from initiating cast acknowledgment attacks, the planned system implements the hybrid cryptography construct so as to boost security. It improves the network’s PDR once the attackers square measure good enough to forge acknowledgment packets. mistreatment hybrid cryptography theme we are able to improve confidentiality, convenience and integrity of the system. thus this planned system ensures a lot of security to the network and conjointly improves outturn.

This paper introduced a detail ElGamal digital signature theme, and chiefly analyzed the presentproblems of the ElGamal digital signature theme. Then improved the theme in step with the present issues of ElGamal digital signature theme, Associate in Nursingd planned an implicit ElGamal sort digital signature theme with the operate of message recovery. As for the matter that message recovery not being allowed by ElGamal signature theme, this text approached a way to recover message. This methodology can build ElGamal signature theme have the operate of message recovery. On this basis, against that a part of signature was used on most attacks for ElGamal signature scheme, a replacement implicit signature theme with the operate of message recovery was shaped, when having tried to hid a part of signature message and purification forthcoming implicit sort signature theme. the protection of the refined theme was anlyzed, and its results indicated that the new theme was higher than the recent one.

ElGamal signature theme is intended to use as a signature, and its speed of secret writing and cryptography is comparatively slower than the parallel rule, it's the common drawback of all sensible public key algorithms nowadays. it's a non-deterministic two-key system. In terms of constant plaintext message, as a result of totally different parameters chosen at random, it's totally different signatures. Most digital signature systems within the public didn't have the message recovery operate. Signature theme permitting message recovery has several blessings , like shorter signature for shorter message; in the meantime, it puts the message at the side of validation. Nyberg and Rueppel had improved the broad-based ELGamal mode, and a series of signature schemes had been received, that may verify the signature whereas convalescent the message.

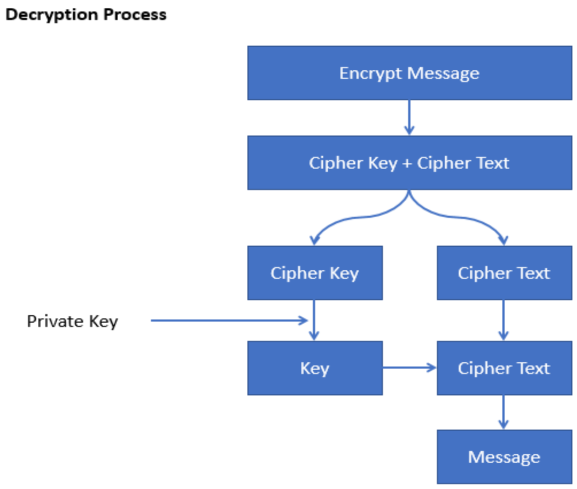

Figure 4: Decryption Process

Generally speaking, a digital signature chiefly has 2 algorithms. Signer will use a (secret) languagealgorithm to sign a message, resulting in the signature by a public verification rule to verify. Verification rule makes a solution with "real" or "false" per whether or not the signature is real once given a try of signature. Signature theme permitting message recovery has several obvious benefits like shorter signature for brief message, lower computation work for the mix of message and its signature to be sent, and so on. Most signature schemes together with ELGamal signature mode don't permit message recovery. supportedELGamal signature mode, Associate in Nursing improved theme was projected, that permits message recovery and has higher security than the initial one. specifically, it will resist homomorphy attack and substitution attack victimisation partial signature. This operate isn't obtainable within the different ELGamal improved schemes. attributable to some options of attacks suffered by ELGamal signature, hash operate should be wont to guarantee its security. As for ELGamal kind signature theme not victimisation hash functions, Yen and Laib truly created plenty of efforts, however were unable to seek out. These schemes area unit attacked by victimisation a number of the signatures s offensive and simply dole out a public key y. though the implicit signature program is additionally not utterly absolve to use a hash operate, one case of a significant offense is prevented a minimum of while not the utilization of hash functions . Harn and Xu identified that there area unit eighteen the secure ELGamal kind signature schemes, fowling attack ways of sculpturesque Nyberg and Rueppel, you'll be able to use a part of signature to substitution attack on nearly eighteen totally different schemes. If the pure public-key attach wasn't thought of, such theme will still maintain its security while not victimisation hash operate.

(1) P is a finite set composed by all possible messages;

(2) A is a finite set composed by all possible signatures ;

(3) K is a finite set composed by all possible keys, which is key space;

(4) As for each k ∈K , there is a signature algorithm ( ) k Sig·∈S and a corresponding verification algorithm (,) k Ver··∈V. Each ( ) k Sig ·∈S and (,) : { , } k Ver··∈V P× A→ true false is a function which satisfies the following equation: as for each message x∈P and each signature y∈ A , there is

(,) k Ver x y = true , If and only if ( ) k y = Sig x , ( ) k Sig · and (,) k Ver·· both are function of polynomial time. (,) k Ver·· is a public function, while ( ) k Sig · is a secret function.

B. The description of the ElGamal type digital signature scheme based on discrete logarithm problem on * p Z

Suppose p is a intractable prime on * p Z the discrete logarithm problem, q is a large prime factor of p-1, or p=q, when q<p, select a element *p α∈Z of an order for the q randomly; When p=q, randomly select a element*

p α∈Z , or * , * ,( ) p p q P∈Z A = Z × Z q⟨ p or * 1( ) p p A Z Z q p − = × = of an order for the p-1. Definition:

K = {(p, q,α ,a,β) β =α a (mod p) }

Where p,q,α ,β are public, a is private.

For K = (p,q,α , a,β) and a secret random *( ) q k ∈Z q < p or *1( ) p k Z q p −∈ = , definition:

(,) (,) k Sig x k = γδ (1)

Where γ =α k mod p(mod q) .

When q<p, δ satisfies the equation:

k ⋅ f (γ , x,δ) + a ⋅ g(γ , x,δ) + h(γ , x,δ) ≡ 0mod q (2)

When q=p, δ satisfies the equation:

k ⋅ f (γ , x,δ) + a ⋅ g(γ , x,δ) + h(γ , x,δ) ≡ 0(mod p −1) (3)

f, g, h is a public function, and is calculated easily from (1) and (2).

Cryptography essentially target varied security goals like availableness,integrity and confidentiality.In today’s day to day setting there square measure varied sorts of attacks like snooping, traffic analysis,modification,masquerading,replaying,repudiation and denial of service. This paper target satisfy the safety problems mistreatment combined approach of RSA and Centro symmetric key cryptography supported improvement of ELGAMAL digital signature theme. This theme works by merging number resolution downside and distinct exponent downside. As a result it provides higher computing speed and output compare to existing RSA-ELGAMAL algorithmic program.

In the current situation of day by day increasing of net over worldwide,we square measure moving towards the safer systems. we have a tendency to expecting additional and safer systems and secure applications. Security is turning into crucial issue in day to day world applications like internet banking, on-line searching. One answer to the present is achieved by mistreatment coding and coding approach. There square measure 2 sorts of cryptologic algorithms,first is uneven key cryptography or public key cryptography and second, Centro symmetric key cryptography or non-public key cryptography.Initially we referred to information as plain text. when applying sure cryptologic algorithms on the plain text encrypted information is thought as cipher text. There square measure varied algorithmic programs exist for achieving coded file or cipher computer file supported varied key size and a few different parameterRSA algorithmic program is public key cryptologic algorithm implies that sender encrypt with its receiver’s public key and receiver decode with its own non-public key.ElGamal cryptosystem is another public key cryptosystem. during this paper we have a tendency to square measure presenting increased technique of ElGamal cryptosystem supported RSA algorithmic program and centrosymmetric key cryptography algorithmic program .Here we have a tendency to are mistreatment the thought of Digital signature for verification of integrity of the message mistreatment SHA-512.

Cryptography is that the technique for making secret codes.Cryptanalysis involves to interrupt these secure codes. There ar varied forms of cryptanalytics attacks like cipher text-only,known-plaintext, chosen-plaintext and chosen-cipher text. In even key cryptography formula heap of computation is needed for key generation and maintenance part. answer to the present drawback is given by exploitation public key cryptography or uneven key cryptological formula. RSA formula , Rabin cryptosystem, ElGamal cryptosystem etc. ar some well-known formula that ar used for the aim of cryptography and decipherment method and to send knowledge or text files in secure manner.

Diffie-Hellman key agreement protocol This theme was 1st printed by Whitfield Diffie and Martin Hellman. Diffie-Hellman key agreement protocol is predicated on cruciate key cryptography rule. during this cryptologic approach we have a tendency to ar mistreatment same key for encoding and decipherment purpose. This theme was 1st printed by Whitfield Diffie and Martin Hellman. Diffie-Hellman key agreement, itself is associate degree anonymous (non-authenticated) key agreement protocol. associate degree unwelcome person in middle will establish communication between the 2 act parties.An commonplace ways is required to forestall this sort of attack between act entities. Diffie-Hellman rule is depend upon issue of computing distinct logarithms.Diffie-Hellman protocol is employed in secure shell(SSH),Internet protocol security (IPsec),public key infrastructure(PKI).

El-Gamal digital signature theme first off, this theme is delineated byTaherElgamal in 1984. This signature theme is predicated on issue of computing distinct logarithms. this can be another public key cryptography rule. 2 attacks are mentioned for the Elgamal cryptosystem supported low modulus and celebrated plain text attacks. Low modulus attack is applicable once price of modulus is low then it's tough to resolve the distinct rule. Known-plain text attack is applicable once we recognize plain text comparable to cipher text, we will simply verify the key and attack becomes easier.

Proposed theme of ElGamal variant theme is create thereto totally different from original theme by key generation and encoding decipherment method. during this technique we have a tendency to use 2 separate files ar used for encrypted file and second for language the digest of the message. we have a tendency to use cruciate key cryptography in improvement of ElGamal cryptography.

A Mobile Ad-hoc Network (MANET) may be a dynamic wireless network will|whichwill|that may} be shaped while not the necessity for any pre-existing infrastructure during which every node can act as a router. a range of routing protocols are projected and a number of other of them are extensively simulated or enforced furthermore. during this paper, we have a tendency to judge the performance Adhoc On demand Multipath Distance Vector (AOMDV) routing protocol with relevancy Adhoc On demand Distance Vector (AODV). Also, we have a tendency to note that on evaluating the performance of AODV and AOMDV, AOMDV incurs additional throughputs, less packet loss than AODV. It conjointly has less route failure once quality is high.

AOMDV routing protocol is associate extension of AODV routing protocol that discovers multiple path between a combine of supply and destination in each route discovery. The multiple methods ought to be loop free and disjoint.

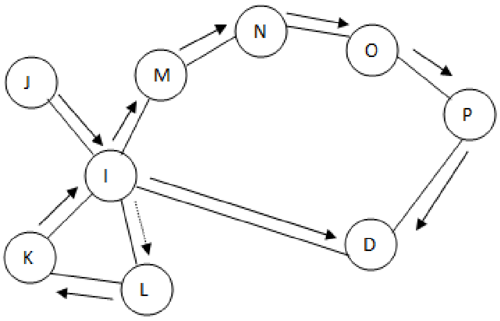

Figure 4: Network Flow

AODV is associate on-demand routing protocol. it's 2 key features: a) Route Discovery b) Route Maintenance.

Route Discovery

It finds routes on Associate in Nursing "as needed" basis. Whenever a traffic supply needs route to the destination, it initiates a route discovery by flooding a route request packet (RREQ) and waits for reply (RREP). The RREQ packet contains the subsequent information: 1) style of packet- RREQ , RREP ,RRER etc. 2) Hop_count- range of hop packet travels 3) Bcast_ID- distinctive id 4) Dest_IP – IP address of destination 5) Dest_seq – destination sequence range 6) Source_IP- IP address of supply 7) Source_seq- supply sequence range 8) Timestamp because the request packet reaches to the intermediate node, it checks whether or not it's initial copy of RREQ packet. If it's then it came upon a reverse path to the supply mistreatment previous hop of the RREQ because the next hop within the routing table. It then checks in its routing table for the route to the destination. If route is on the market, it unicast a RREP back to the supply mistreatment reverse path, otherwise it re-broadcasts the RREQ packet over the network. once node receives duplicates copies of RREQ, it now discarded.

Route Maintenance

When a node detects a blunder like link failure, equipment failure etc., it generates a RRER

packet. The RRER packet sends to any or all traffic sources that have a route via unsuccessful link and erase all broken routes on the means. once a traffic supply receives a RRER, it starts a replacement route discovery if it still desires a route.

Sequence variety and Loop Freedom Sequence variety is a very important field in RREQ, RREP and RERR packet. each node maintains 2 variety of sequence variety. First is, sequence variety for itself and second is that the sequence variety for destination that is named destination sequence variety. It the best renowned sequence variety.once a node receives multiple RREQ packets it compares the sequence numbers within the RREQ packet. The RREQ having highest sequence variety is maintained. RREQ with highest sequence variety is assumed to own additional recent data. just in case of same sequence variety, packet with highest hop count is accepted. It impose a complete ordering among nodes on any valid route to a destination d.This is referred to as route update rule. The update rule ensures loop freedom. In AODV, once a link fail from i to j node i domestically increment sequence variety and hop count to destination to ∞. This prevents i from later forming a path to destination.

AOMDV shares several characteristics of AODV. it's supported distance vector and hop by hop routing approach. It conjointly has 2 key options like AODV: 1) Route Discovery 2) Route Maintenance. the most distinction between AODV and AOMDV is that the variety of route found in every route discovery. Route Discovery: once a traffic supply needs a route, it sends a RREQ packet over the network and waits for RREP. In distinction to AODV it receives all the duplicate RREQ packet and established reverse path through all routes towards supply. It examines all the duplicate copies and solely those copies ar maintained that preserve loop freedom and disjoint. The AOMDV route update rule is applied at every node to make sure loop freedom and disjointness properties. once associate intermediate node receives RREQ packet, it checks whether or not there ar one or additional valid forward path to the destination. If so, it generates a RREP packet and sends it back to the supply via reverse path. The RREP includes solely forward path that don't seem to be utilized in any previous RREP and once once path is formed towards destination, intermediate nodes doesn't propagate the RREQ additional. once destination node receives RREQ, it conjointly kind reverse path within the same manner as intermediate node. It adopts somewhat "looser" approach for generating RREP. It generates RREP in response of each RREQ packet that arrives via loop-free and disjoint path. once associate intermediate node receives RREP, it follows route update rule to provide loop-free and disjoint route. Route Maintenance: Route maintenance in AOMDV is just the extension of AODV route maintenance. AOMDV conjointly uses RERR packet for causing error message. A node sends a RERR for destination once path fails. As AOMDV has multiple ways, once a node finds that a link fails it at once selected various path. Another drawback in AOMDV is timeout for every path. it's tougher in AOMDV to manage timeout compared to AODV. With multiple ways, AOMDV has higher chance of stale routes. This drawback may be avoided by exploitation little timeout. It conjointly uses how-do-you-do message to get rid of stale routes. Packet Forwarding In AOMDV, a node has multiple ways for forwarding knowledge packets. an information packet is to be forwarded to the route till there's no failure. Here we have a tendency to use a straightforward approach once a link failure happens. therein case, it merely selected route so as of their creation.

Dynamic Source Routing (DSR)

DSR routing protocol forms a route as like as AODV to form a route on demand with a transmitting computer request. DSR protocol uses source routing table at each intermediate device, where the routing information is present at mobile nodes. The determining source routes append with the own identifier at the time of forwarding RREQ route discovery. The appended path information is caught by nodes processes route discovery packets. The routed packets contain the address of each device to minimize the overhead cost to traverse a long distance. Generally, DSR defines a flow id option that allows packets to forward on a hop-by-hop basis to avoid the source routing. The two major phases of a DSR protocol are route discovery and routemaintenance. Route reply is generated as soon as the message reaching at destination node. The destination node returns the route reply. The route uses in the destination node's route cache, else the node reverses the route based on the route record in the route reply message header. The route maintenance phase initiates with the route error packets generated at a node. The error generated hop should be removed from the node's route cache and all routes containing the hops are truncated at that point.

CONCLUSION

Security of Manets is challenging task as nodes in manets are mobile and infrastructureless.In this paper,a detailed survey on IDS using MANETSisdone.we have seen in detailed about different cryptographic algorithms and the support extended by them to secure MANETS .On the other hand we have also studied in detailed about routing protocols in MANETS and security provided to them using Elgamal Digital Signature.This paper also projects few benefical results over various attacks on MANETS and shows that there are more constructive schemes than legacy secure system like watchdog.

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