

DEFENDING BLACK HOLE ATTACK IN MANET

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REFERENCE

CONCEPT AND ALGORITHM

ALGORITHM:

2014 - Prevention of Black Hole Attack in AODV Routing Algorithm of MANET Using Trust Based Computing

-Ashish Sharma , Dinesh Bhuriya , Upendra Singh , Sushma Singh

-International Journal of Computer Science and Information Technologies

2018 -A Secure and Trust based Approach to Mitigate Blackhole Attack on AODV based Manet

-mh Kamel , Ibrahim alameri , ameer N Onaizah

OVERALL:

2018 - Routing AODV Defending Black Hole Attack through NS3 in Manet

-Anupam Mishra , Rajeev Paulus , Aditi Agrawa

-International Journal of Computer Applications

SIMULATION:

2018 - Evaluation of MANET Routing Protocols under Black Hole Attack Using AODV and OLSR in NS3

-Abdellah Nabou , My Driss Laanaoui , Mohammed Ouzzif

REFERENCE - LINKS

CONCEPT AND ALGORITHM

ALGORITHM:

2014 - [Microsoft Word - 84. adhoc ntetwork peper \(psu.edu\)](#).

2018 - <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8054219>

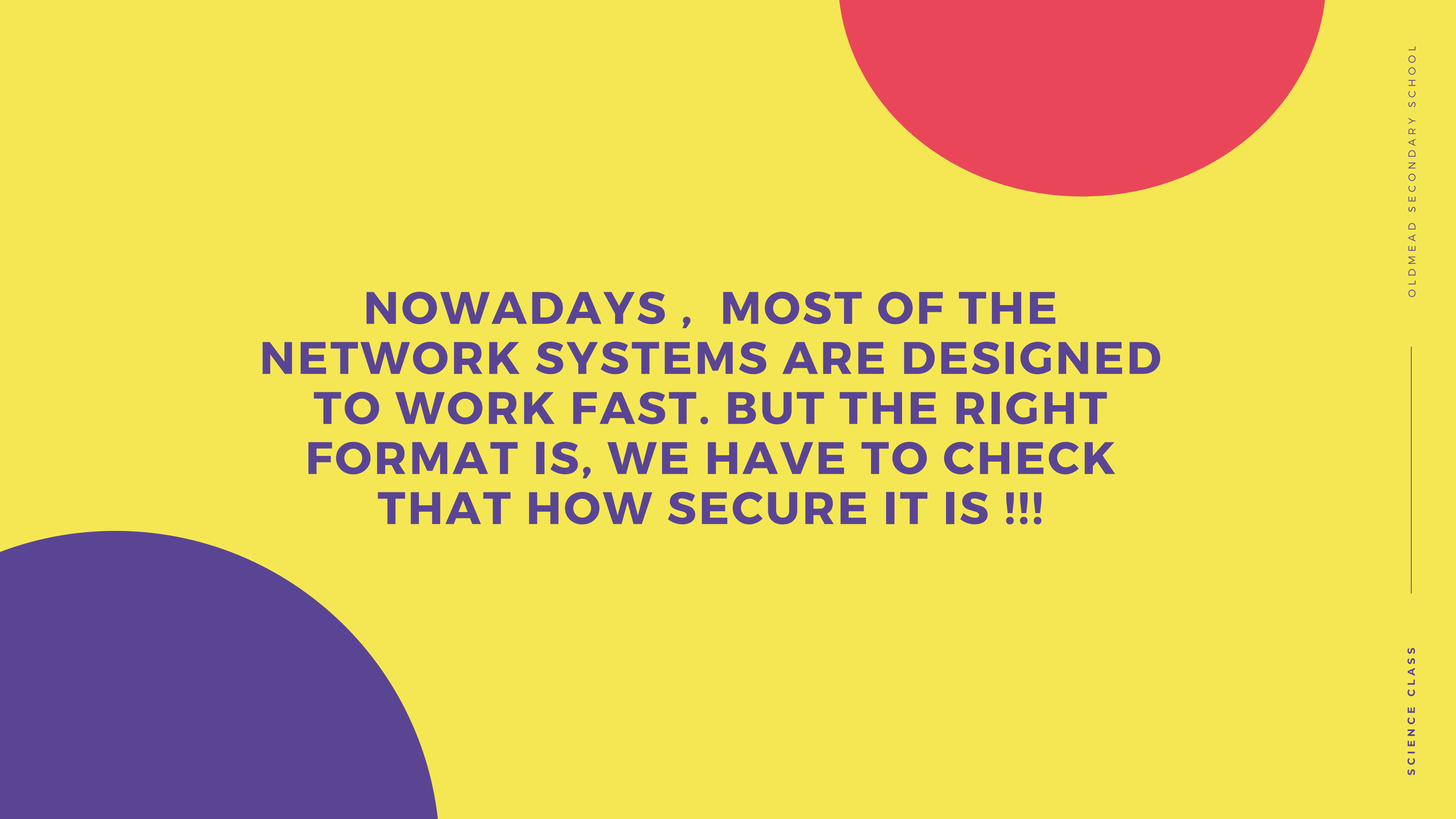
OVERALL:

2018 - [https://www.researchgate.net/profile/Rajeev-](https://www.researchgate.net/profile/Rajeev-Paulus/publication/327224082_Routing_AODV_Defending_Black_Hole_Attack_through_NS3_in_Manet/links/5b9eed56299bf13e6037c364/Routing-AODV-Defending-Black-Hole-Attack-through-NS3-in-Manet.pdf)

[Paulus/publication/327224082_Routing_AODV_Defending_Black_Hole_Attack_through_NS3_in_Manet/links/5b9eed56299bf13e6037c364/Routing-AODV-Defending-Black-Hole-Attack-through-NS3-in-Manet.pdf](https://www.researchgate.net/profile/Rajeev-Paulus/publication/327224082_Routing_AODV_Defending_Black_Hole_Attack_through_NS3_in_Manet/links/5b9eed56299bf13e6037c364/Routing-AODV-Defending-Black-Hole-Attack-through-NS3-in-Manet.pdf)

SIMULATION:

2018 - <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8629603>



**NOWADAYS , MOST OF THE
NETWORK SYSTEMS ARE DESIGNED
TO WORK FAST. BUT THE RIGHT
FORMAT IS, WE HAVE TO CHECK
THAT HOW SECURE IT IS !!!**

MANET

A **MOBILE AD HOC** NETWORK (MANET) IS A CONTINUOUSLY **SELF-CONFIGURING**, SELF-ORGANIZING, **INFRASTRUCTURE-LESS** NETWORK OF MOBILE DEVICES CONNECTED WITHOUT WIRE

AODV

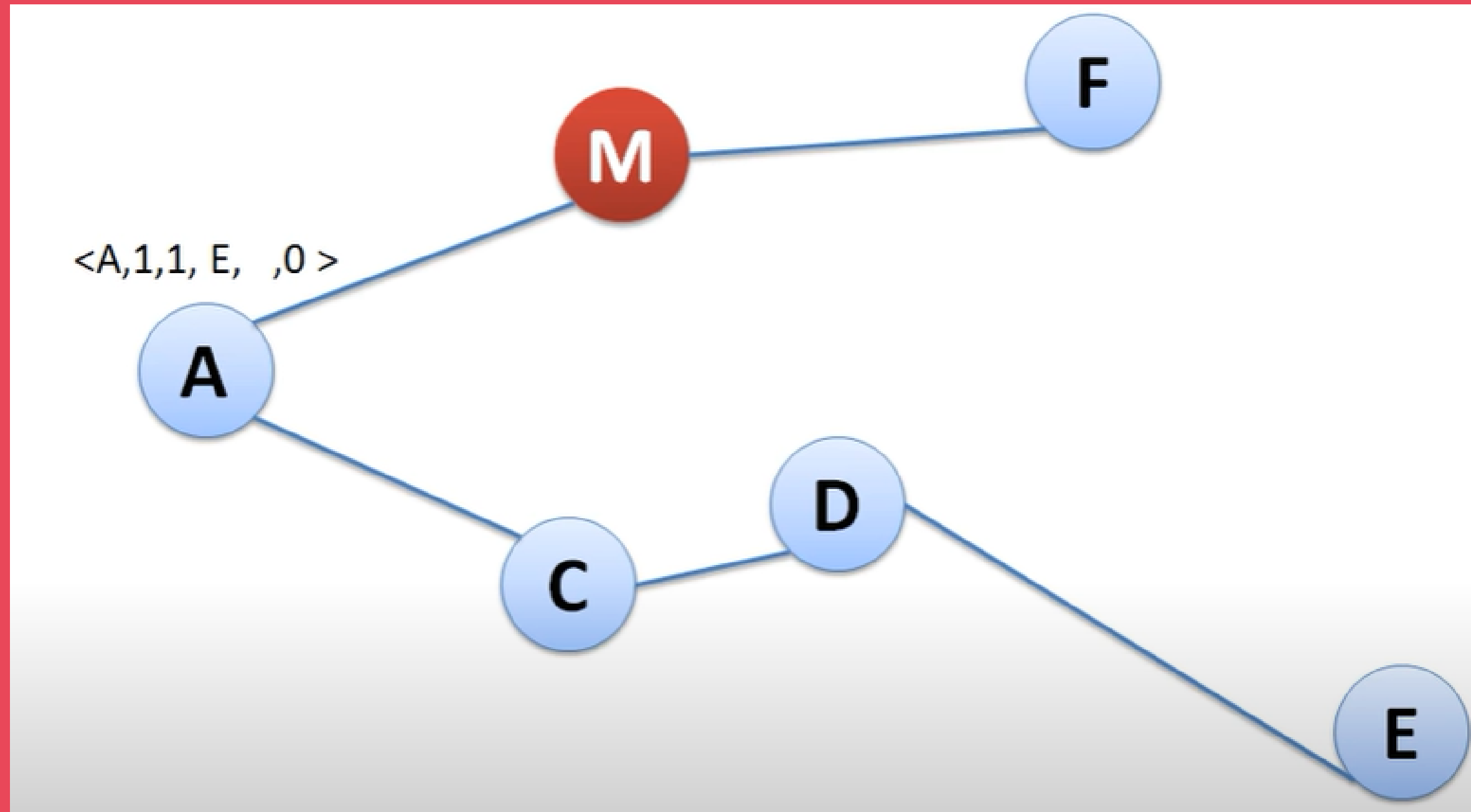
AODV (AD-HOC ON-DEMAND DISTANCE VECTOR) IS A LOOP-FREE ROUTING PROTOCOL FOR AD-HOC NETWORKS. IT IS DESIGNED TO BE **SELF-STARTING** IN AN ENVIRONMENT OF MOBILE NODES, WITHSTANDING A VARIETY OF NETWORK BEHAVIORS SUCH AS NODE **MOBILITY**, **LINK** FAILURES AND PACKET LOSSES

BLACK HOLE ATTACK

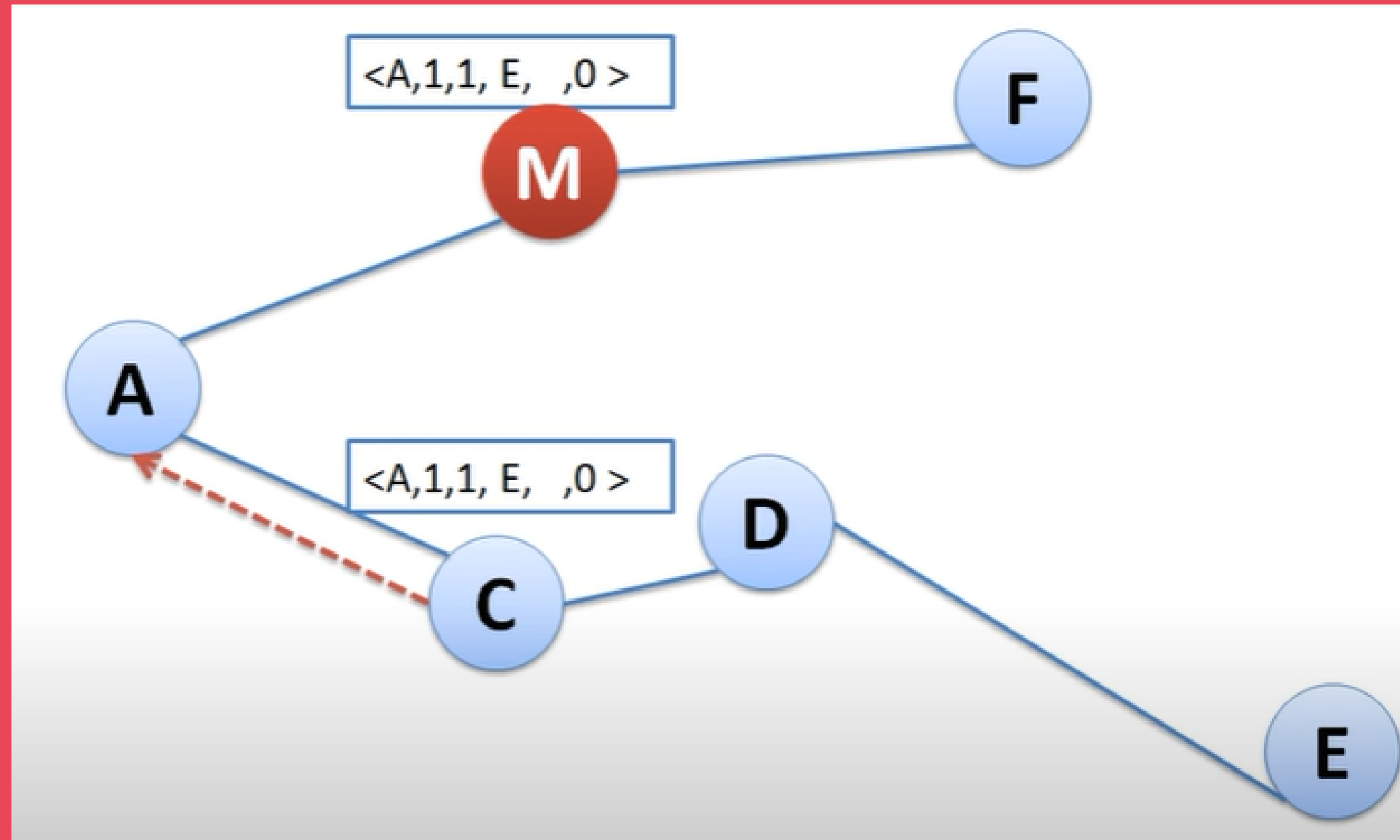
BLACK-HOLE ATTACKS OCCUR WHEN A ROUTER **DELETES ALL MESSAGES** IT IS SUPPOSED TO FORWARD



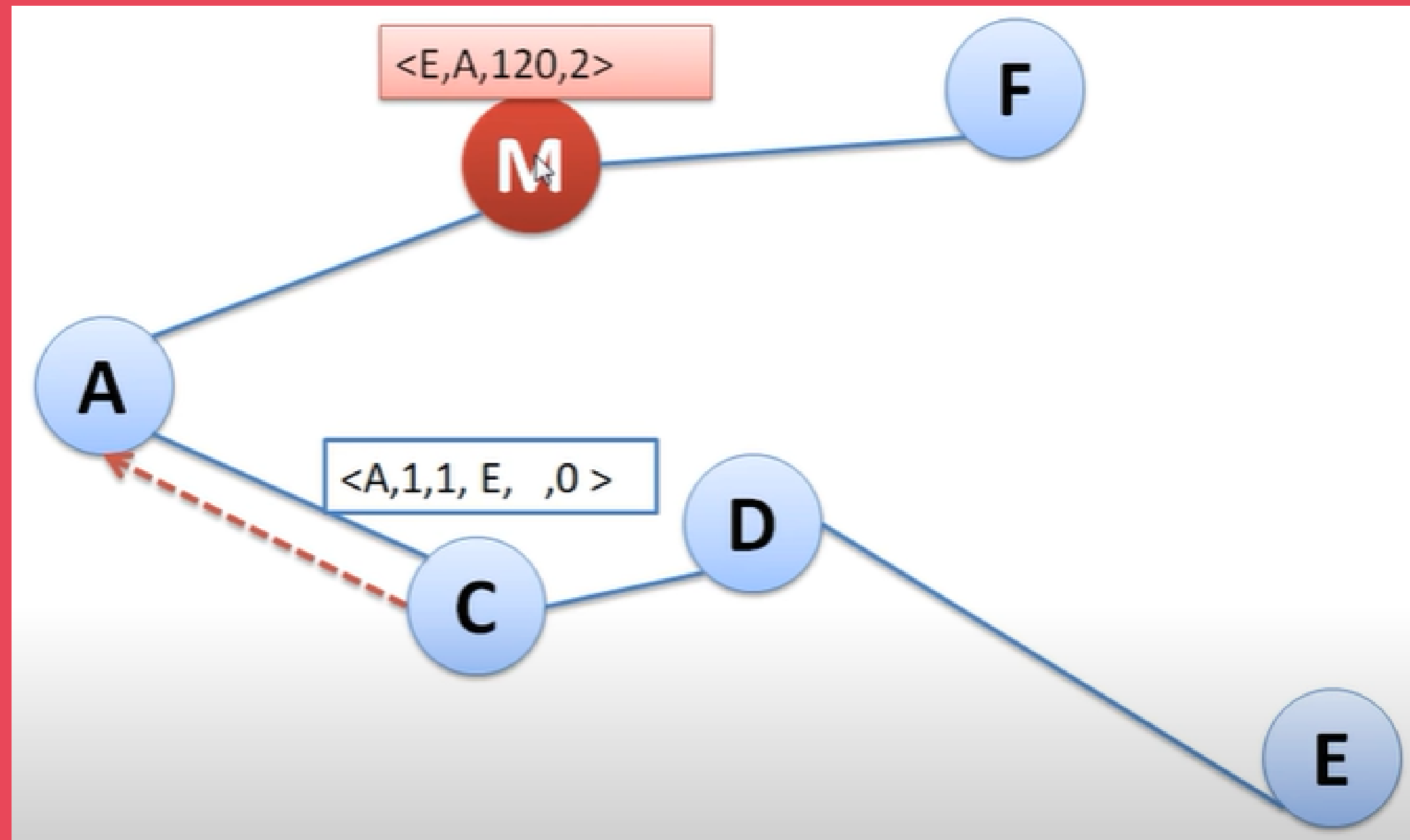
HOW DOES THE PROBLEM OCCURS?



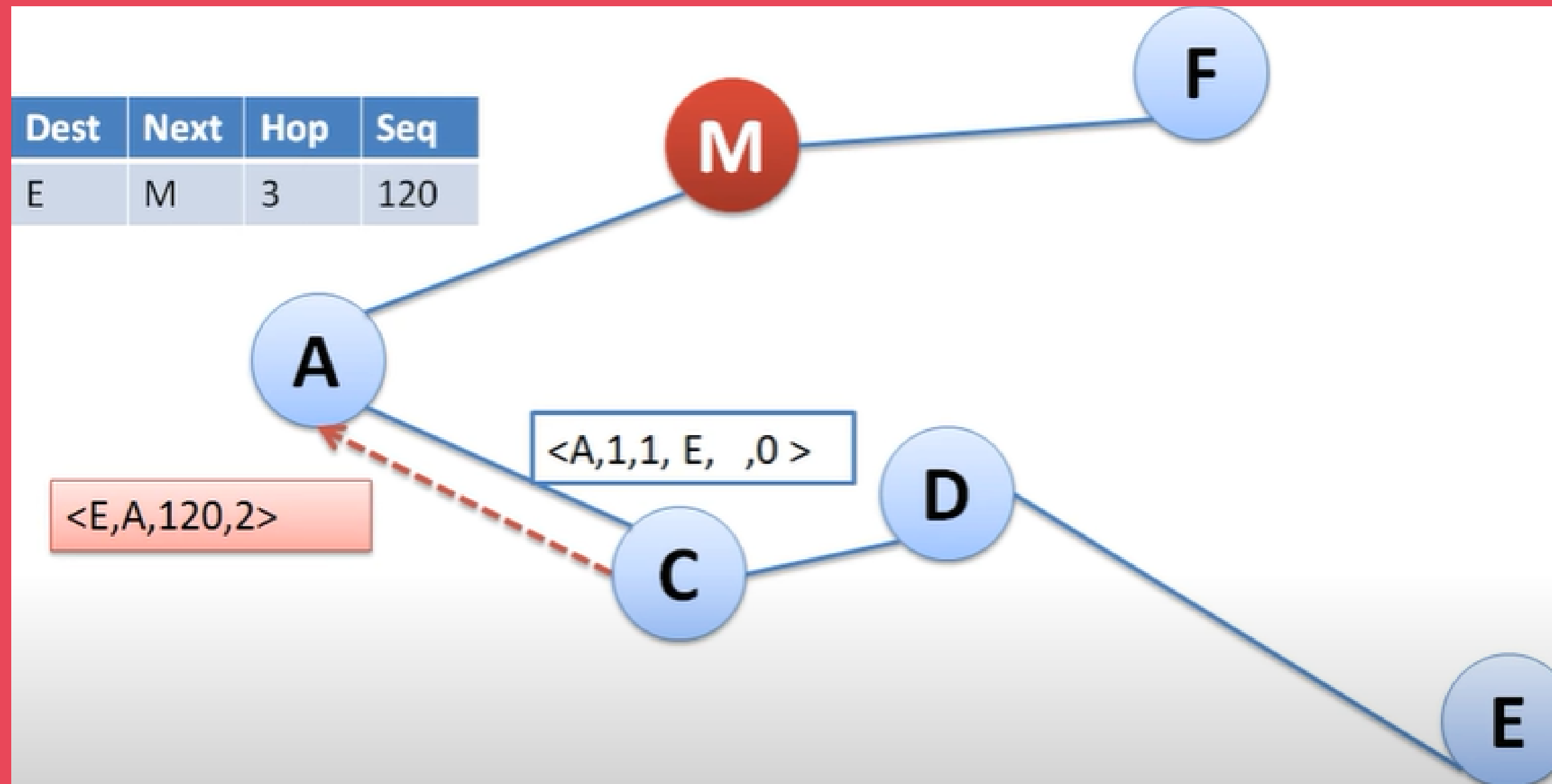
HOW DOES THE PROBLEM OCCURS?



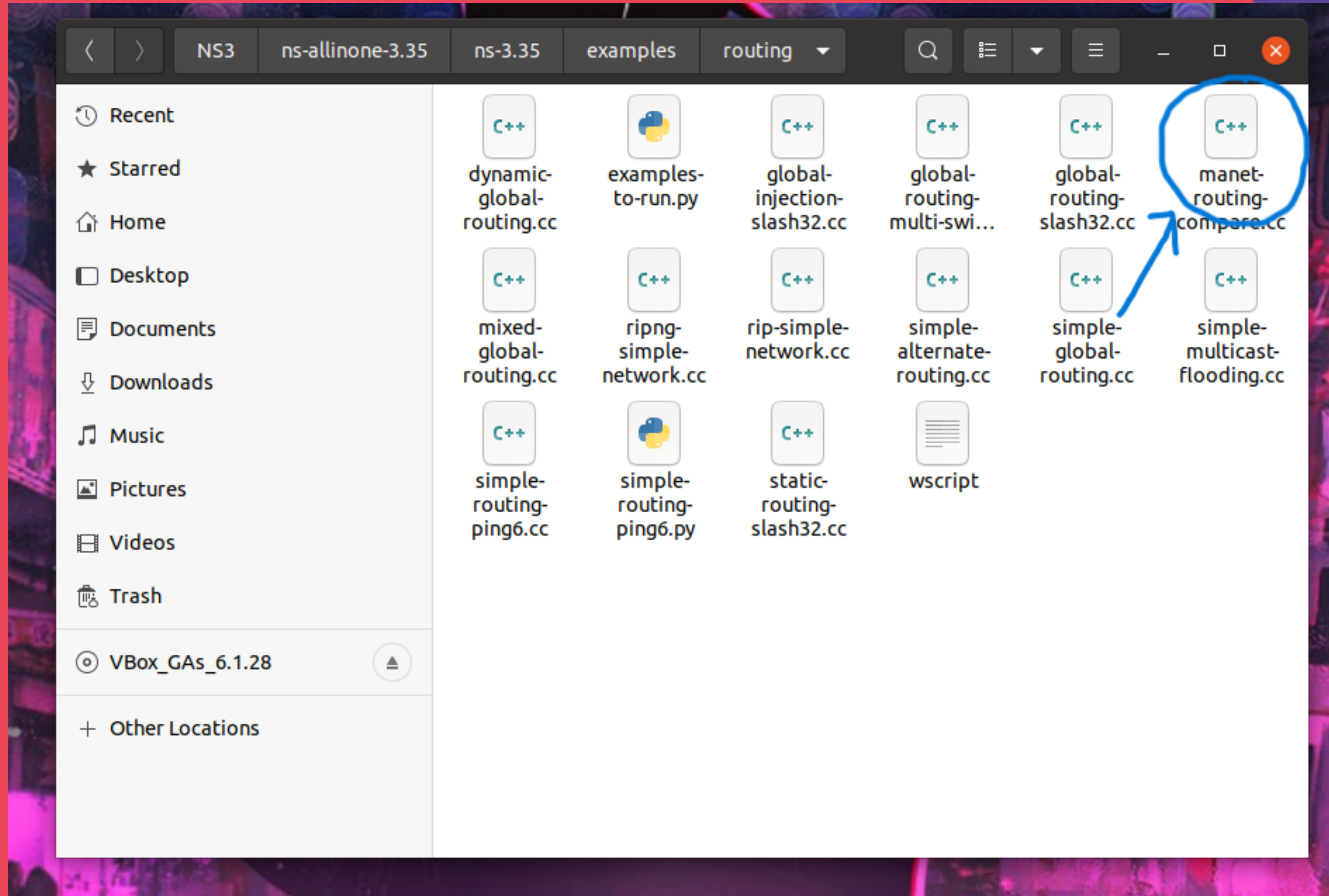
HOW DOES THE PROBLEM OCCURS?



HOW DOES THE PROBLEM OCCURS?



MANET ROUTING EXAMPLE



ADDING BLACK WHOLE NODE

```
// Enable AODV
AodvHelper aodv;
AodvHelper malicious_aodv;

// Set up internet stack
InternetStackHelper internet;
internet.SetRoutingHelper (aodv);
internet.Install (not_malicious);

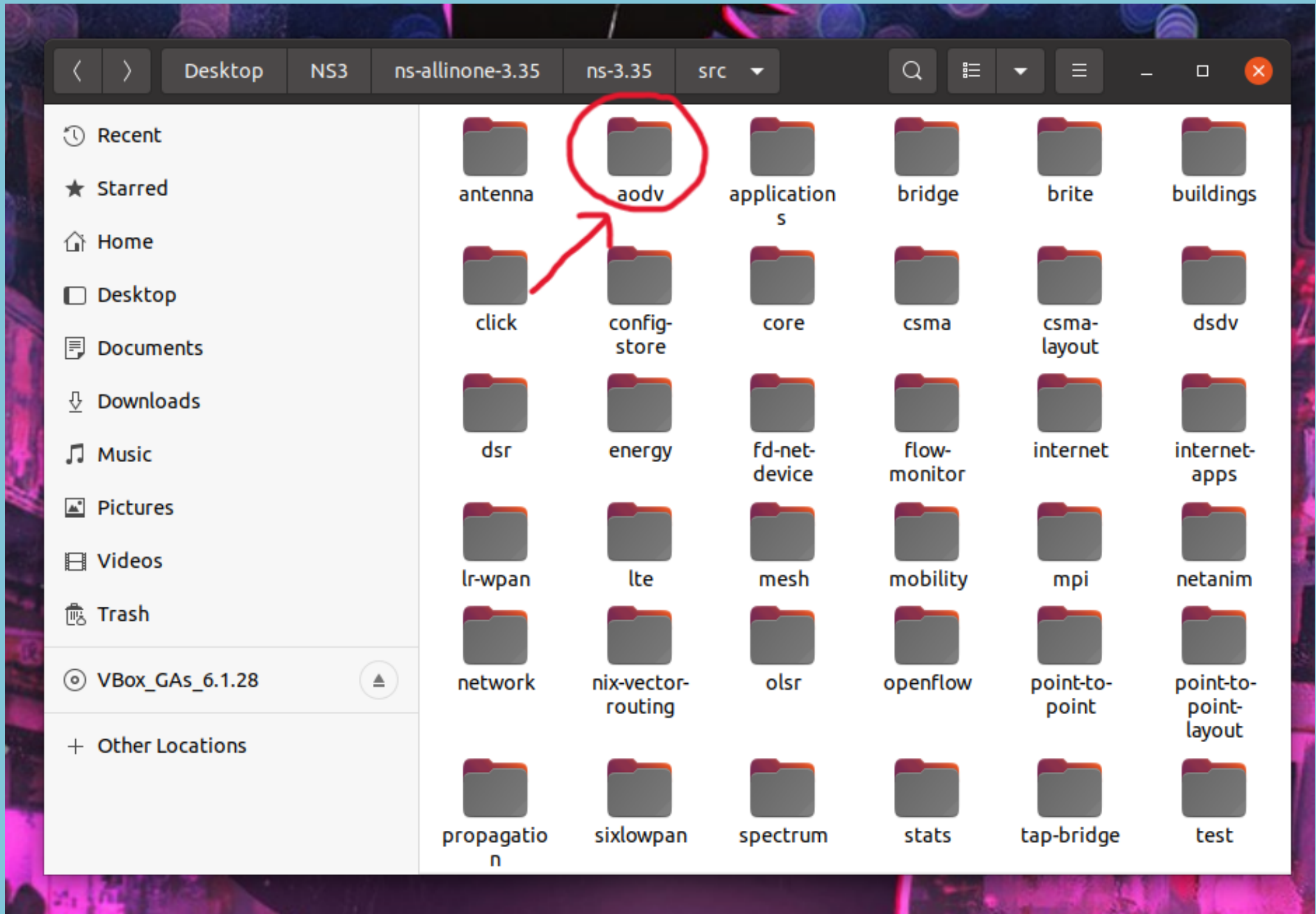
malicious_aodv.Set("IsMalicious", BooleanValue(true));
internet.SetRoutingHelper (malicious_aodv);
internet.Install (malicious);
```

SOLUTION

- INTENTIONAL FAKE RREQ
- FAKE RREP DETECT
- TRUST TABLE
- CLUSTARING
- ETC



THE PLACE WHERE TO UPDATE



ADDING RATING TABLE

I. Pending packet table

Packet ID	Next Hop	Expiry Time	Packet Destination
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- Packet ID: ID of packet sent.
- Next Hop: Address of next hop node
- Expiry Time: Time-to-live of packet
- Packet Destination: Address of destination node.

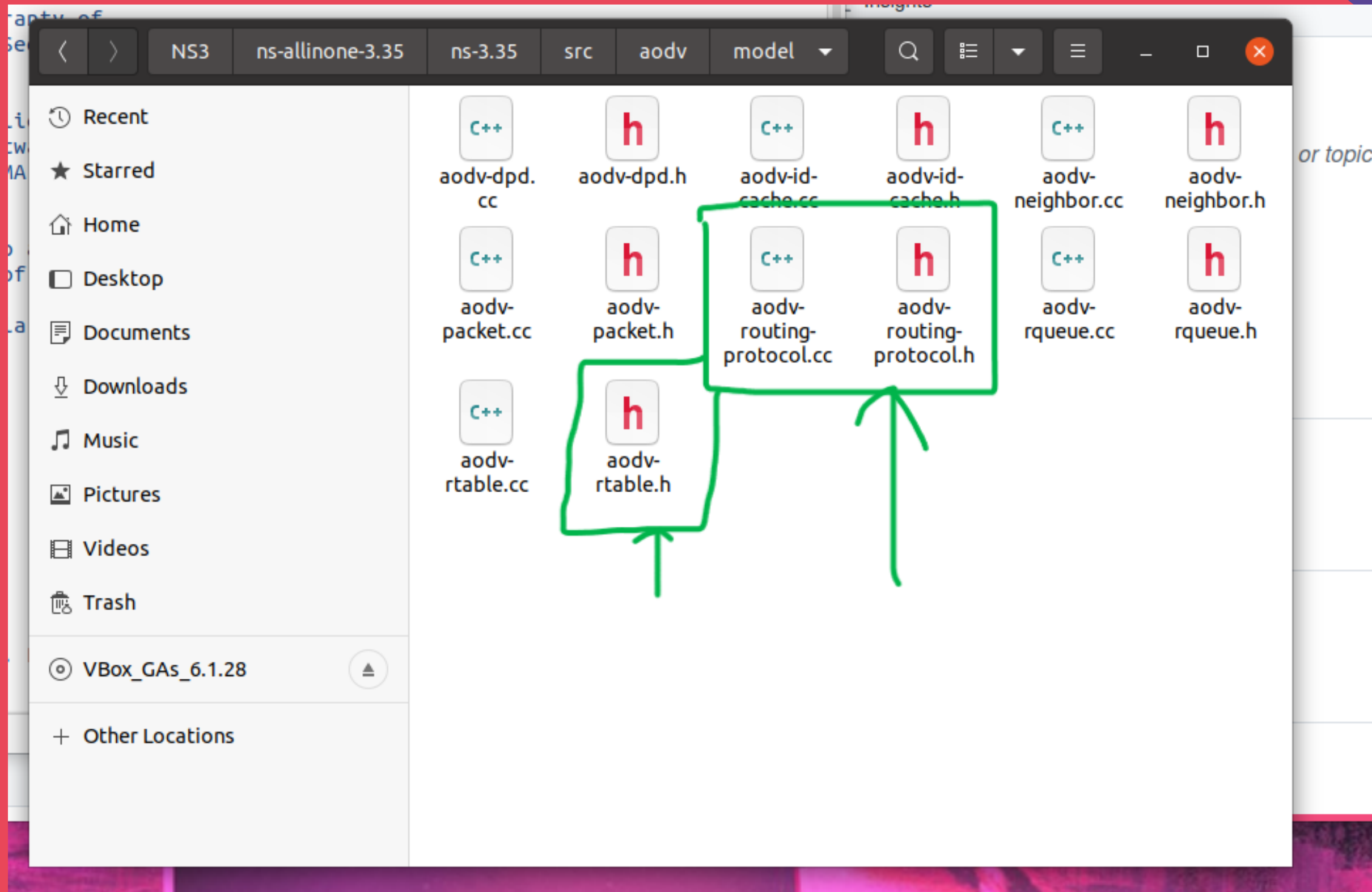
There are also four fields in node rating table, Node Address, Packet drops, Packet forwards and Misbehave. This table updated corresponding to pending packet table.

I. Node rating table

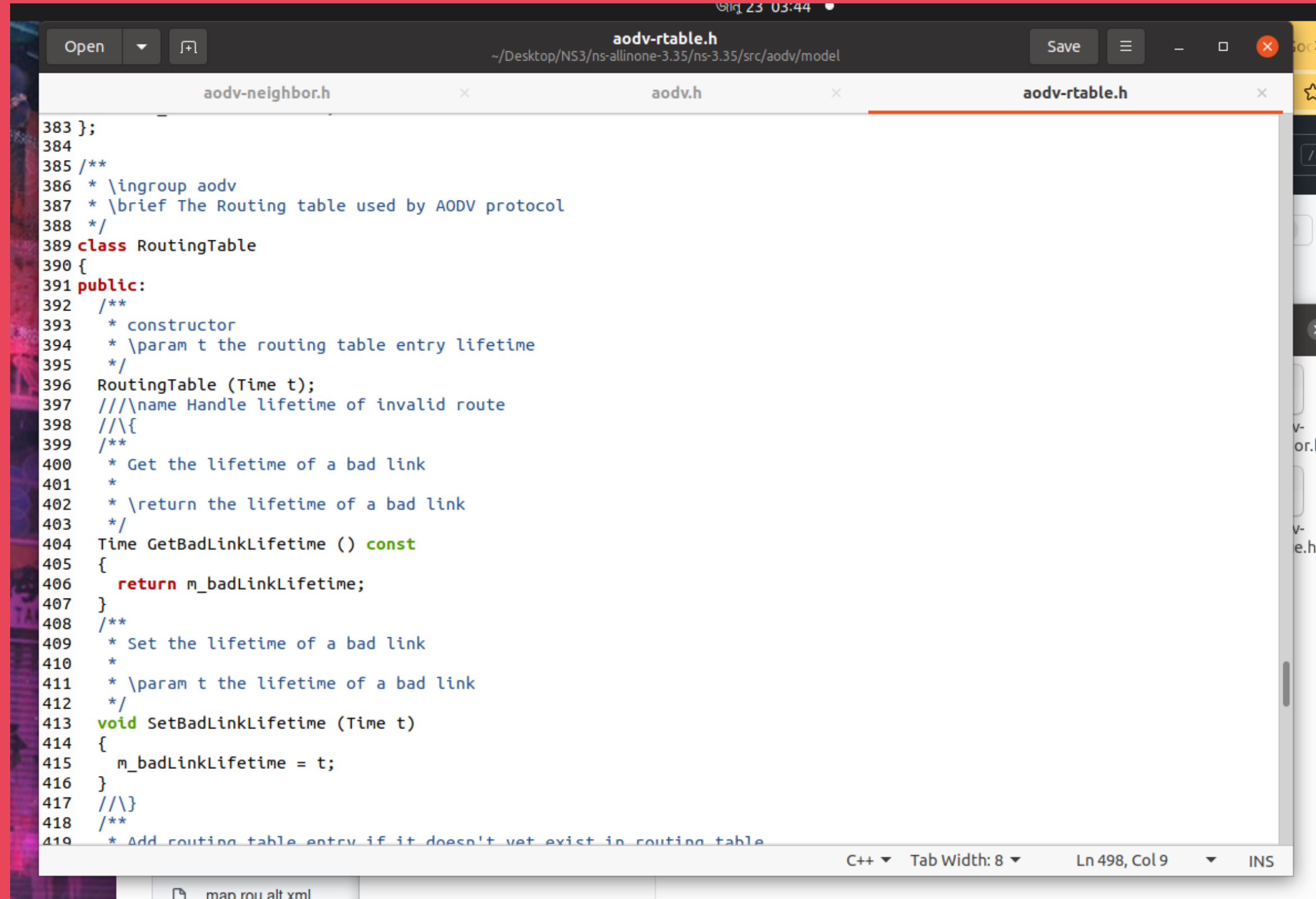
Node Address	Packet Drops	Packet Forwards	Misbehave
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- Node Address: Address of next hop node.
- Packet Drops: Counter for counting the dropped packet.
- Packet Forwards: Counter for counting the forwarded packet.
- Misbehave: It has two values 0 and 1, 0 for well behaving node, 1 for misbehaving

ADDING RATING TABLE



ADDING RATING TABLE



```
383 };
384
385 /**
386  * \ingroup aodv
387  * \brief The Routing table used by AODV protocol
388  */
389 class RoutingTable
390 {
391 public:
392     /**
393      * constructor
394      * \param t the routing table entry lifetime
395      */
396     RoutingTable (Time t);
397     ///\name Handle lifetime of invalid route
398     ///\{
399     /**
400      * Get the lifetime of a bad link
401      *
402      * \return the lifetime of a bad link
403      */
404     Time GetBadLinkLifetime () const
405     {
406         return m_badLinkLifetime;
407     }
408     /**
409      * Set the lifetime of a bad link
410      *
411      * \param t the lifetime of a bad link
412      */
413     void SetBadLinkLifetime (Time t)
414     {
415         m_badLinkLifetime = t;
416     }
417     ///\}
418     /**
419      * Add routing table entry if it doesn't yet exist in routing table
```


THE ALGORITHM

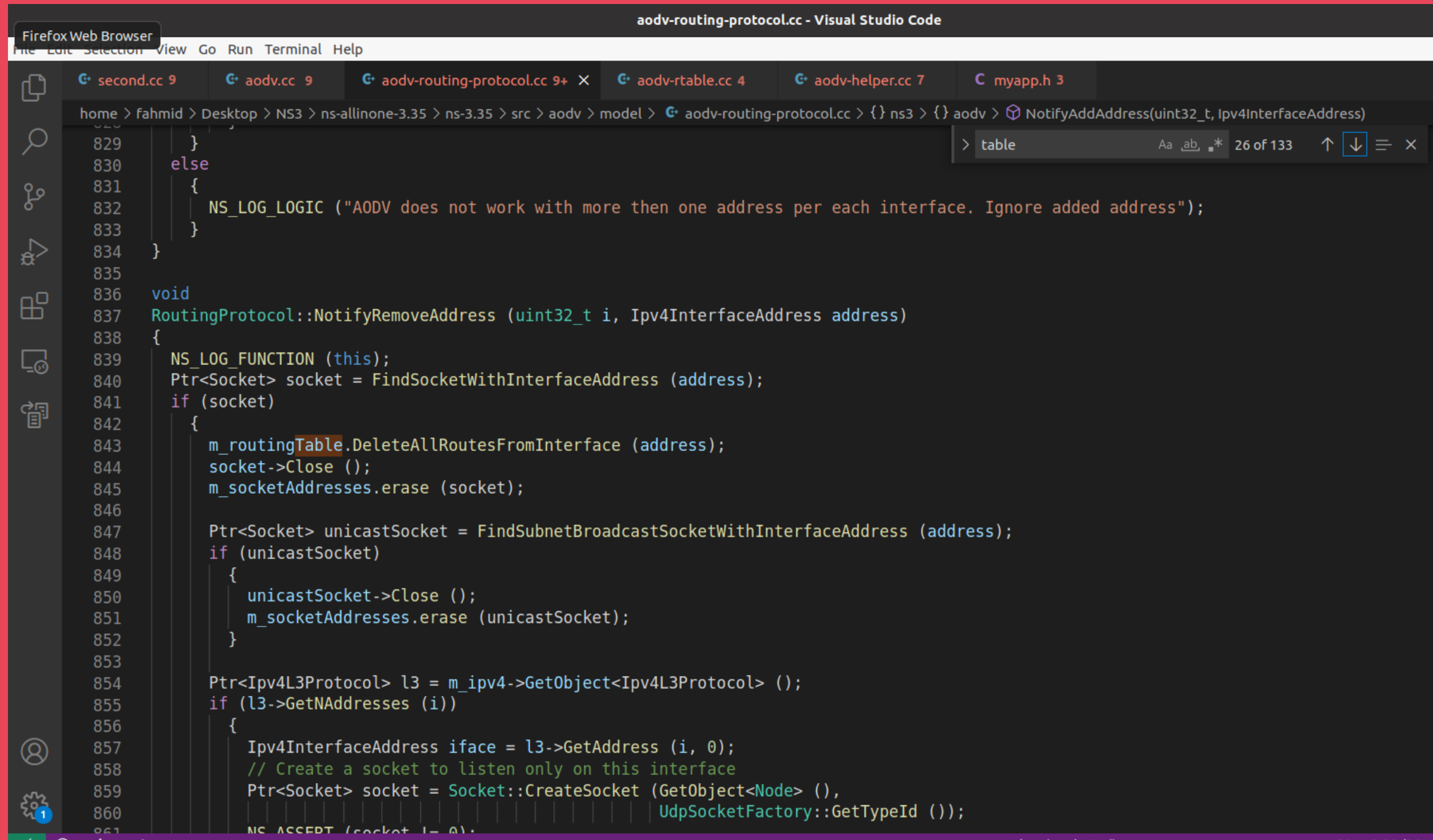


I. Pending packet table

Introduced mechanism proposed an algorithm is as follows:

1. Data packet forwarded or sent.
2. Copy and keep the data packet in pending packet table until it is expired or forwarded
3. If (data packet forwarded)
{
 Increment the corresponding forwarded packet in the node-rating table and remove the data packet from pending packet table
}
4. If (data packet expires in the pending packet table)
{
 Increment the corresponding dropped packet in the node-rating table and removes the data packet from pending packet table.
 If (dropped packet > threshold (th1)) then
 {
 If ((dropped packet / forwarded packet) > threshold (th1))
 {
 Node is misbehaving.
 Promiscuous node locally tells all the node of its wireless range that particular node is misbehaving node.
 Discard RREP message coming from the misbehaving node
 }
 }
}

ADDING RATING TABLE AND ALGO



```
home > fahmid > Desktop > NS3 > ns-allinone-3.35 > ns-3.35 > src > aadv > model > aadv-routing-protocol.cc > {} ns3 > {} aadv > NotifyAddAddress(uint32_t, Ipv4InterfaceAddress)
> table Aa ,ab, .* 26 of 133 ↑ ↓ ≡ ×

829     }
830     else
831     {
832         NS_LOG_LOGIC ("AADV does not work with more then one address per each interface. Ignore added address");
833     }
834 }
835
836 void
837 RoutingProtocol::NotifyRemoveAddress (uint32_t i, Ipv4InterfaceAddress address)
838 {
839     NS_LOG_FUNCTION (this);
840     Ptr<Socket> socket = FindSocketWithInterfaceAddress (address);
841     if (socket)
842     {
843         m_routingTable.DeleteAllRoutesFromInterface (address);
844         socket->Close ();
845         m_socketAddresses.erase (socket);
846
847         Ptr<Socket> unicastSocket = FindSubnetBroadcastSocketWithInterfaceAddress (address);
848         if (unicastSocket)
849         {
850             unicastSocket->Close ();
851             m_socketAddresses.erase (unicastSocket);
852         }
853
854         Ptr<Ipv4L3Protocol> l3 = m_ipv4->GetObject<Ipv4L3Protocol> ();
855         if (l3->GetNAddresses (i))
856         {
857             Ipv4InterfaceAddress iface = l3->GetAddress (i, 0);
858             // Create a socket to listen only on this interface
859             Ptr<Socket> socket = Socket::CreateSocket (GetObject<Node> (),
860             UdpSocketFactory::GetTypeId ());
861             NS_ASSERT (socket != 0);
```



EXPECTATIONS AND OUTCOMES

01 . Packet Delivery Ratio

A decrease in PDR is seen at the same time that is a black hole attack on AODV . we can see which is a successful increment in the PDR of modified AODV

02. Average Throughput

Throughput is decreases due to black hole attack but without black hole it is increases in modified routing AODVsee which is a successful increment in the PDR of modified AODV



EXPECTATIONS AND OUTCOMES

03 . Average End-to-End delay

Average End to End Delay with black hole attack is much higher than without black hole attack in AODV routing protocol.

04. Packet Drop Ratio

It is the ratio of the data lost at destination to those generated by the CBR sources . It increases as data travel much distance than before

SOFTWARE WE USED



NET-ANIM

NetAnim is an offline animator based on the Qt toolkit. It currently animates the simulation using an XML



WIRESRK

Wireshark is the world's foremost and widely-used network protocol analyzer. It lets you see what's happening on your network at a microscopic level



TRACEME TRICS

TraceMetrics is a trace file analyzer for Network Simulator 3 (ns-3).

THANK YOU !! 😊