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Effective Group Communication using Reliable Path Discovery Multicast Routing in MANET

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ABSTRACT: In MANET communication or data delivery through neighbor nodes, that are freely move within the network and number of times route modification situation for same sender or multiple senders is happening. Therefore successfully data receiving is the complicated task to take care of routing in decentralized dynamic network. MANET faces variety of challenges like limited bandwidth capacity, quality of service issue and determination of network topology for strong link establishment. In this research, we work on multicast protocol (Quality of Service) QoS enhancement. The Multicast routing is not anything but communication between a single sender to multiple receivers on a dynamic network and it transmits a single data or message to a select group of recipients. MANET communication is dynamic in nature and each and every node behaves like a both host and router. The proposed multicast routing work done is to resolve the whole drawback of channel sense based communication and congestion control queue management scheme with the assistance of range of effective communication technique therefore congestion control approach is provides effective multicast communication with the comparison of MAODV and ODMRP multicast routing protocols and improves quality of service parameter. The proposed multicast communication diminishes the packets dropping due to congestion and collision by utilizing the network limited bandwidth proficiently. The proposed protocols performance is better than ODMRP and MAODV. This proposed scheme improves the standard of service moreover as provides reliable communication in the network. The performance metrics like better throughput and reduced routing packets flooding shows the effective outcome of proposed scheme in dynamic network.

KEYWORDS: ***MAODV, ODMRP, QoS, Proposed Multicast Routing, Congestion, Collision and MANET.***

1. INTRODUCTION

Mobile Ad hoc mobile network (MANET) is designed to overcome the natural limitation of these wired backbone networks and infrastructure based wireless networks [1] and also the proper multicast communication improves the QoS (Quality of Service) [2]. Ad hoc mobile wireless networks are a collection of mobile nodes sharing a wireless channel and dynamically forming a temporary network topology without the existence of network infrastructure or centralized administration. Restricted by transmission range, each mobile node can only communicate with neighboring nodes within its radio coverage area [3].

In MANET lacking of centralized framework cause on Wireless Ad hoc Network to have not a clear and special topology. Wireless Ad hoc Network nodes in most portable devices, limited by the size of bandwidth capacity, the whole network system is bound with limited communication capability, to utilize proper bandwidth or channel capacity, it is necessary to sense the channel and balance the load at the nodes in Wireless Mobile Ad hoc Network [4] and we must minimize the possibility of collision and congestion [5] of the entire network. This is particularly important in emergency rescue, military operations, business meetings and other situations. From this perspective, the shortest route is not necessarily the best route. On the contrary, with some shortest hop configurations to replace the relatively long jump configurations may be better energy balance load communication choices available. Sending multiple copies of packet to different nodes is called Multicasting [6]. Wired and infrastructure-based wireless networks are supported by many multicast routing protocols. But, applying this concept in Mobile Ad hoc wireless networks (MANETs) is a big challenge. Problems in ad hoc networks are the scarcity of bandwidth, short lifetime of the nodes due to power constraints and dynamic topology due to the mobility of nodes. These problems put in force to design a simple, scalable, robust and energy efficient routing protocol for multicast environment.

In this research we proposed the better multicast routing by adding the concept of channel sensing and load

balancing with MAODV protocol and the performance of proposed multicast routing is compare with original ODMRP [7] and Original MAODV [8] in MANET. The proposed routing improves the performance of multicast communication and reduces the drop packets due to collision and congestion i.e. the main reason of improvement of QoS in dynamic network.

2. QoS in Manet

QoS problems with MANETs in multicast communications are even more difficult owing to the involvement of multiple senders and multiple receivers as we tend toll also additionally further furthermore in addition likewise moreover similarly still yet as cluster membership effort and connexion data storing are complicated therefore here we style design to resolve drawback of QoS [1] and load balancing beneath MANET [5]. Congestion control is also achieved by regulating the source's transmission rate, together with link algorithms that measure the congestion, perform congestion signaling and/or queue size management. The proposed scheme in this paper measures the channel situation for communication (channel condition for accessing) on each node. Then by proper sensing, accessing the medium on the basis of availability for transmission of data. The congestion possibility is happening because of improper balancing of load on the severely congested links, the scheme seeks to increase the transmission rates on these links, such that the overall system congestion is alleviate. The proposed load balancing scheme manage the queue length of mobile nodes for minimizes the congestion. The better QoS multicast routing improves the network performance with minimization of flooding of packets in dynamic network.

3. Literature Survey

Kanwalpreet Kaur et al. [2] Shows the performance analysis of the ODMRP and therefore the MAODV within the paper shows the comparisons of the protocol on the assorted parameters such consistence performance, finish to finish delay, Jitter etc. The performance of the protocol is known and analysis is completed by the simulation within the completely different situations. Quality of the services metrics that are known during this work are multicast, throughput, average multicast finish to finish delay and interference. The performance analysis shows that the operating performance of the ODMRP and MAODV performs higher on the premise of the metrics used for the analysis [1].

G. Santhi1 and Alamelu Nachiappan et al. [9] presents in Quality of service (QoS) is the performance level of a provider offered by the community to the user. Many of the multimedia purposes have stringent QoS specifications that have got to be satisfied. The intention of QoS provisioning is to achieve a more deterministic network behaviour, in order that expertise carried through the network can also be better delivered and community resources can also be higher utilized. However, there is still remnants a significant confront to provide QoS solutions and maintain end-to-end QoS communication with user mobility. The primary intention of the QoS attentive routing protocols is to investigate a route from a source to the destination that satisfies the requirement of the preferred QoS. The QoS attentive route is set within the constraints of bandwidth, minimal search, distance, and traffic stipulations. Given that route resolution is depend on the favoured QoS, the routing protocol may also be termed QoS aware.

Aparna K et al. [10] in this paper proposed a comparative performance of three multicast protocols for cellular advert hoc Networks – ODMRP, AMRIS and MAODV specializing in the results of changes such as the increasing number of receivers or sources and increasing the number of nodes. AMRIS used to be mighty in a mild traffic environment and not using mobility, however its performance was once prone to visitors load and mobility. ODMRP was once very robust and efficient in most of our simulation eventualities. Nonetheless, the protocol confirmed a trend of rapidly growing overhead as the quantity of senders elevated. The basic subject for improving the MAODV is the not easily broken of the bi-directional shared tree which inflicting the poor delivery ratio.

Garcia et al. [11] projected Core motor-assisted multicast routing protocol (CAMP), may be a receiver initiated shared multicast mesh routing protocol. CAMP extends the usage of core nodes to ascertain multicast mesh. Once a node needs to hitch a multicast cluster, it sends the be part of request message to multicast cluster. The primary node that receives the be part of request message responds to the node by causation a be part of acknowledgment message and it becomes a member of the multicast cluster. CAMP uses as several cores as desired for a given mesh (Garcia et al., 1999). It improves the network responsibility within the cases wherever the core of the cluster fails. In CAMP, rather than flooding the advertisement packets to the network, every core disseminates the mappings of multicast addresses to 1 or additional core addresses to the network (Vaishampayan and Garcia-Luna-Aceves, 2004).

Consequently, CAMP enhances the quantify ability of the protocol as compared to flood based mostly routing protocols. However, CAMP is predicated on unicast routing protocols and it may well be the Achilles' heel in routing practicality of CAMP.

Xue and Ganz et al. [12] projected, Quality of service support for ODMRP, and enhances the performance of ODMRP victimization admission management. The admission management determines whether or not associate degree incoming request is accepted or rejected supported offered and consumed information measure. once the intermediate nodes receive the Join-Query message, they compare worth the worth} of accessible band- breadth with a threshold value. If the nodes will give the specified information measure, they alter their states to registered mode and transmit the Join-Reply message. This mechanism reduces transmission traffic as a result of the causative nodes ar on the route to the supply node and even has enough information measure; however periodic messages to accumulate information measure data of neighbouring nodes scale back the offered information measure of the nodes.

Traditional unicast routing protocols designed for flat MANETs and ranked extensions, cannot scale well in large-scale MANETs. Similarly, ancient multicast routing protocols, e.g., flooding-based, tree-based, and mesh based mostly, cannot scale well in large-scale MANETs either In recent years, location-based unicast routing has attracted abundant attention as a result of it scales quite well in giant scale MANETs. consequently, researchers have projected to use location data in multicast routing protocols.

S. Basagni et al. [13] proposed the Location aware, dependable multicast for mobile unplanned networks, once a packet is to be multicast, the sender 1st regionally computes a shot of the worldwide topology in line with the placement and transmission radius data collected from all the nodes within the network. A multicast tree for the self-addressed multicast cluster is then computed regionally supported the shot. The ensuing multicast tree is then optimally encoded and is enclosed within the packet header. This protocol improves the quantify ability as a result of it eliminates the upkeep of the multicast session state in every router, that should be wiped out ancient multicast tree or multicast mesh based mostly protocols.

K. Chen et al. [14] proposed "Effective location-guided tree construction algorithms for little cluster multicast in MANET", that give tiny cluster Multicast (SGM) protocol supported packet encapsulation is projected. This protocol builds associate degree overlay multicast packet distribution tree on prime of the underlying unicast routing protocol. Completely different from the DSM protocol that computes the multicast tree at every sender, this protocol constructs the tree in a very distributed way: every node solely constructs its out-going branches to the next-level sub trees and forwards the packet to the roots of the sub trees. This method repeats till all the destinations are reached. This protocol is additional ascendable than the DSM protocol as a result of the nodes in a very cluster needn't to understand the worldwide topology. Instead, they're solely tuned in to one another in terms of the cluster membership and therefore the location data of the cluster nodes. However, this protocol doesn't specify a technique for dynamic joins and leaves in terms of location update among the cluster nodes. Therefore, this protocol is additional appropriate for the teams during which the cluster membership is static.

4. PROPOSED MULTICAST ROUTING ALGORITHM

Before Quality of service maintaining in group communication (multicast) beneath mobile ad-hoc network is one of the challenging tasks due to node mobility and coordination between member nodes. Some of researcher focuses the quality issue under unicast as well as multicast routing and resolve it, but in his work measure concern about efficient QoS in all dimensions are taken. Proposed approach initially executed multicast (MAODV) ad-hoc routing and forms a group as well as selects a coordinator based on node mobility and capacity of number of node handling. Selected coordinator takes the responsibility of member leaving and joining information and reliable channel discovery of source to group member nodes.

In Proposed multicast work first setup the path from source to group members based on route request flooding and while the route request packet receive the coordinator, than coordinator identifies the group id from packet and forward the route packet to all members where they belong within the group. Here we also identifies the channel capacity and its states (ideal, busy) for resolving the problem of collision, and while detected channel is busy than demand the new available channel from sender to coordinator and send the data from the ideal channel. In our approach we also resolve the congestion through the queue based approach and minimized the data drop. In our multicast routing approach routing overhead and average end to end delay are minimized, since coordinator selection is based on mobility and its range to cover maximum number of member nodes, so route broken problem are minimized, that is useful for fulfil the requirement of routing and delay minimization. During the communication while nodes are update the position from one location to other, than multiple region are control the communication with the help of inter cluster or coordinator communication that is drastically increases the

network performance as compare to existing MAODV (multicast ad-hoc on demand distance vector) and ODMRP (on demand multicast routing protocol).

Proposed Algorithm

In this section design the algorithm to provide the efficient quality of service to the multicast users, the algorithm define the basic input, output and procedure to define the simulation structure. Algorithm gives the better group communication with low overhead and delay under mobile ad-hoc network.

Algorithm: QoS MAODV
Input:
N: {N_i, N_j,…… N_{n-1}, N_n }number of nodes
G_j: group ϵ N
C_k: Coordinator
M_i: set of members in G_j
Routing: MAODV
R_r: radio Range
k:(i ,m,s) // group , member, status
Output: Throughput, PDR, Overhead
Procedure:
N_j ← generate the election msg(N_j, $Speed_j$, R_{rj})
While N_{n-1} receives election msg **do**
Compare-each($Speed_j$: $Speed_{n-1}$,Rr_j:R_{rn-1})
If speedj(min) && R_{rj}(Max) **Then**
C ← N_j
Else
C← N_{n-1}
End If
C_i← form G_i
C_m← broadcast win msg to all M_i
C_s ← Maintain join and leaving M_i status
End do
Data-pkt(S, M_i,pkt)
If path is available && channel is ideal **then**
S send data packet by C_k
C_k multicast the data to M_i
Else
$C_{k\leftarrow}$ search new ideal channel
End if
Calculate PDR ←(number of packets receive/number of packets send)*100
Packet-duration = End - Start;
If Packet-duration > 0 **then**
sum += packet_duration;
no of packet recv;
Calculate Avg-delay =sum/ no of packet recv;
End if

5. SIMULATION PARAMETERS AND PERFORMANCE METRICS

NS2 (Network Simulator) version ms-2.31 is event driven simulator designed specifically for analysis in wireless communication. The simulation ns-2 tool we've accustomed simulate the Ad hoc routing protocols developed [10] from Berkeley. To simulate the mobile wireless radio environment we've used a quality extension to ns that's developed by the CMU Monarch project at Carnegie Andrew William Mellon University. Since its origination in 1989, NS2 has endlessly gained tremendous interest from education, academia, and government purpose.
To investigate network performance, we will merely use associate degree easy-to-use scripting language to piece a network, and observe results generated by NS2. NS2 has become the foremost wide used open supply network system, and one amongst the foremost wide used network simulators.

5.1 Simulation parameters

The simulation parameters used for simulation in tgis research is mentioned in table 1.

Table 1.1 Simulation Parameters for Case Study

Number of nodes	50
Dimension of simulated area	800×600
Routing Protocol	ODMRP, MAODV
Simulation time (seconds)	100
Transmission Range	250m
Traffic type	CBR 3pkts/s
Packet size (bytes)	512
Agent type	TCP, UDP
Number of traffic connections	20
Maximum Speed (m/s)	30
Nodes Mobility	Random way point

6. SIMULATION RESULTS

The simulation results are evaluated in case of normal mesh based (ODMRP), Tree based (MAODV) and proposed modified congestion control MAODV.

6.1. Packet Delivery Ratio Analysis

The better number of packets receiving in network is shows the better routing performance of network. The number of packets sending is depend on the packets receiving in network and the whole performance of network is affected if the packets loss is more due to congestion and collision in dynamic network. In this graph the PDR performance of three protocols are evaluated and observe that the performance of proposed QoS is better than other protocols like ODMRP and MAODV protocols. In these protocols the congestion and collision of data is more due to that the packet receiving is affected and the PDR

performance is degrades. In this research the PDR of proposed multicast routing is about 96% but in rest of two protocol performances is 80% and 85%. The proposed scheme is improves multicast communication to reduces the possibility of congestion and collision.

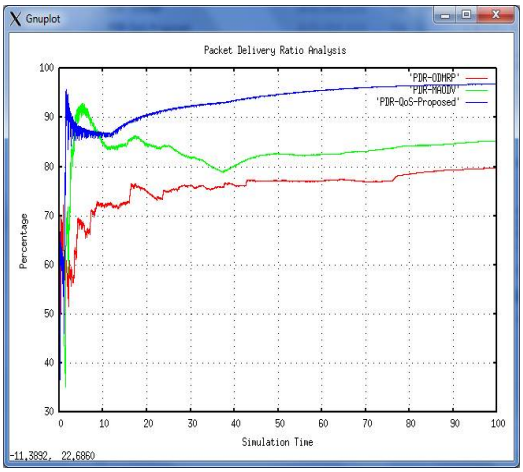

Fig.1 PDR Analysis

6.2. Throughput Performance Analysis

The multicast routing performance in dynamic network is affected due continuously movement of nodes. The wireless network has a limitation of bandwidth capacity by that the possibility of congestion in wireless network more. In this graph the throughput performance of proposed multicast protocol is better because of channel sense based communication and congestion control by queue estimation in dynamic network. The proposed throughput is about 160pks/sec and rest of them performance is 40pks/sec and 65pks/sec up to closing stage of simulation time. The proposed multicat routing improves QoS i.e. provides enhanced performance than normal ODMRP and MAODV protocols in MANET.

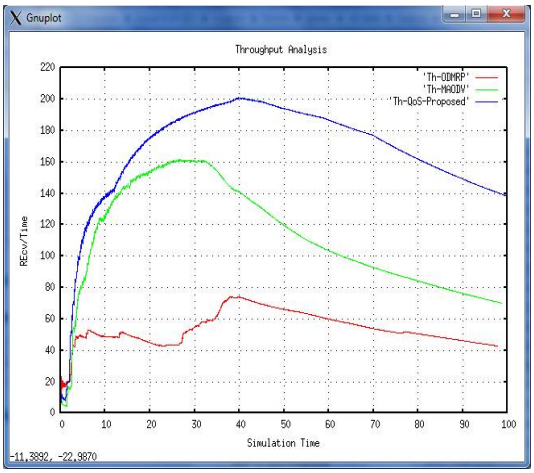

Fig.2 Throughput Performance Analysis

6.3. Routing Packets Analysis

The routing packets in network are flooding for finding the destination. The quantity of routing packets in multicast routing protocol is more because of finding the more than one destination to single source. The routing packets flooding is MANET is identified the destination and also their enhance quantity due to link breakage is affected data packets delivery. In this graph represents the packets flooding of ODMRP, MAODV and proposed well again QoS multicast routing. The routing packets flooding of ODMRP is maximum about 7200packets and MAODV is 7000 packets but the performance of proposed QoS improved multicast routing is 5200 only. Here due to proper sensing of channel befor transmission and balance load by queue estimation provides efficient results.

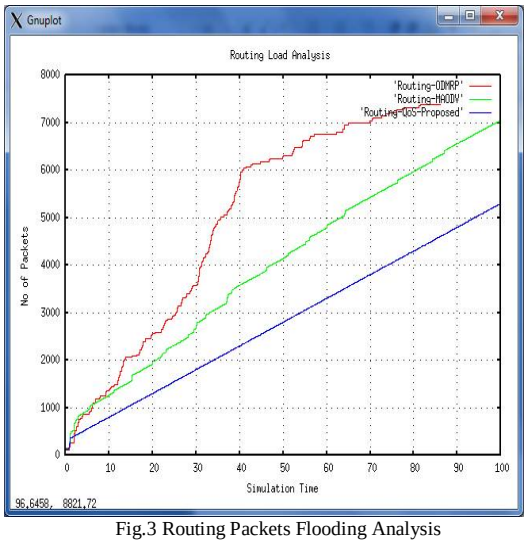

Fig.3 Routing Packets Flooding Analysis

6.4. UDP Data Send Analysis

The transport layer is control the flow of data and maintains the synchronization at the end. The User Datagram protocol (UDP) is one of the transport layer protocol in network. This protocol is less reliable for the sending and receiving of data due to absence of reply mechanism of receiver to sender of successful data receiving. This graph represents the data sending analysis of ODMRP, MAODV and proposed multicast routing with get better QoS. The proposed multicast protocol has sending data as equal to normal MAODV protocol but little bit less than ODMRP protocol.

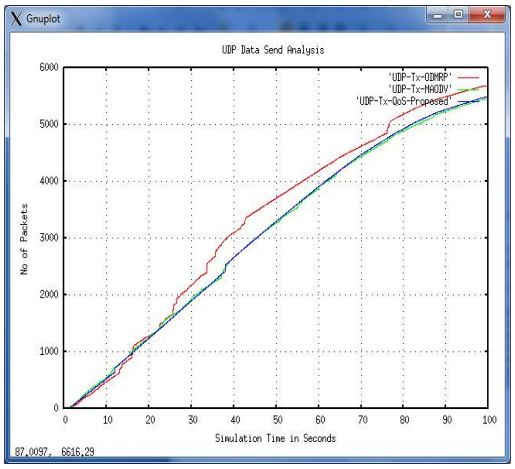

Fig.4 UDP Data Send Analysis

6.5. UDP Receives Analysis

The transport layer UDP protocol end to end data receiving analysis is represents through this graph of all three protocols. The proposed protocol are improves quality of service (QoS) of multicast protocol by handling the congestion and collision in dynamic network. The UDP packets receiving of proposed multicast protocol are highest about 6200 and remaining of two is 4300 and 4600. The data loss in proposed QoS routing is less that is the sign of well again multicast routing performance in dynamic decentralized network.

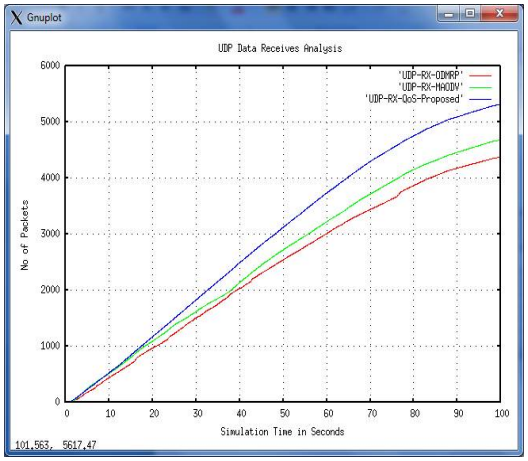

Fig.5 UDP Receives Analysis

6.6. UDP Data Lost Analysis

The loss of data in network is not possible to completely obstruct in decentralized dynamic network. The little bit or desired loss of data according to sender or host is imagined, that provides better routing performance. The UDP end data loss analysis of all three protocols is observe here and decided that the proposed multicast protocol loss is really minimum only nearby 200 packets but rest of them is about 1300 packets and 800 packets, which degrades the multicast routing performance in network.

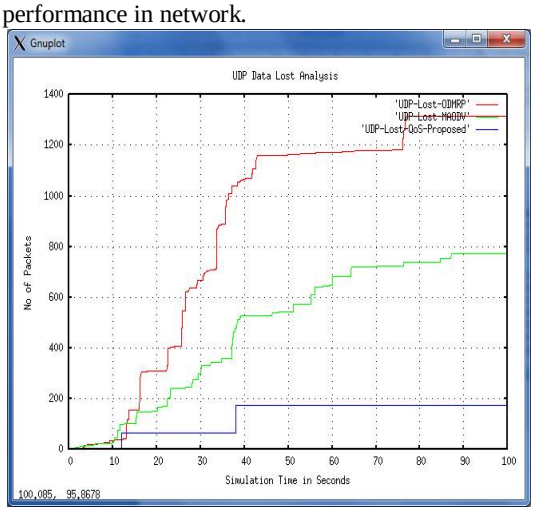

Fig.6 UDP Loss Analysis

6.7. Performance of ODMRP, MAODV and Proposed-QoS

The multicast protocol is required for sending the same data to multiple receivers and the performance of network is affected if the collision or congestion possibility is arising in network. The ODMRD and MAODV are the better multicast protocols but these protocols are not having capability of channel sensing and load estimation. The proposed multicast protocol improves QoS and reduces the possibility of congestion and collision with better routing performance.

Table1 Complete Performance Analysis

Parameter	ODMRP	MAODV	Proposed-Qos
Send	5494	5494	5494
Recv	4377	4681	5320
Routingpkts	7395	7057	5308
Pdf	79.67	85.2	96.83
Average E-E Delay(Ms)	3.05	0.31	0.12
NRL	1.69	1.51	1.0

7. CONCLUSION AND FUTURE WORK

The multicast routing protocols like ODMRP (Mesh based) and MAODV (Tree based) are transmitting packets from a source or a group of sources to a group of one or more hosts that are recognized by a

single destination address. Multicasting routing protocols are greatly reduces the transmission cost when sending the same packet to multiple recipients or destinations. It can improve the usage of wireless links by sending multiple copies of data packets using inherent broadcast behavior of wireless transmission though reducing transmission overhead. The main problem in MANET is limited bandwidth capacity by that the QoS of routing in dynamic network is affected by the possibility of collision and congestion. The proposed research work is done on to decreases the collision and congestion by sensing of channel for communication and balancing the load for handling congestion. The normal multicast routing protocols are not able to handle the collision and congestion in dynamic network. The proposed research is represents the modification in multicast routing that improves the QoS parameter of network. The minimum packet loss and maximized throughput is shows the enhanced multicast performance with minimum flooding of control packets or routing packets. The performance of three protocols like Mesh based (ODMRP). MAODV (Tree based) and proposed modified tree based multicast routing is evaluate and decided that the proposed routing performance is provides balanced data delivery. The end to end un-reliable UDP protocol performance is also measures i.e. provide better result in proposed multicast communication.

In future we also applied the channel sense scheme in multipath protocols like MP-DSR (Multipath DSR) and AOMDV (M is for Multipath) routing protocols and also try to established connection to that nodes in network their mobility speed low, just avoids the involvement of higher mobility nodes in routing procedure of multipath and multipath routing protocols in MANET.

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