Optimized CAR based Adaptive Routing in Mesh Network

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Optimized Raco-Car Based Adaptive Routing in Mesh Network

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Abstract: Network management is a challenging issue due to the growing size of the network. Many solutions are proposed for network management, but there is always difficulty arises when the existing infrastructure changes. Software defined network (SDN) is an emerging phenomenon in computer networking. It has centralized management, security and reliability. Data availability is the main challenge in today's data centers, so data replication is an effective approach. But to achieve low latency and high throughput for data replication operation, the traffic load must be spread out evenly across various paths in the data center network to minimize congestion. SDN is a solution to control traffic forwarding in a desired way. The proposed work aimed to develop a SDN based framework for effective data replication operation. The adaptive routing scheme which routes the flows based on the current network state is proposed, it chooses routes based on the current load paths. So there is a need for optimal routing algorithm. Several routing algorithms based on Ant colony optimization techniques were used but to a this work proposes regional ant colony optimization –cascaded adaptive routing (RACO-CAR)algorithm scheme with the following techniques: 1) table elimination by removing redundant information, 2) table sharing by grouping pheromone information to merge table content and 3) cascaded routing that assigns traffic to different uncongested regions to balance traffic thus it can have lower average latency and higher saturation throughput.

Key words: SDN・Regional ant colony optimization (RACO-CAR)・Data replication operation

INTRODUCTION

Network routing is important in all the field of engineering. SDN is routed as a most promising solution. The key idea of SDN is to decouple the control plane from the data plane and allow flexible and efficient management and operation of the network via software programs. Specifically, devices (e.g., switches and routers) in the data plane perform packet forwarding, based on rules installed by controllers. Controllers the control plane over see the underlying network and provide a flexible and efficient platform to implement various network applications and services. Under this new paradigm, innovative solutions for specific purposes (e.g., network security, network virtualization and green networking) can be rapidly implemented in form of software and deployed in networks with real traffic.

Routing Techniques: Hierarchical routing is proposed in network they are well know technique they are some advantages related to scalability and efficient communication. The concept of hierarchical routing is also used to perform energy-efficient routing . Location based routing is used to perform the distance between neighboring nodes can be estimated basis on incoming signal strengths. Relative coordinates of neighboring nodes will be obtained by exchanging such information between neighbors. In Query based routing this kind of routing, the destination nodes propagate a query for data sensing task from a node through the network and a node having this data sends the data which matches. In Negotiation based routing protocols use high level data descriptors n order to eliminate redundant data transmissions through negotiation. Communication decisions are also taken based on the resources that are available to them. In QoS-based routing protocols, the network has to balance between energy consumption and data quality. In particular , the network has to satisfy certain Qos metrics.Sequential assignment routing proposed in is one of the first routingprotocols.

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Review of Routing Techniques for Traffic Balancing: Traditional networks were designed to forward packets for m source to destination using the shortest route possible. In many cases , static network bandwidth and latency requirements of applications. The innovations in networking are mostly around increasing the throughput or packet forwarding capacity of network devices such as routers and switches. Software-defined networks (SDN) changed the way networks are designed, developed and deployed, providing significant opportunities for service providers to delivery infrastructure, optimize their network architecture, launch newer services and and improve the overall end-user experience [1].

Adaptive Clustering Based Dynamic Routing: Wireless sensor network use battery powered sensor nodes for sensing , the energy efficiency in critical to extend the lifespan. The performance depends upon the trade off among energy consumption , latency and reliability. Data aggregation is the fundamental approach to eliminate redundancy and minimize transmission cost to save energy. Dynamic clustering based routing is used to achieve good performance by adaptive algorithms. The generalized Ant Colony Optimization is designed to increase the reliable lifespan of sensor nodes with energy constraints. Each sensor node is designed as an artificial ant and dynamic routing is designed as ant foraging. Route invents , data aggregation and information loss are designed as the processes of pheromone diffusion, accumulation and evaporation. Each sensor node can be calculated the residual energy and dynamically calculates probabilities to select an optimal channel to extend the lifespan of WSNs. [2]. Several ACO systems were developed, with features like making the ants has two kinds of pheromones with different evaporation rates. The temporal pheromone variation which helps to capture hidden-state dependencies of upcoming congestion status. Information provided by the proposed two schemes improves the system performance [3]. To overcome the problem in civilian applications of mobile ad hoc networks in order to stimulate the nodes for packet forwarding, a simple mechanism based on each node is provided to protected against misuse [4].

ACO-Based Cascaded Adaptive Routing: Ant Colony Optimization is a bio-inspired algorithm which is applied in optimization problems. The performance of network is generally dominated by traffic distribution and routing. With more precise network information for path selection is used pheromone, ACO-based adaptive routing has higher potential to overwhelm the unbalance and unpredictable traffic load. The implementation cost of ACO is in general very high to store network information in pheromone memory, which is a routing table of all destination-channel pairs [5].

Problem Identification: To reduce the traffic of nodes in cluster ACPO is used in the temporal network. To minimize the time to find the cascaded points in the cluster and also it form table for finding the shortest path for sending the packets. From the table we want eliminate the redundant information of the nodes and from that we want to find the shortest path for sending the packets to the destination node. A number of approaches to exploiting sink mobility for data collection in WSNs have been proposed in recent years. In single hop communication, we can easily minimize energy consumption, however, at the expense of high data delivery delay. In this second solution, node delay is low but the energy consumption due to multi hop communication is rather high. It takes lots of time to find the destination and it also spread traffic load. Broadcasting by flooding loads to information redundancy .Identification of congested router. If they are not found the network becomes more traffic.

Raco-Car Based Adaptive Routing in Mesh Network: To overcome the table cost problem encountered when designing of an ACO based adaptive routing scheme for mesh based network .The primary goal is to model the ant colony metaphor by considering additional mesh-based characteristics and appropriately transforming ACO-based adaptive routing to fit mesh-based network-on-chip systems. To reduce implementation cost of a routing table and balance network load will helps the RACO-CAR. Our proposed system aims at minimizing the overall network overhead and energy expenditure associated with the multi hop data retrieval process while also ensuring balanced energy consumption among SNs and prolonged network lifetime. This is benefited through building cluster structures consist of member nodes that route their measured data by their assigned cluster head. Clustering has proved to be an effective approach for organizing the network in the above context. Besides achieving energy efficiency, clustering also reduce channel contention and packet collisions, resulting in improved network throughput under high load.

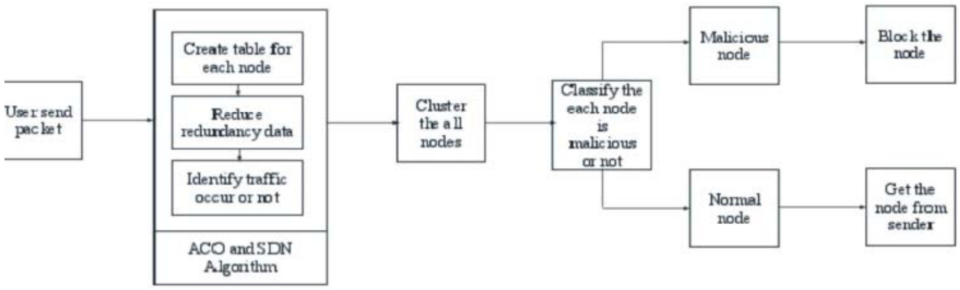

Fig. 1: System Architecture

The overall system architecture is depicted here. The user sends the packets to the nearest node. Then it will create the table for each node and it will eliminate the redundant data in the table. Then it will identify the weather the node is in online /offline then the node can transfer the packet. It form a cluster of all the nodes and authenticate the node whether it is malicious node / not if it is malicious node then the node must be blocked.

Cluster Formation: Nodes cooperate to form clusters and each cluster consists of a CH along with some Cluster Members (CMs) located with in the transmission range of their CH. While a node takes part in the network, it is allowed by itself as a CH. In this model, if a node proclaims itself as a CH, it sends a CH Hello Packet (CHP) to notify neighboring nodes periodically. The nodes that are in this CH's transmission range will accept the packet to participate in this cluster as cluster members. On the other hand, when a node is deemed to be a CM, it has to wait for CHP. It will receive CHP, the CM replies with a CM Hello Packet (CMP) to set up connection with the CH. Afterward, the CM will join this cluster; meanwhile, CH and CM keep in touch with each other by sending CHP and CMP.

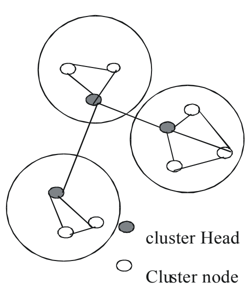

Fig. 2: Cluster formation

Redundant Information Removal by Table Elimination: To reduce information elimination, the relationship between information elimination and saturation throughput will be 16 * 16 mesh is analyzed. The experimental will change the observation window size (i.e., the range of size of observation window is 1-8) and records each saturation throughput. Different size of observation window in different traffic patterns. For random traffic and transpose1 traffic, gives a suitable information elimination value exists with performance degradation, when size of observation window is 6 and equals the low bound of the range of size of observation window, which is derived by (2). In under transpose1 traffic, due to high average of hop count and high deviation of hop count, performance degrades dramatically as the decrease of size of observation window. For hs-center traffic and hs-row traffic, a suitable information elimination value exists with , when size of observation window is 6. In summary, size of observation window ¼ 6 is chosen to construct the routing table. If the destination does not belong to the observation region, we need to search a cascaded point and route a packet to it. Then we can check whether the destination is in the observation region again. If the destination belongs to the observation region, the packet is routed to the destination directly and this process is terminated. The algorithm 1 explains the process of CACO Algorithm.

Algorithm 1: RACO-CAR-Cascaded

```
begin
 var: dest, obsrregn, cdpt;
 if dest belongs to obserregn then
 check dest in obserregn;
 else
 search cdpt;
 route cdpt;
 end if
end.
```

Cascading Routing for Balance Traffic Trough SDN: This work sets size of observation window ¼ 6 and network throughput ¼ 8 for RACO scheme. Besides, we use Minimum Congestion Searching to assist the regional ACO scheme will make a better routing decision by increasing flexibility for the search for cascaded regions. The performance of regional ACO-based cascaded adaptive routing is compared with the output buffer length, neighbour's-on-path and Regional congestion awareness quadrant. Average latency for output buffer length, neighbour's-on-path, Regional congestion awareness, conventional ACO and regional ACO-based cascaded adaptive routing. For four traffic patterns, simulation results indicate that regional ACO-based cascaded adaptive routing, with the reduced routing table, performs the same as conventional ACO selection. It means that Minimum Congestion Searching will be equal for the performance loss caused by only using the regional ACO-based cascaded adaptive routing scheme. The regional ACO-based cascaded adaptive routing has lower average latency and higher saturation throughput than the other selection functions. At very first, network controller traverses all the BSs and users Information in the BS. Acquire BS' information of longitude and altitude. Secondly, Grouping. Using users' situation and navigate information to predict users traversal trace. According to the relationship of users traversal trace and BS location, the users are grouped. This makes the least number of BSs to server. So, more spare BS can be found, chosen and set to sleep mode.

Algorithm 2: RACO-CAR-Network control

```
begin
 Read bs;
 get bs(long, lati);
 group( users, bslocation)
 end.
```

Expermential Result: There are many nodes and from that they are grouping all the nodes. They are forming into clusters. These clusters have some cascaded group of nodes and from that they will send the messages to the remaining nodes. There are two relay mobile nodes which will be moving from its original position .It will be going to cluster node for easy transfer of message to the destination node. In ACO there will be packet loss and as well as their will be loss of time to find the destination node but in this there will be less packet loss and their will not be loss of time for destination node.

Performance Analysis: The performance of the existing and proposed system is compared. In ACO the handover, throughput, packet loss and finding of destination node will be high but in RACO-CAR will be less and performance will be high in RACO-CAR and there will be no packet loss and there will not be any energy loss in nodes so this will be more efficient than ACO. The green color show the RACO-CAR functionality and red color shows the ACO functionality.

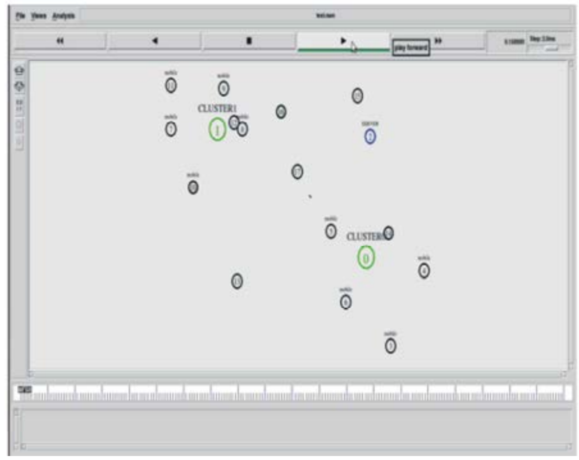

Fig. 3: Cluster formation

Fig. 4: Message transfer

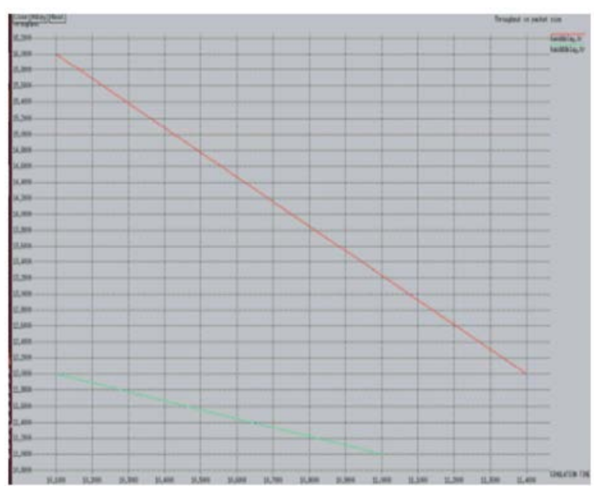

Fig. 5: Packet size

Table 1: Comparison of Packet size

	Throughput	Simulation time
RACO-CAR	0.4500	1.0000
	1.0000	3.0000
ACO	0.4000	1.0000
	0.9500	3.0000

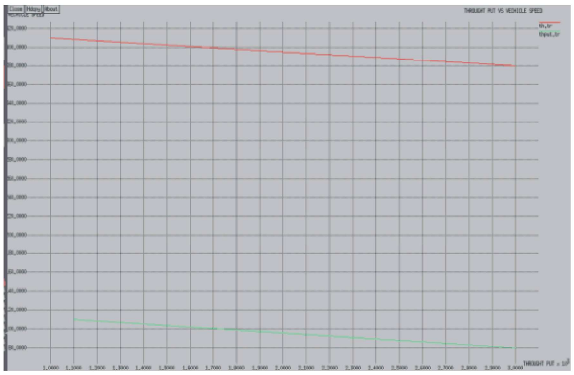

Fig. 6: Throughput

Table 2: Comparison of Throughput

	Mobile speed	Throughput
RACO-CAR	1005000	10000
	800000	30000
CAR	1100000	125000
	800000	30000

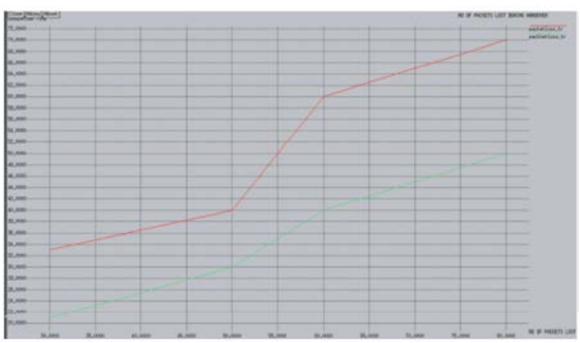

Fig. 7: Packet loss

Table 3: Comparison of Packet Loss

	Simulation time	No of packet loss
RACO-CAR	21.0000	30.0000
	50.0000	80.0000
ACO	33.0000	30.0000
	70.0000	80.0000

Table 4: Comparison of Handover

	Speed	Handover
RACO-CAR	12.0000	10.0000
	11.0000	11.0000
ACO	16.0000	10.0000
	12.0000	11.4000

CONCLUSION

In this paper, we propose an RACO-CAR for balancing network load and reduce the implementation

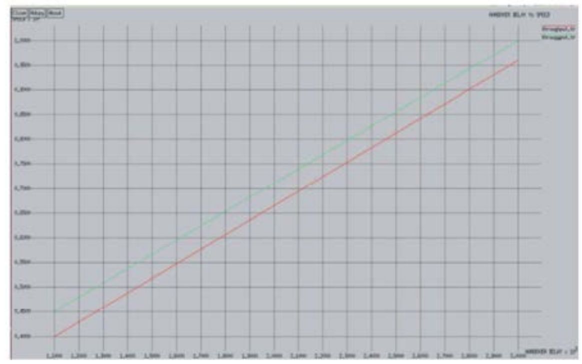

Fig. 8: Handover

cost of routing table by SDN technique. It reduces size of the routing table The information elimination value is 0.031, meaning that routing table size will be reduced from 80 percent to 96.9 percent. ACO-based cascaded adaptive routing to the output buffer length selection and the neighbor's-on-path selection are 6.49-36.84 percent and 4.71-18.18 percent in saturation throughput, respectively. Regional ACO-based cascaded adaptive routing also has higher saturation throughput with an improvement of 3.9-36.67 percent compared with Regional congestion awareness. Thus the proposed system is able to provide balance traffic in a efficient manner.

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