UTILIZATION OF RESOURCES VIA OVERLAY ROUTING SOURCE NODE AT A SENSIBLE RATES

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Abstract :
Any computer network application places limits on a variety of quality of service (QoS) measures, including jitter, bandwidth, packet loss, and latency. The Internet's best-effort service model prevents it from ensuring these QoS restrictions. At the application layer, overlay networks have shown to be a successful method for addressing various QoS requirements of networking applications. A superior QoS is made possible in softwaredefined overlay networks by introducing the software-defined networking (SDN) paradigm, which enables centralised and effective traffic routing in the overlay networks. The rapidly varying overlay connection QoS characteristics is one of the major challenges in software-defined overlay networks. he current routing algorithms, however, require lengthy route computation times and are therefore unable to adapt to the rapidly varying overlay link QoS features.These routing algorithms are used to satisfy numerous QoS criteria in softwaredefined overlay networks.Furthermore, the size of forwarding tables grows exponentially as the size of overlay networks scales. This is due to the fact that the current routing protocols for ensuring multiple QoS requirements convey data using both the source and destination addresses. As a result, the controller must push a significant number of forwarding table entries via the network, which limits the capacity of the overlay network For meeting various QoS requirements in software-defined overlay networks, we present the effective routing method QROUTE. Because it uses a revolutionary directed acyclic graph (DAG) based technique, QROUTE's control plane routing algorithm has a drastically reduced route computation time
KeyWords: Resource allocation, Overlay Network, Overlay, QoS, Routing, DAG are some related terms

Introduction:

In recent years, overlay routing has been suggested as a practical means of achieving routing features without undergoing arduous standardisation procedures, deploying new routing protocols, or altering the fundamental principles underlying underlay routing. TCP performance over the internet was enhanced via overlay routing, which in this case broke the end-to-end feedback loop into smaller loops. The routing overlay is constructed on top of the current layer. It is used in BGP routing to decrease latency and increase dependability. Here, we will focus on this issue and investigate the bare minimum of underbuilding nodes that must be introduced in order to enhance routing features. The task of improving the routing qualities between a single source and a single destination is not difficult in this work, and determining the ideal number of nodes is straightforward because there are few candidates for the overlay placement.[2]

Related Work:

The use of overlay routing to boost network performance has been supported by numerous studies on the efficacy of various networking topologies and applications. Savage et al. research the question: How good is internet routing from the user's perspective taking round- trip time, packet loss rate, and capacity into consideration? TCP in [4] and [5] .RTT directly affects performance. Hence, splitting a TCP connection into low latency sub-connections enhances the performance of the connection.
In [6] inflated routing patterns over the internet cause true distances between clients to be more than the required number of hops.The usage of overlay routing enhances network performance and routing. In [7], experimental strategies to enhance the network over real-world environments are also evaluated and studied. Overlay routing is also employed in this context.Application layer overlay

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routing will be employed in Resilient Overlay Network in addition to the current internet routing. The overlay infrastructure is the main focus, and system costs are not taken into account. Study the k relay node placement problem in to determine where they should be placed in the intra-domain network. Introduce a routing technique in that, in place of shortest path routing, directs traffic to its destination while preventing network congestion in the event of traffic fluctuation.[4] **Proposed system:**

The proposed approach focuses on determining the bare minimum of infrastructure nodes that must be installed in order to preserve crucial overlay routing properties. The suggested method focuses on identifying the absolute minimum of infrastructure nodes that must be set up in order to maintain essential overlay routing attributes

Advantages of Proposed system:

- The challenge is not overly complex if the suggested system is merely concerned in enhancing the routing qualities between a single source and a single destination.
- Finding the ideal number of nodes becomes less straightforward; as a result, there are fewer candidates for overlay placement, and any assignment would be beneficial.

Model and Problem Definition:

There are fewer options for overlay placement as a result of the difficulty in determining the appropriate number of nodes; hence, any assignment would be advantageous. Given pair of vertices s, t £ V, denote by Po ^s ,t the set of overlay path between the s and t.Given instance of the overlay routing resource allocation problem, and non-negative weight function W:

V R over the vertices, one need to find a set

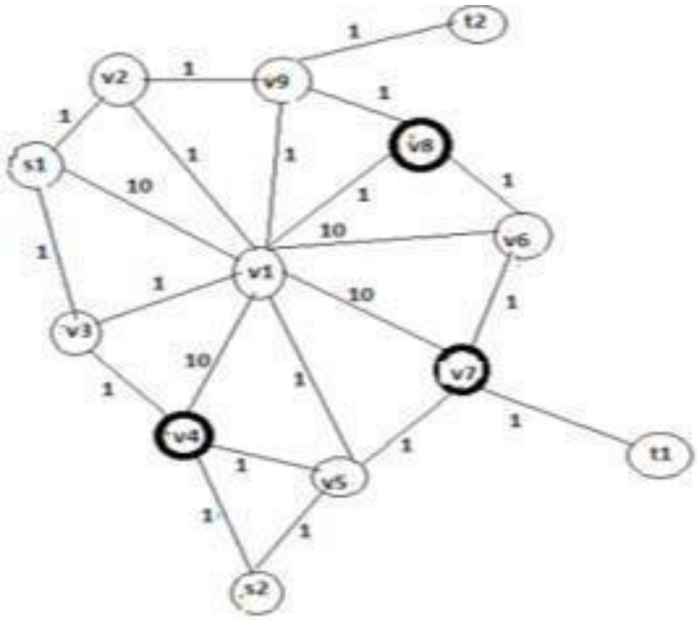
Uopt→ V such that:

1) Uopt is feasible. And 2) the cost of

Uopt is minimal among all feasible sets.

In this case, the underlay path between S1 and t1 is (s1, v1, v7, t1), while the overlay path between them should be (s1, v3, v4, v5, v7, t1) or (s1, v2, v1, v4, v5, v7, t1). Similarly the underlay path between s2 and t2 is (s2, v4, v5, v7, v6, v8, v9, t2) while the overlay path between them should be (s2, v5, v7, v6, v8, v9, t2).

Deploying the relay nodes on the v4 and v7 implies from s1 and t1 can be routed through underlay paths (s1, v3, v4), (v4, v5, v7) and (v7, t1), while the packets from s2 and t2 can be routed through fallowing underlay paths (s2, v4), (v4, v5, v7), (v7, v6, v8), (v8, v9, t2).Thus, U = {v4, v7} is a feasible solution to corresponding ORRA problem. If the all nodes have equal weight, then one may observe that this is also an optimal solution.



Algorithm :

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The overlay routing resource allocation (ORRA) algorithm is used to find the possible relay nodes. This is greedy method. Result is near optimal solution. This is a recursive algorithm for NP hard ORRA problem.

Terms: Q = {(s1, t1), (s2, t2), ... , (sn,tn)} – all source destination pairs

Po (s,t) = set of overlay paths between s and t

Inputs: G (V, E) network topology, W – Weight function W: V->R, Pu – Set of underlay paths, Po – set of overlay paths, U – Set of relay nodes. Steps:ORRA(G = (V, E), W, Pu, Po, U)

Step 1: for all v belongs (V-U), if w(v) = 0 then U<-{v}

Step 2: If U covers Q then return U

Step 3: Find (s, t) belongs Q not covered by U Step 4: Find for all v present on Po (s,t) and v not belongs U then V'<-{v}

Step 5: set x = {min w(v) | v belongs V'}

Step 6: set w1(v) = , belongs v′ 0, *h*

Step 7: for all v set w2(v) = w(v) – w1(v) Step 8:

ORRA (G, w2, Pu, Po, U) go to step 1

Step9: for all v if U-{v} covers Q then U=U-{v}

Step 10: return U

Output: The set of relay nodes U is the output of algorithm.[6]

Functional Diagram:

The algorithm must be aware of the specifics of the input network architecture. TCP connections are made between nodes after all of them are aware of the network. BGP chooses the routing strategy for the path choice.Different BGP routers exchanged this path information. BGP can assign multiple ratings to various pathways based on delay, bandwidth, congestion, and other variables. When nodes want to send data over the network, they first choose the source and destination pairs, then they decide whether to utilise a direct path or an overlay path based on the path rating. Relay nodes on that path are chosen to maintain data transmission if an overlay path is chosen. After that, a few chosen overlay nodes carry out the data transmission.[3]

System design:

service provider: The shortest-path routing across the Internet using a BGP-based router is determined by the service provider. The service provider browses the necessary file and uploads their data files with their DIP (Destination IP) of End User to the Specified End User (A, B, C, and D).**Overlay router :**

The overlay router is in charge of sending the file to the designated location. The overlay routing scheme is a collection of the shortest physical paths, which makes it easier to run this system. By using overlay routing,one can perform routing via shortest paths. The overlay router is also in charge of assigning costs and has the ability to view node costs with their tags From the node (from), To the node (to), and the cost.

BGP Router:

The BGP Router is in charge of using BGP routing to route the nodes, with the aim of locating the fewest possible relay node locations that can enable shortest-path routing between source-destination

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pairs. The BGP Router also takes into account a one-to-many destination where we want to enhance routing between a single source and many destinationsT. From its source to the whole collection of nodes, the BGP routing table comprises valid routes. [1]

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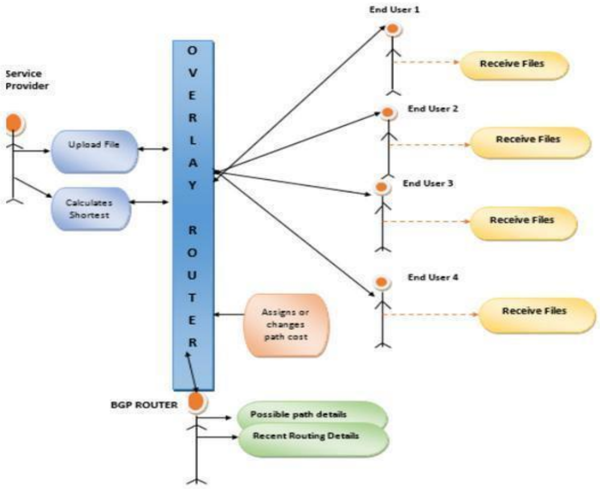
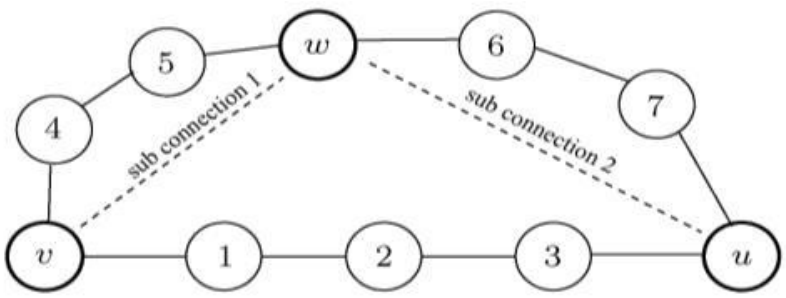


Performance Analysis :
This article offered a novel resource allocation strategy for overlay networks based on link and node weights. The suggested Link-Node weight based ORRA-LN approach and the Node weight based ORRA-N approach are compared and contrasted. The ORRA-N strategy solely distributes resources for data transmission based on node weight. While the ORRALN technique distributes resources for data transmission based on both the node weight and the link weight.
TCP Throughput :
Throughput and latency are two important performance indicators that are used to assess the cost of routing.depicts the instance delay calculated for a test case that was simulated using ORRA-N and ORRA-NL methodologies. The amount of delay reduction is minimal. The delay graph displays the significant reaction time variances that affect the suggested system. Congestion or timeouts in the transit system produce this, which leads to subpar performance of the provider path to the destination. The actual improvement is demonstrated by the throughput observation.[3]

TCP performance is also enhanced by overlay routing. The TCP protocol is responsive to delays, and TCP throughput and RTT statistically correlate. Hence, breaking high latency TCP connections in low latency sub-connections is advantageous. The TCP connection between v and u can be fragmented using the relay node situated in w, lowering the maximum RTT of the connection. The accompanying chart illustrates that they have identical latency. Regarding the ORRA problem, a path p is an underlay routing path if it is a valid path and its RTT is less than the previously set RTTmax, which specifies the maximum RTT for each sub-connection, and the network topology is represented as the graph G = (V, E) [1]



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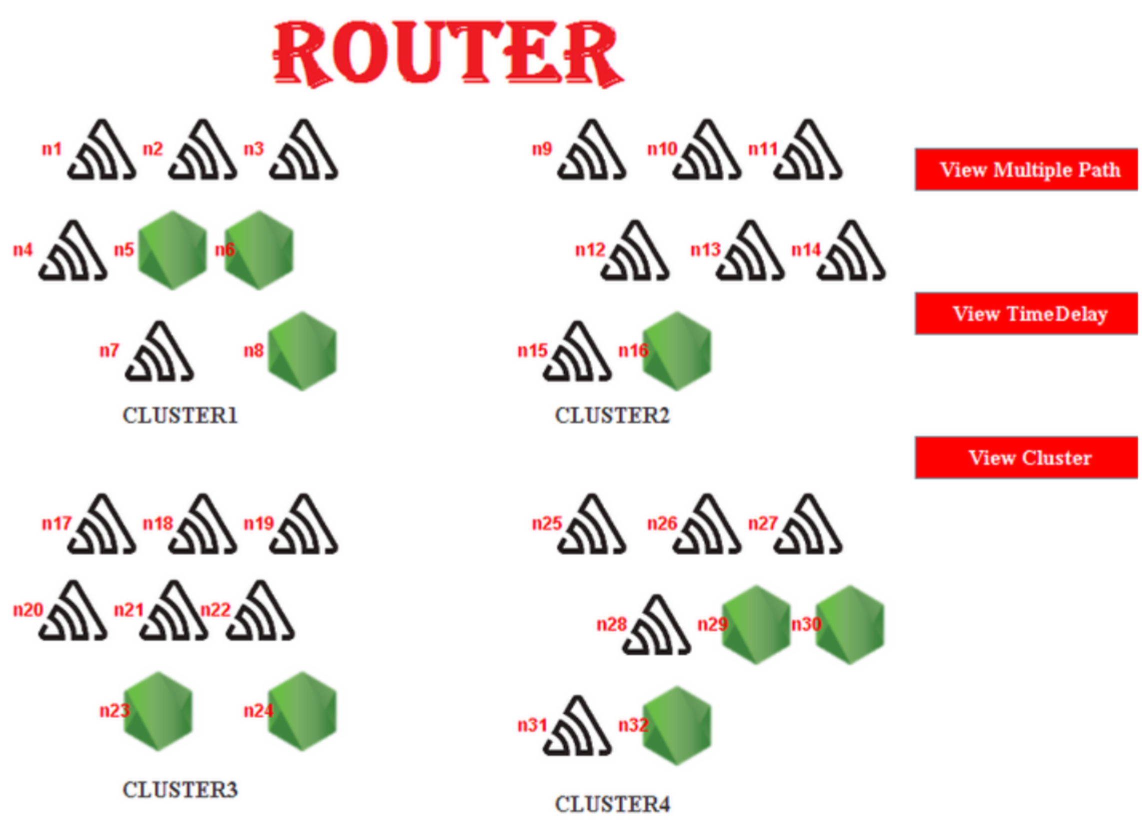
Result :



From	to	Path
Cluster4	Destination	Node27->Node29->Node30->Node32->
Cluster1	Cluster2	Node5->Node6->Node8->
Cluster2	Cluster3	Node13->Node14->Node16->
Cluster3	Cluster4	Node23->Node24->
Cluster4	Destination	Node27->Node29->Node30->Node32->
Cluster1	Cluster2	Node5->Node6->Node8->
Cluster2	Cluster3	Node13->Node14->Node16->
Cluster3	Cluster4	node17->Node18->Node19->Node21-...
Cluster4	Destination	Node27->Node29->Node30->Node32->
Cluster1	Cluster2	Node5->Node6->Node8->
Cluster2	Cluster3	Node16->
Cluster3	Cluster4	Node20->Node21->Node22->Node24->
Cluster4	Destination	Node29->Node30->Node32->
Cluster1	Cluster2	Node5->Node6->Node8->
Cluster2	Cluster3	Node16->
Cluster3	Cluster4	Node23->Node24->

File-Name	Destination	UPloaded time	Time -Delay	Throughput
dbcon.java	Dest A	30/11/2017 13:20:34	30143	62464
DestC.java	Dest A	30/11/2017 13:24:56	26079	7168
DestB.java	Dest A	30/11/2017 13:33:44	24116	6144
DestA.java	Dest A	30/11/2017 13:37:42	24092	6144
VDetails.jsp	Dest A	30/11/2017 13:47:51	22143	4096
RPath.java	Dest B	30/11/2017 13:48:58	18088	9216
RRouting.java	Dest C	30/11/2017 13:50:18	26134	13312
sample	Dest B	19/03/2023 21:45:53	18425	8192
demo1	Dest B	19/03/2023 21:55:28	22260	46080
kavii	Dest B	20/03/2023 15:17:33	28017	6144

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Conclusion:

For meeting various QoS requirements in software-defined overlay networks, we present the effective routing method QROUTE. Because it uses a revolutionary directed acyclic graph (DAG) based technique, QROUTE's control plane routing algorithm has a drastically reduced route computation time. By utilising a QoS-metric- based forwarding strategy, QROUTE also lowers the forwarding entries in the data plane. When the primary DAG fails, QROUTE employs a backup DAG in addition to the primary DAG to maintain an adequate level of QoS. Additionally, we offer a framework for assessing a path's adherence to a multi-constrained QoS policy, allowing the network administrator to identify paths that barely deviate from the QoS standard.Our experimental findings show that the suggested QROUTE routing technique drastically reduces the forwarding table size while also significantly reducing the route computation time. Evaluations further demonstrate that there is minimal overhead associated with addition and range operations carried out in the data plane. Findings show that QROUTE successfully and substantially achieves QoS with and without failure.

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