

MULTIPATH LOAD BALANCING IN SDN NETWORKS

GROUP NUMBER - 17

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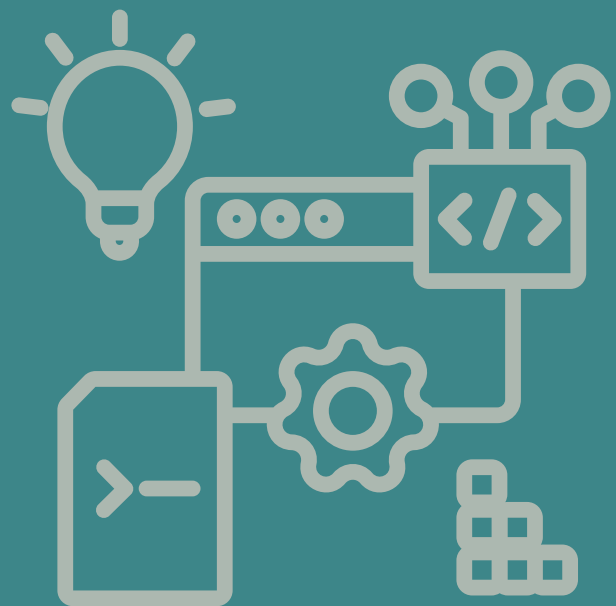
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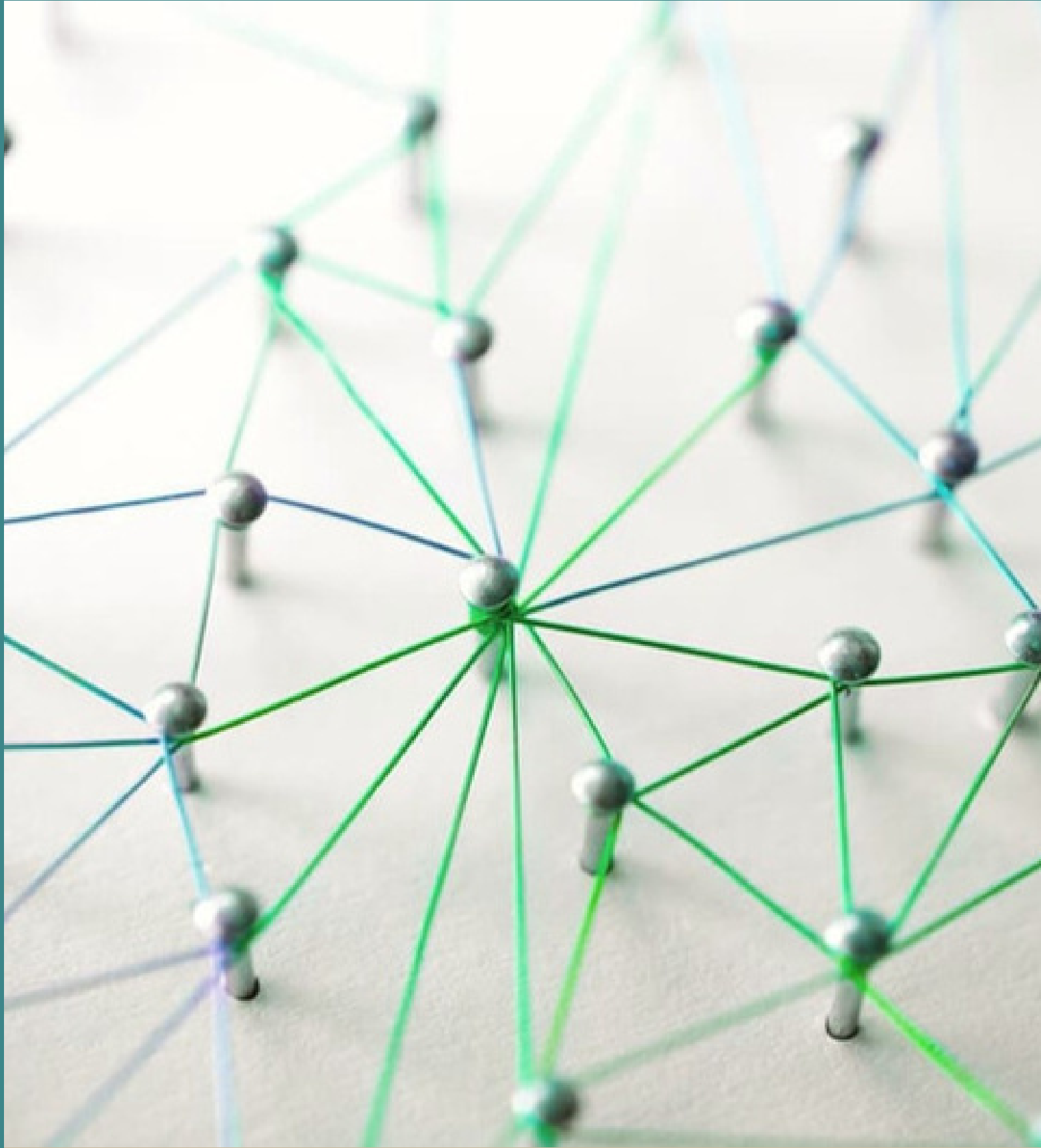
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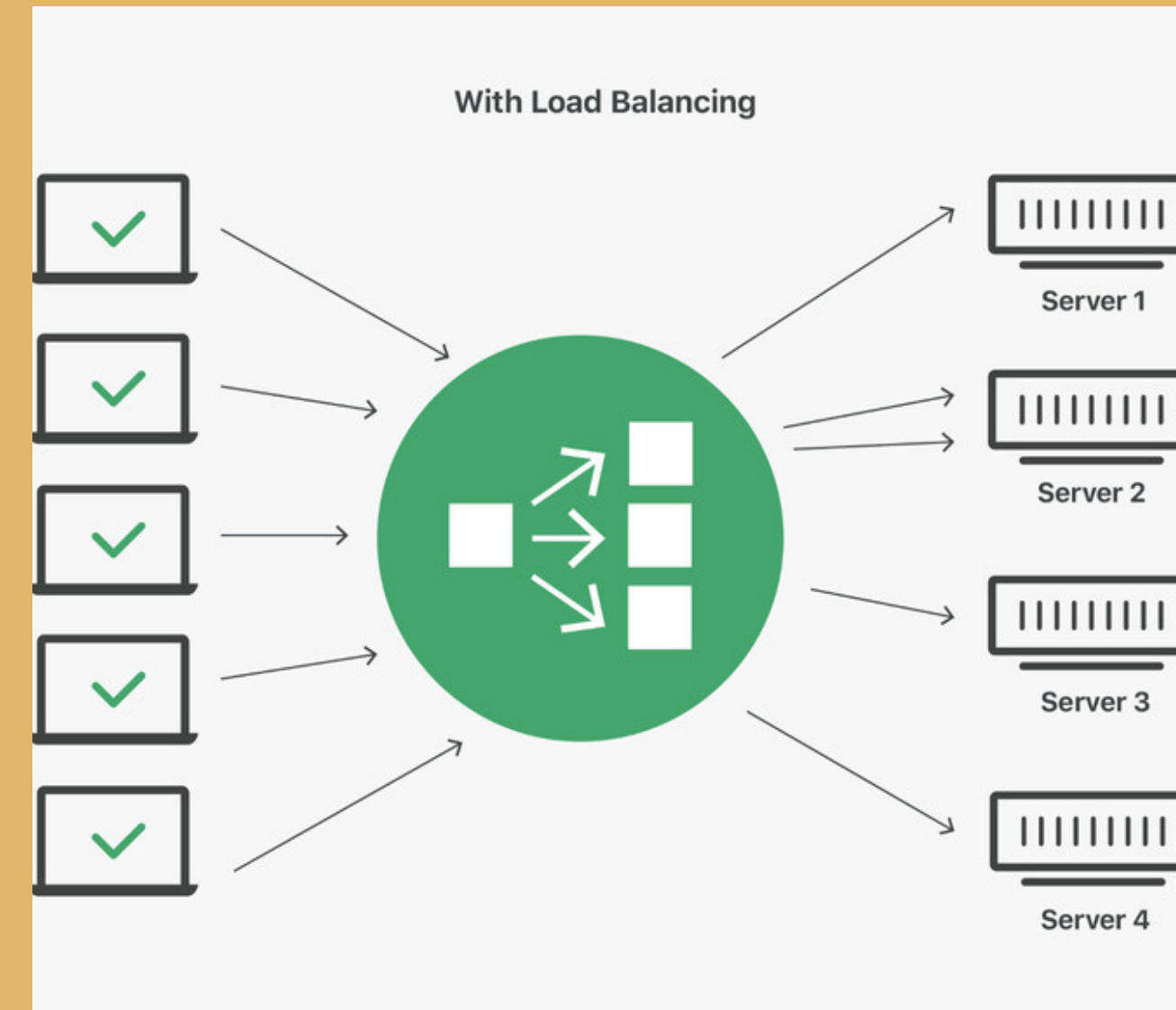
ABSTRACT

- Multipath routing is a routing method which finds multiple routes to a destination in a network topology.
- By providing multiple routes to a destination, it is possible for network traffic to be distributed fairly through multiple paths in the network, or a mechanism known as load-balancing, thus increasing the efficiency of network utility.
- With the rise of Software-Defined Networks recently through the OpenFlow protocol, Multipath Routing has been made simpler, with a more programmable approach to computer networks. Since version 1.1, the OpenFlow protocol supported Group Tables, which basically allows us to define or apply multiple actions to a specific flow.



BRIEF EXPLANATION OF THE PROJECT

- Load balancing is distributing network traffic across multiple routes to improve performance and utilization. Multipath load balancing does this by splitting traffic across multiple paths between source and destination.
- The project implements multipath load balancing in SDN using the Ryu controller and OpenFlow rules. The steps include:
- Finding all possible paths between source and destination using depth-first search (DFS) algorithm.
- Calculating path costs and selecting optimal 'n' paths based on lowest cost.
- Installing OpenFlow rules in switches along the paths to split traffic across multiple ports using group tables and actions.
- Calculating bucket weights based on path costs to determine how to split traffic across the optimal paths.
- Demonstrating the load balancing by setting up a Mininet topology, servers, and clients. Verifying traffic is split according to bucket weights.
- Overall, this implements and tests a common SDN use case of improving network utilization and performance using multipath load balancing with OpenFlow. .



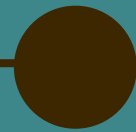
PROJECT TIMELINE

DEC



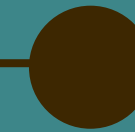
Identified the path finding algorithm as DFS and started implementing it. Successfully completed and returned the path using the above mentioned algorithm. Also worked on the cost finding algorithm and got the results.

JAN WEEK-1 & 2



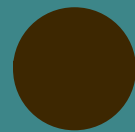
Started working on the openflow rules and setting up of the environment. Studied and worked on setting up the ryu controller in mininet.

JAN WEEK-3



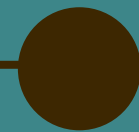
Successfully implemented the ryu controller and predicted the multiple paths connecting a source and a destination host. Tried using different topologies and got the result.

CONTRIBUTION



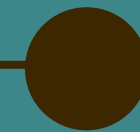
GOKUL

Implementation of the Path Finding Algorithm. Depth first Search (DFS) was used.



ADVAITH

Implementation of the Path cost calculation Algorithm.



ANAND,NANDANA,PARVATHY

Implementation of OpenFlow algorithms and testing of the code.

Each of the team members also created several topologies and tested them.

ACCOMPLISHMENTS

- Successfully created and tested a mininet environment with several hosts and switches using ryu controller.
- Successfully tested the load balancing in ryu controller. The ping command was used to test the load balancing. The packets were transmitted successfully.
- Created and tested some topologies and the multi-path routing between the switches. 3 topologies were created with 2, 2 and 4 hosts respectively. They all had different numbers of switches. All of the topologies' optimal paths were found and the packets were transmitted between their hosts.

References

Research paper used as reference:

https://www.researchgate.net/publication/360491515_Multipath-routing_based_load-balancing_in_SDN_networks

Ryu controller :

<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjaxPWHovODAxUnxDgGHUi nA1oQFnoECBEQAQ&url=https%3A%2F%2Fryu-sdn.org%2F&usg=AOvVaw2lv4CH4LrZV2batzq-aiM-&opi=89978449>

Thank You