

KLE Society's
KLE Technological University



A Course Project Report
On
Load Balancing using FloodLight Controller

Submitted By Team 17:

Sourabh Jain	01FE17BCS214
Usman Khan	01FE17BCS235

SCHOOL OF COMPUTER SCIENCE & ENGINEERING

HUBLI-580 031 (India)

Academic year 2020-2021

Problem Statement

To implement load balancing on a custom topology created using Mininet Network Emulator and Floodlight Controller.

Introduction

A load balancer, or server load balancer (SLB), is hardware or software-based device that efficiently distributes network or application traffic across a number of servers. Modern high-traffic websites must serve hundreds of thousands, if not millions, of concurrent requests from users or clients and return the correct text, images, video, or application data, all in a fast and reliable manner.

A load balancer acts as the “traffic cop” sitting in front of your servers and routing client requests across all servers capable of fulfilling those requests in a manner that maximizes speed and capacity utilization and ensures that no one server is overworked, which could degrade performance. The Load Balancer employs an algorithm to efficiently manage the flow of packets to the multiple servers present in various pools of the network.

Literature Survey

The conventional load balancing techniques are the current techniques in use to balance the load. These techniques use the traditional algorithms for load balancing, and prominent of them include round-robin technique, equal-cost multipath routing protocol, least connections, random techniques, etc. Round robin provides uniform load distribution and is not dynamic in nature. However starvation may happen. Weighted Round Robin provides improved load balancing and prevents starvation. The Limitation of weighted load balancing is that the admin assigns the weight which would be considered as a bias towards particular servers.[1]

Floodlight is an SDN-OpenFlow controller that comes with built-in applications. A set of common functionalities be utilized by FloodLight Controller onto the probe and control the OpenFlow network when implementations onto the top achieve various characteristics into obtaining resolve various employer requires over the network. Floodlight architecture, consists of the 3 interconnected parts from the Floodlight Controller, implementations create Java modules compiled within the Floodlight, then implementations built over the Floodlight REST API.[2]

Weighted round-robin load balancing using OpenFlow switch in SDN is implemented in this paper and results are co-related with a round-robin load balancer in SDN. Results reveal that weighted round-robin strategy is more prominent than round-robin strategy. Plus point of using a weighted round-robin is that in a round-robin load balancer it assumes that all the servers are homogeneous in nature that is all servers carry a uniform load but in some cases, servers are heterogeneous in nature, in that case, weighted round-robin is used. Another advantage about weighted round-robin is that sometimes if we want one server to get a substantially lower number of connections than an equally capable server for the reason that the first server is running business-critical applications and we don't want it to be easily overloaded.[3]

Implementation Details

Mininet Emulator

We will be using the Mininet emulator for the demonstration of the project. Mininet emulator is used to demonstrate the problem, Mininet is a network emulator which creates a network of virtual hosts, switches, controllers, and links. Mininet hosts run standard Linux network software, and its switches support OpenFlow for highly flexible custom routing and Software-Defined Networking.

Custom Topology

Custom topology is built using mininet. The custom topology includes Openflow switches and hosts.

Floodlight Controller

We will be using a Floodlight controller for this project. Floodlight Controller is an SDN Controller developed by Big Switch Networks, that uses the OpenFlow protocol to orchestrate traffic flows in an SDN environment. OpenFlow defines the open communications protocol in an SDN environment that allows the SDN Controller to speak to the forwarding plane (switches, routers, etc.) to make changes to the network.

REST API Instructions

Floodlight uses REST API calls to post instructions to the controller. The instructions include details of virtual IPs, pools, and pool members.

Topology:

The topology used is a tree topology consisting of 8 hosts and 3 switches and is created by using the following python script

Python script:

```
from mininet.topo import Topo
from mininet.link import TCLink
class MyTopo( Topo ):
    "Simple topology example."
    def __init__( self ):
        "Create custom topo."
        # Initialize topology
        Topo.__init__( self )

        # Add hosts and switches

        #low bandwidth hosts
        host1 = self.addHost( 'h1' )
        host2 = self.addHost( 'h2' )

        #high bandwidth hosts
        host3 = self.addHost( 'h3' )
        host4 = self.addHost( 'h4' )

        #switch
        switch = self.addSwitch( 's3' )
```

```

# Add links
#links with lower bandwidth
self.addLink( host1, switch ,cls=TCLink,bw=200)
self.addLink( host2, switch ,cls=TCLink,bw=200)

#links with highest possible bandwidth and highest possible latency
self.addLink( host3, switch )
self.addLink( host4, switch )

topos = { 'mytopo': ( lambda: MyTopo() ) }

```

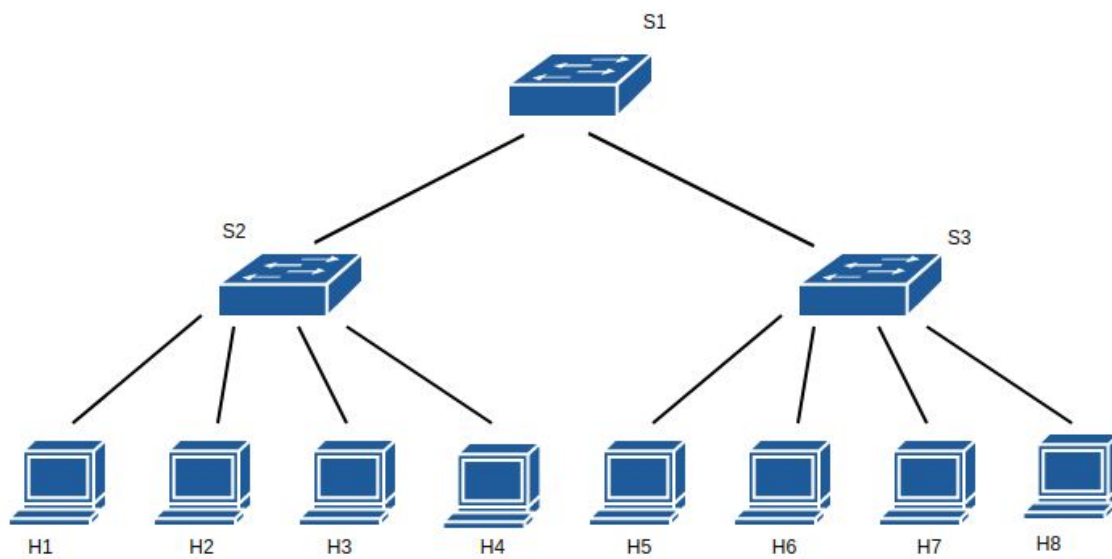
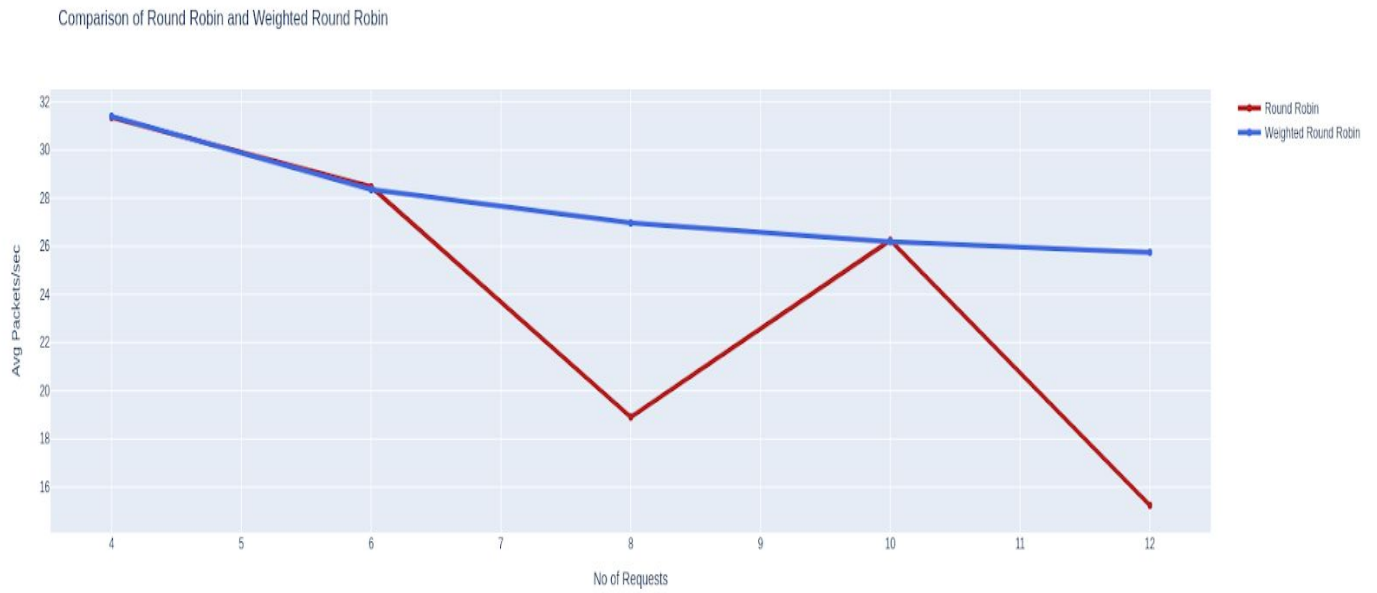


Fig.1. Network Topology

The link between h1 --- s2 and h2 ---- s2 have been given a different bandwidth for the execution of the weighted round-robin algorithm

Results and discussion

Graph Analysis



Conclusion

References

- [1]M. R. Belgaum, S. Musa, M. M. Alam and M. M. Su'ud, "A Systematic Review of Load Balancing Techniques in Software-Defined Networking," in *IEEE Access*, vol. 8, pp. 98612-98636, 2020
- [2]Qassim, Mohammad & Al Salam, Mohammed & Tariq, Abeer. (2017). Floodlight Controller onto Load Balancing of SDN Management. International Journal Of Advancement In Engineering Technology, Management and Applied Science (IJAETMAS). 04. 124-131.
- [3]Sabiya, Japinder Singh,"Weighted Round-Robin Load Balancing Using Software Defined Networking", in International Journal of Advanced Research in Computer Science and Software Engineering,vol. 6, pp.621-625, 2016