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Resource Optimization and Revenue Maximization in SDN based Cloud Servers

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Abstract - *Many companies and organizations nowadays choose to deploy or install their applications in data centers to influence their resource sharing. Thus, making it challenging for the data center provider to maximize the revenue by scheduling tasks intelligently in Software Design Networks, It increases the tasks of multiple applications. As we know the data Centers require to address this requirement ENCAPSULATION and TUNNELING is used which causes less throughput to overcome this point, we are going to optimize the SDN based resource by using optimized data centers which will increase the efficiency of the resources used here.*

Key Words: SDN, Encapsulation, Tunnelling, Optimization, Resource Optimization, Revenue Maximization, Throughput.

1. INTRODUCTION

Nowadays many companies and organizations choose to deploy or install their applications in data centers to leverage resource sharing. Due to this there is an increase or maximization in their tasks for multiple applications, which makes it a great challenge for the nearby Data Centers for providing and maximizing the revenue by intelligently tasking by scheduled process in Software Defined Networking (SDN)-enabled data centers. As we know Software Defined Networking (SDN) is an architecture that highly aims to make networks agile i.e. as per the client's requirements and flexible. The prime goal of Software Defined Networking (SDN) is to improve network control around its whole network. SDN is a concept newly introduced of the network infrastructure for its specialty like it decouples the control and data planes. With its characteristic like of programmability and it's feasible to achieve network. CLOUD computing provides on-demand IT services and pay-as –u –go through via datacenters distributed on a large scale over high-speed networks. There are some of the benefits of cloud computing, which include:

1} on-demand availability

2} scalability

3} pay-per-use model

This all have business prompted to switch to the cloud in order to reduce the overall cost of computing. To operate in the cloud environment, users must be always provided with different kind of policies like the robust performance by service providers which may help them in many cases like as this can be achieved like in ways as say when the technologies used they totally work efficiently and the system is managed optimally in a clear system. Cloud computing, which has a great approach with the distributed data center, it thus requires datacenters location to be located as near to the client as possible in order to implement in low-latency and give or provide it the real- time services. For managing the service providers require and need to control their Distributed Data Centers that allows them to connect multiple networks in an existing single substrate network.

For great flexibility the core networks in the large-scale cloud Data Centers must meet the changing requirements and thus for same flexibility for facilitating the use of programmable networks is proposed in the networking environment. Software-defined networking (SDN) imparts flexibility by transferring the control layer from data transfer layer of the network to the control plane It also reduces CapEx (Capital Expenses) and OpEx (Operating Expenses) (up to $32 billion) manually it also increases the revenue which is generated for the cloud providers.

Further the SDN controller controls or manages by an entity, thus which is overall view of the network is maintained it also allocates or configures dynamically as per the networking resources as per its system requirements. The destination is thus defined that where the data has to be sent through the central part of the SDN controller. The configuration and managing of the flow of data packets is thus managed by controller in the data plane though the switch. It data traffic to the defined destination.

With efficiency management of the virtual networks is promoted by SDN management plane, as we all know the SDN is a good tool to facilitate the any implementation of network virtualization.

SDN utilizes many alternative processes like:

1} code to manage

2} manage program

3} Virtualizes the network

It supports the need-based resource allocation for getting network resources on demand by associate degree application platform interface for the end-users and repair suppliers which permit the purchasers for dominant the acquisition of resources.

For provision of upper level innovation, the SDN as an enabler it permits the network virtualization which will expand the services that are provided by cloud service suppliers. Sizable amount of request is received from the purchasers by the Cloud datacenters for allocating the resources and therefore for any process. That successively for with efficiency allocating and programming the requesting their distributed datacenters suppliers are needed.

For getting the network resources on demand the platform interface permits the end-users and repair suppliers on demand the support is given to the need-based resource allocation that therefore permits dominant the acquisition of the resources by the purchasers. sizable number of requests and from purchasers for process and for resource allocation is received by the Cloud datacenters, that successively for allocating with efficiency and programming the request in their distributed datacenters the necessity of the suppliers is obligatory. For a specific quality of services (QoS) maintain for the consumer, irrespective of the resources being shared with different purchasers. For resolution this drawback effectively by the central controller that incorporates a overall read of the network which is dynamically allotted of network resources by taken into thought of QoS by seeing the right match with the supply.

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2. Tunneling

Tunneling protocol: it's associate degree communication protocol that permits the movement from one network to a different of the info within the laptop networks. It additionally involves permitting personal network communications to be sent across a public network, like the net, through a method known as encapsulation. The tunneling is finished such the simplest way that it's broken into little items known as because the packets that moves on the tunnel for the transport, whereas moving from tunnel the packets that contain the info are encrypted and another method which happens therefore known as encapsulation. The personal network information and also the protocol data that goes with it are encapsulated publicly network transmission units for causation. The unit that is being received therefore feels like public information, that permits them to transmit the net across to that. The planned work of the encapsulation is to permit the packets containing the info to attain the right selected destination, therefore once reaching the selected destination the de-capsulation; cryptography is being taken into the method

There are numerous protocols that enable tunneling to occur, including:

2.1 Point-to-Point Tunneling Protocol (PPTP):

This protocol known as Point-to-Point Tunneling Protocol keeps proprietary information secure even once it's being communicated over public networks. For accessing of the personal network known as VPN (virtual private network) the licensed users are given its authority that is provided by an online service supplier. Therefore, because it is being created by a tunneled setting it's a personal network within the “virtual” sense.

2.2 Layer 2 Tunneling Protocol (L2TP):

This kind of tunneling protocol involves a mix of victimization Point-to-Point Tunneling Protocol and Layer two Forwarding.

For encoding choices and additionally for Security Company setting the tunneling plays a main role by tunneling network through a public network.

3. Encapsulation

This encapsulation is such a method that for the continuation of transferring the info from one network to a different protocol the networking is taken in to thought as a topic for encapsulation. For instance, a TCP/IP packet contained at intervals associate ATM frame may be a kind of encapsulation. It happens altogether the layers of the

OSI model, in the main within the layer variety four, the info application that is so encapsulated into the transport layer and thus more known as a TCP header. the easy and straight that means of the encapsulation is information activity as its all the implementation taken place at the rear finish of the system is completely hided from the user solely special members will get access thereto by death penalty the special perform known as ways. Here it conjointly means that combining the 2 components and to form a replacement entity. For instance, a procedure may be a kind of encapsulation as a result of it combines a series of laptop directions. Similarly, a posh information sort, like a record or category, depends on encapsulation. Typically, solely the object's own ways will directly examine or manipulate its fields. Below this definition, encapsulation implies that the interior illustration of associate object is usually hidden from read outside of the object's definition.

4. Resource Optimization

The set of processes and ways to match the out their resources with the requirements of organization so as to realize established goals is termed because the resource optimization. It makes associate usually use of the system resources for rising the potency for a selected organization network for a best usage. It conjointly makes use for the reshaping of the traffic, redundant information elimination.

5. Revenue Maximization

Nowadays because the increase in information of the tasks of the multiple applications it makes it difficult for the datacenters to maximize its revenue by showing intelligence planning the task in SDN by creating associate aware for the work-load in SDN enabled datacenters. By presumptuous software system outlined Network (SDN) as a directed graph 𝒢 = (N𝒬∪Q,𝒢), we tend to denote it as some notations like N𝒬 may be a set of SDN enabled switch nodes and letter is a set of information centers, and 𝒢 may be a set of links with the 2 between SDN-enabled switches & SDN enabled switches and information centers. The process of the implementation of the VNFs at intervals the info centers consumes computing resource. it's so shown by 𝒞 the capability for computing of information center letter ∈ Q. Furthermore, the info traffic routing of every request consumes link information measure and at intervals the data transmission delays on its routing path. By giving the request for user for 𝓇𝓆 = (𝓇𝓆, ;(𝒢), 𝓇𝓆, 𝓇𝓆,𝓇𝓆) that its information traffic can transfer from supply 𝓇𝓆 to destination 𝓇𝓆 with a given packet rate 𝓇𝓆 > zero, and also the information traffic should submit to the instances of VNFs in its service chain 𝒮𝒞(𝒢). The chains among all the request that may be classified into completely different M sorts. every instance of the VNF has the essential patterns of packet rates and conjointly the request 𝓇𝓆 with 𝓇𝓆 packet rate implies it wants 𝓇𝓆 instances of its needed kind of service chain and also the quantity 𝒞𝒞 (= 𝓇𝓆 ·𝒢(𝒢)) of information measure resource, wherever 𝒢(𝒢) is that the information measure demand of a basic information packet rate of the request with 𝒮𝒞(𝒢).

By presumptuous the services for the chains that are instantiated within the information centers. associate ordered sequence of VNFs is outlined as a service chain (SC). Denote by 𝒢(𝒢) the service chain of sort 𝒢 associated 𝒢(𝒞𝒞(𝒢)) the computing resource consumption of an instance of the service chain of type 𝒢 with one ≤ m ≤ M. Assume that there are 𝒢(𝒢) 𝒢 ≥ zero instances of type-𝒢 service chain pre-installed in information center letter ∈ Q . The instances for a specific variable chain during a specific information center may additionally run out of it. Each request 𝓇𝓆 has associate end-to-end delay demand 𝒟𝒟 that specifies the most length of per information packet of the request from its supply to its destination, it includes both of the times they are- process delay and also the transmission delay of the packet. what is more, traffic route for request 𝓇𝓆 on a link 𝒢 ∈ 𝒢 incurs a knowledge transmission delay 𝒟𝒢. the info transmission delay on the primary section 𝒢(𝒮𝒟, 𝒢) of the routing path for the info traffic of request 𝓇𝓆 from node 𝒮𝒟 to data center 𝒢 is 𝒟𝒢(𝒢(𝒮𝒟, 𝒢)) = Σ𝒢′∈(𝒮𝒟,𝒢) 𝒟𝒢′ . Similarly, the info transmission delay on the second section (𝒢, 𝒟𝒞) of the routing path is ((𝒢, 𝒟𝒞)) =Σ𝒢′∈𝒢(𝒢,𝒟𝒞) 𝒟𝒢′ . The end-to-end delay of information transmission of request 𝓇𝓆 on the routing path via information center 𝒢 so is (𝒟𝒞) = 𝒟𝒞 ((𝒮𝒟, 𝒢)) + 𝒟𝒞(𝒟𝒞(𝒢)𝒢) +𝒟𝒞(𝒢(𝒢, 𝒟𝒞)). to fulfill the end-to-end delay demand of 𝓇𝓆 we've got (𝒟𝒞) ≤ 𝒟𝒞. By admitting the request of PAY-As-You-Go basis through some revenue assortment model. so, the revenue we've got collected 𝒢 by admitting an invitation 𝓇𝓆 is proportional to its computing and information measure resource demands, The constant weights for the computing supply and for the information measure calculation of the marketing amount 𝒢1 and 𝒢2 are severally. the whole revenue collected by admitting a group 𝒢 of requests is 𝒮𝒮𝒢 =Σ𝓇𝓆∈𝒢 𝓇𝓆 .Given associate SDN 𝒢 = (N𝒬∪Q,𝒢), the amount of instances 𝒢(𝒢)𝒢 of 𝒮𝒞(𝒢) for sort 𝒢 service chain pre-installed at every information center q∈ letter, let 𝒢1, 𝒢2, . . . 𝓇𝓆 be the sequence of requests arrive one by one while not the data of future arrivals.

6. Literature Survey

The challenge for maximizing the revenue by maximizing the regular task in package outlined networks helps U.S.A. to extend within the tasks of multiple applications that conjointly helps us to leverage the resource in knowledge sharing in several corporations and organizations [1]. therefore this planned paper conjointly says that by ignoring the VM latency it's going to cause an excellent revenue loss, therefore answer to the present that is given is that the heat (work load aware revenue maximization) it helps us to maximize the info from data center provider's perspective, therefore the experimental result once implementing shows that the round-trip time of all task will increase the revenue by reducing its visits.

Cloud computing may be a promising paradigm for future computing platform. It permits the physical resources (computing, storage, networking, etc.) to be provided on-demand. As in [3] being known SDN controllers it still faces the challenges for allocation of heterogeneous resources to services. SDN may be a new construct because it decouples the info and management planes. during this paper, we have a tendency to propose Associate in Nursing algorithmic program supported Entropy Weighted Topological Potential considering multiple varieties of resources to tackle the matter in SDN-enabled knowledge center network. As per [2] differing kinds of intensive simulations show that our planned algorithmic program which may be used for maximizing the revenue and might embedded a lot of virtual request with nice acceptance the quantitative relation and resource revenue over time.

7. Methodology

7.1 Package outlined Networks

It is Associate in Nursing design that has been separated and distinguished into 3 totally different layers that are connected through northward and south arthropod genus. The brain of the SDN is that the SDN management package that is therefore drawn by the control layer. As SDN management is Associate in Nursing application in software-defined networking (SDN) that manages flow control to alter intelligent networking. it's supported the various protocols like Open Flow because it relies on SDN controllers which permit to send packets that are therefore directions are given by switches wherever to send packets. they're Agile, Open, and extremely Secure, automates IT tasks, and accelerate knowledge center application deployments.

Chart -1: SDN in Data center

7.2 Mininet

A package ape that's used for prototyping an oversized network on solely single machine may be a Mininet. Mininet permits the user to quickly produce, move with, customize and share a software-defined network (SDN) model to simulate a configuration that uses Open flow switches. It conjointly creates a network of virtual hosts, switched, controllers and links. Mininet hosts run customary Linux network package, and its switches support Open Flow for extremely versatile custom routing and Software-Defined Networking.

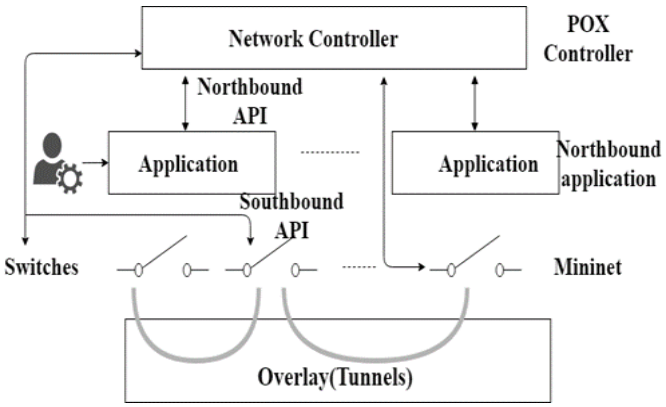

Chart -2: SDN Framework

7.3 RYU Controller

Ryu SDN Framework (Ryu) may be a framework that gives the libraries and tools that are needed so as to develop SDN applications the framework facilitates development by providing the fundamental functions for dominant the info plane and therefore the functions that are common to SDN applications.

Ryu Controller is Associate in Nursing open, software-defined networking (SDN) Controller designed to extend the lightness of the network by creating it simple to manage and adapt however traffic is handled.

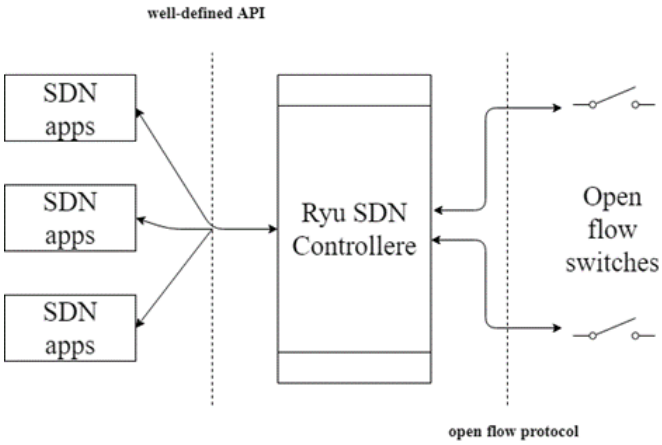

Chart -3: RYU Framework

7.4 Flow

My proposed work here is like as I am working on the SDN controller which includes the tools like the Mininet and Ryu for the clear understanding of the project here. Further work is such like when the SDN controller receives the data in form of small packets which is hidden from the user as in form of encapsulated form transferred through the tunneling process to the different tools used here, many different types of switches and routers are been used here for the better output on a particular bandwidth that has been set for recalculating the size of the packets so that the quality of service(QoS) which will be provided should be in the form of 3 different policies:

Adaptive policy

Static policy

ROAR policy

As nowadays we know the all over the companies and different IT firms expect a good through put with its good revenue maximization and less resource utilization as per taking this into consideration, I am going minimize the resource here and maximize the revenue throughput.

8. Experimental Setup and Result Analysis

Experimental setup for cloud networking is based on Mininet SDN simulator and RYU controller is deployed with virtual LANs, Virtual Hosts and Virtual Switches.

There are three policies framed for identifying the above metrics namely bandwidth and throughput. The policies were either ROAR or static or adaptive policy. The ROAR policy is where all the nodes use the bandwidth what is available at the VLAN and they could not be allocated with extra bandwidth during the streaming of a video. The static policy is run based on the static bandwidth allocated to each host that are available at its discretion. The adaptive policy is where the hosts use the bandwidth according to the requirement needed to stream the video signal. The table 1 refers to the parameters that are used for experimental setup.

Table -1: Sample Table format

Parameter	Values
Types of data	Video streaming server
No. of virtual hosts	6
No. of VLANS	3 policies namely ROAR, static and adaptive
Hosts configuration	H1, H2 uses a web server and a streaming client, Other hosts use an IPERF clients
VLAN Configuration	VLAN0 – Video Streaming (h1, h2) VLAN1- h3, h4, h5, h6 – Iperf Client

From the above table 1, the input parameters were set on the cloud hosts and the bandwidth is being monitored in a browser window. The following from Fig 4 to Fig 10 will show the various measurements and results of this work.

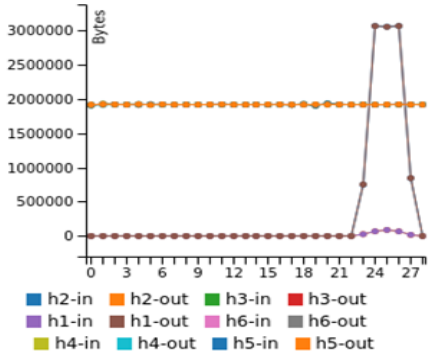

Chart -4: Policy for bandwidth monitor

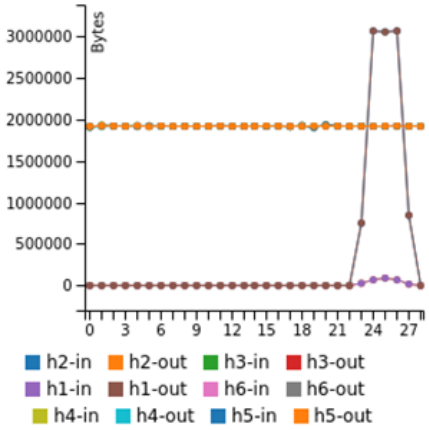

Chart -5: Bandwidth share

Figures above shows the policies that are set for the bandwidth monitor and the ROAR bandwidth share between the hosts of the VLAN.

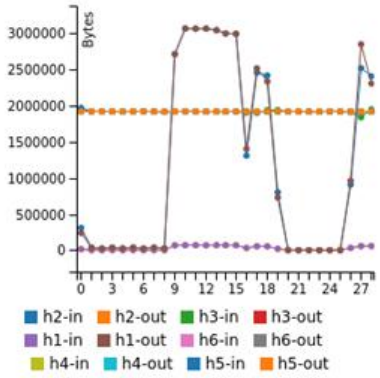

Chart -6: Data usage during different policies

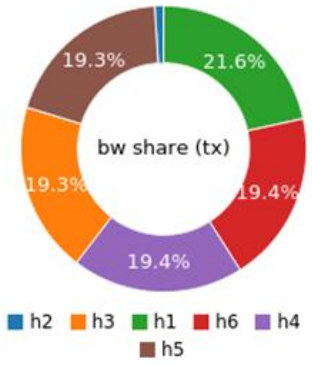

Chart -7: Bandwidth share during adaptive policy

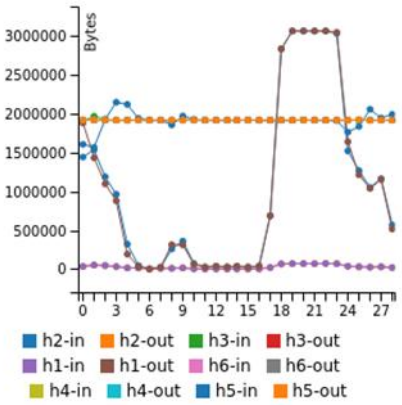

Chart -8: Bandwidth usage during static and adaptive policy

9. CONCLUSION

The above graphs show the bandwidth monitoring and its shares between the hosts and the VLANs of the SDN based Mininet framework. However, this work does not bother or record the packet loss arisen out of the network. In our future work, we will monitor the packet loss during the streaming of the video data so that the latency and the reliability of the network will be assessed. This entire work is done using the Ryu controller that controls the data plane of the SDN that is powered with Mininet. The same can be replicated in a real data center at a nominal cost and is very helpful in minimizing the cost of the deployment and hence maximizing the revenue. Also due to the adaptive policy framework, the resources like hosts, switches can be optimized so that they can use the resources whenever the other hosts resources are shared among the LANs.

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