TrafficShaper: Shaping Inter-Datacenter Traffic to Reduce the Transmission Cost

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Abstract

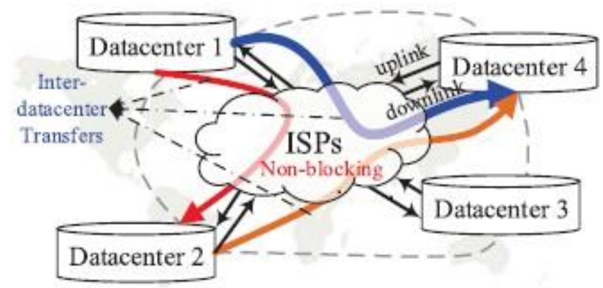
Data Traffic occurs through the large amount of data moving across the data centers at a given point of time which is mostly encapsulated in network packets which provide load to the network. The practice involving of data packets which is of highly prioritized which is scheduled to regulating the free flow of packets into a network can be sent to receiver. In a corporate environment, business related traffic may be given priority over another traffic. Normally a sender sends their files to the receiver which can be of larger size and hence cannot be downloaded. TrafficShaper designs a strategy for receiving the files with the lesser the transmission cost along with the bandwidth rate. By performing the analysis for optimizing the shorter distance the multipath routing algorithm is used. For calculating the packet loss the First Come First Serve (FCFS)algorithm can be used.

I. INTRODUCTION

An organizations such as Google and Amazon, have made vast investments in building in DCs to deliver their online services.

A key feature of these services is that they continuously produce large volumes of data transmission among different DCs.A recent survey highlighted that 70% of the IT firms have huge data transmission among DCs a month.Such huge data transmission incurs substantial cost for the service provider. In fact, the annual transmission cost is of up to hundreds of millions of dollars, which approximately equals to the power cost of DCs.Some charging model can be described as a charging period of *N* time slots, the ISP samples the bandwidth usage that a service provider consumed in every timeslot and sorts them in ascendingorder (each time slot is typically 5 minutes).

This provides an opportunity to reduce service provider's transmission cost by carefully scheduling their inter-DataCenter transfers.



1. An illustrative example of inter-DC network model.

II. LITERATURE SURVEY

B4: Experience with Globally-Deployed Software Defined WAN

The design and stock of B4 a particular wide area network linking Google's DCs across the planet. It has the different characteristics i) The immense bandwidth requirements disposed to a low-key number of plots ii)The elastic traffic demand that seeks to maximize average bandwidth.

A system that boosts the utilization of the inter-DataCenter networks by centrally controlling, when we present SWAN and how much traffic each service sends and frequently re-configuring the network's data plane to match current traffic demand. But these re-configurations can also cause severe, transient congestion because different switches may apply updates at different times. A novel technique that leverages a small amount of scratch capacity on links to apply updates in a provably congestion-free manner, without making any assumptions 0large networks in the face of limited forwarding table capacity, SWAN greedily selects a small set of entries that can best satisfy current demand.

III. IMPLEMENTATION

A. Network creation

In this module, a wireless network is created. All the nodes are randomly deployed in the network area. Our network is a censored network, nodes are assigned with mobility (movement).Source and destination nodes are defined. Data transferred from source node to destination node. Since we are working in wireless network, nodes mobility is set ie., node move from one position to another Adversary Model. The goal of the adversary is to prevent the sender(s) from communicating with all, or a subset of the intended receivers.

B. Path selection

In this module, path has been selected between sources to destination. Path selection involves applying a routing metric to multiple routes to select (or predict) the best route. The metric is computed by a routing algorithm, and can cover information such as bandwidth, network delay, hop count, path cost, load, MTU (maximum transmission unit), reliability, and communication cost. The routing protocol stores only the best possible routes, while link-state or topological databases may store all other information as well. Here opportunistic Routing algorithm is implemented.

C. Task scheduler

Placement of tasks (execution) could be as important as placement of data. Task schedulers and resource managers can place computation in accordance with placement of data to reduce network usage, contention for network access and queuing. A task scheduler may consider the flow scheduling policy of the network in addition to placement of data to improve overall task completion times.

D. Load balancing

Datacenter topologies typically provide a large degree of path redundancy. Properly distributing load across these paths reduces contention among flows while increasing overall resource utilization. Without effective load balancing many links may not be utilized while some experiencing congestion. Load balancing can be static or dynamic (adaptive). Static approaches use fixed criteria to assign traffic to available paths such as by hashing specific fields from packet headers.

E. Traffic analysis

Traffic Shaper advocates shaping the inter-DC traffic to construct more traffic peaks during those “free” time slots, and maintain less traffic differentiation among the remaining time slots. Specifically, in the sender side, this distributed method determines how much bandwidth to be allocated to each flow; and in the receiver side, it decides the receiving rate for each flow; finally, the minimal value between sending rate and receiving rate is chosen as the rate for each flow.

IV. SYSTEM ANALYSIS

Existing System

Service providers typically purchase bandwidth from Internet Service Providers (ISPs) for their inter-DC transfers, while ISPs charge service providers based on the widely adopted q-th percentile charging model. In such a charging model, the time slots with top (100 − q) percent of data transmission do not affect the total transmission cost and can be viewed as “free.” This brings the opportunity to optimize the scheduling of inter- DC transfers to minimize the entire transmission cost. However, a very little work has been done to exploit those “free” time slots for scheduling inter-DC transfers. The crux is that existing work either lacks a mechanism to accumulate traffic to “free” time slots, or inevitably relies on prior knowledge of future traffic arrival patterns.

No existing methods are in place to exploit the “free” time slots in the q-th percentile charging model to minimize the transmission cost as well as to guarantee deadlines for inter-DC transfers. First, state-of-the-art methods on inter-DC traffic either lack a mechanism to accumulate traffic to “free” time slots, or cannot guarantee the deadlines of inter-DC transfers. Second, although some Internet traffic scheduling methods investigated the impact of the percentile charging model, they either require prior knowledge of future traffic demand, or assume uniform deadline requirements for all traffic.

Disadvantage:

- High transmission cost.
- No efficient traffic prediction.
- Loss of data.
- Cannot guarantee the deadlines of inter-DC transfers.

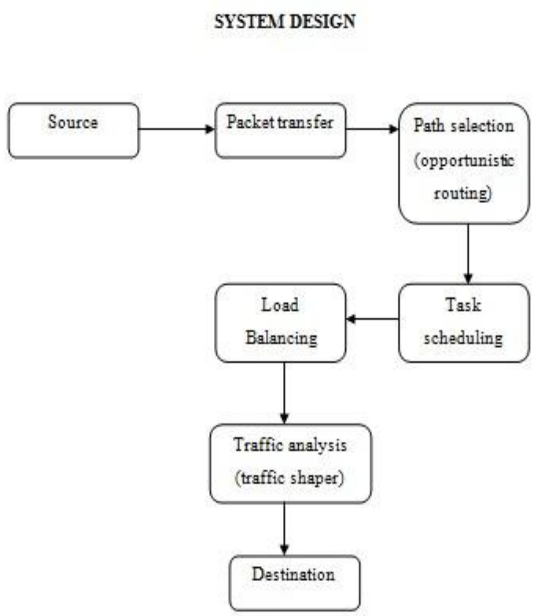
V. PROPOSED SYSTEM

Traffic Shaper, a new scheduler that aims to minimize the transmission cost of inter-DC transfers by fully exploiting the advantages of “free” time slots in q-th percentile charging model and the diverse deadline requirements among inter-DC transfers. Traffic Shaper advocates shaping the inter-DC traffic to construct more traffic peaks during those “free” time slots, and maintain less traffic differentiation among the remaining time slots. To this end, Traffic Shaper designs a pricing-aware online control framework to practically make scheduling decisions for inter-DC transfers, without prior knowledge of the traffic arrival patterns. Nevertheless, it is impractical to obtain an optimal solution for this problem, due to the unknown information of future traffic arrivals. This motivates Traffic Shaper to transform it into a relaxed problem which is then solved by designing an optimal algorithm represented as opportunistic routing algorithm. We present Traffic Shaper, a new scheduler that exploits the "free" time slots in q-th percentile charging model to minimize the transmission cost of inter-DC transfers. Specifically, Traffic Shaper employs a pricing-aware online control framework to schedule inter-DC transfers, and can provably approach a transmission cost that is arbitrarily close to optimum.

Advantages:

- Efficient traffic scheduling withoutcollision occurrence.
- Schedule data packets in efficient manner based on queue analysis.
- Avoids packets delay.
- Achieves data reliability.

VI. SYSTEM DESIGN



VII. CONCLUSION

In this paper, we argue that a simple principle of "more peak, less differentiation" should be followed when schedulinginter-DC traffic under the q-th percentile charging model.To this end, we present TrafficShaper, a new scheduler thatleverages the diverse deadlines of inter-DC transfer requeststo exploit the "free" time slots involved in the q-th percentilecharging model.

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