Journal of Nonlinear Analysis and Optimization
Vol. 13(11) (2022), November 2022
https://ph03.tci-thaijjo.org/

ISSN : 1906-9685

J.Nonlinear Anal. Optim

Router Support for Fine Grained Latency Measurements

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***Abstract* — An increasing number of datacenter network applications, including automated trading and high-performance computing, have stringent end-to-end latency requirements where even microsecond variations may be intolerable. Latterly we use two techniques called the SNMP and Net Flow but it is not efficient. So we propose a new technique called Lossy Difference Aggregator (LDA) to measure latencies down to tens of microseconds even in the presence of packet loss. Because LDA does not modify or encapsulate the packet, it can be deployed incrementally without changes along the forwarding path. LDA can be cheaply incorporated with in the routers.**

***Index Terms*—Computer networks, coordinated streaming, latency measurement, router.**

I.INTRODUCTION

An increasing number of datacenter-based applications require end-to-end latencies on the order of milliseconds or even microseconds. When we send a packet from source to destination by using different routes and routers it will reach the destination. So there is a great chance for the packet loss because of congestion or traffic. Here we propose a new technique in which the router stores all the information send by the source. The source send the packet towards the router. The router stores the alias data send by the source and is send towards the destination. Also we implement a Lossy Difference Aggregator (LDA) which is used to measure the latency in between sending and receiving the packet.

Currently we use two techniques called the SNMP and Net Flow. The SNMP is the simple network management protocol. It is not used for calculating the latency, it is used for calculating the load. So, the operators use an external monitoring mechanism to calculate the latency by using different samples. It will not give the accurate measures. Also it is very difficult to calculate. They are having high cost. The router simply pass the packet towards another router or to the destination. They would not know the actual size, time or the content on that packet. Traffic information are collected by the Net Flow and also it monitors the traffic. Calculating latency requires coordinating samples at multiple routers (e.g., trajectory sampling). Even if such coordination is possible, consistent samples and their timestamps have to be communicated to a measurement processor that subtracts the sent timestamp from the receive timestamp of each successfully delivered packet in order to estimate the average, a procedure with fundamentally high space complexity. Moreover, computing accurate time averages requires a high sampling rate, and detecting short-term deviations from the mean requires even more. Unfortunately, high Net Flow sampling rates significantly impact routers forwarding performance and are frequently incompatible with operational throughput demands.

So we propose a new system called Lossy Difference Aggregator (LDA) which is used for calculating the latency or delay in between sending and receiving the packet. And also the routers that stores all the informations send by the source. The router receives all data and is send towards the destination. It is the responsibility of the router to successfully deliver the packet. When the packet reaches the destination the router receives that message with in no time. I f a packet is lost, it is also known by the router and the router resend the packet. The source can know it from the receiver. Because the source and destination can have access to the routers.

Lossy Difference Aggregator (LDA), is a low-overhead mechanism for fine-grain latency and loss measurement that can be cheaply incorporated within routers to achieve the same effect. LDA has the following features.

• *Fine-granularity measurement:* LDA measures the loss very accurately. Even shot delay can be calculated by the LDA. There exists no external monitoring methods to calculate the delay. LDA can be cheaply incorporated with in the routers.

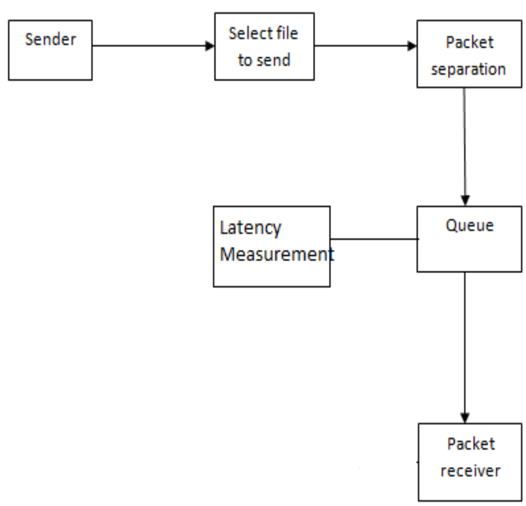
• *Low overhead:* There exist low or no traffic for the LDA and also no congestion can be occurred in the network because the router pass all the packets so safely, so there will not cause any congestion.

• *Customizability:* LDA can be cheaply incorporated with in the routers. Latency can be measured with out any loss in the packet. LDA measure the delay of any traffic to differing levels of precision, independent of others.

While researchers are often hesitant to propose new router primitives for measurement because of the need to convince major router vendors to implement them, we observe several recent trends. First, router vendors are already under strong financial pressure from trading and high-performance computing customers to find low-latency measurement primitives. Second, the advent of merchant silicon such as Broadcom and Marvell has forced router vendors to seek new features that will avoid commoditization and preserve profit margins. Hence, we suggest that improved measurement infrastructure might be an attractive value proposition for legacy vendors.

II.IMPLEMENTATION OF LDA

When we send a packet from source to destination by using different routes and routers it will reach the destination. So there is a great chance for the packet loss because of congestion or traffic. We have to check whether all the packets reached the destination or not.



Firstly the sender select any file to send. Then the packet separation is done. Packet separation means if it is a larger one, the packet is divided into several smaller ones. So it will be more comfortable for the sender to send the packet and also the receiver to receive it. Each packet contain 48 bytes of characters including the blank space. Then it is send towards the receiver. Queue means that the packet will arrive in FIFO manner.(First In First Out). Then the packet is send towards the receiver. In the router the latency calculation is done.

III.MEASUREMENT USING LDA

While entering the first router, the router checks whether all packets from the source are arrived (router can have access to both sender and receiver) then that router send the packet towards the destination and the destination also checks whether all the packets are arrived or not. Which is identified by using the packet size. i.e, we have to check whether the size of packets at router and destination are equal. If not the report will be send back to the router. It is the responsibility of the router to resend the packet successively towards the destination.

$$\text{Delay} = Tb - Ta / N$$

Where Tb is the timestamp of the receiver and Ta is the time stamp of the sender. N is the total number of packets.

All the information are written in the router. The router knows in which time the sender send the packet and the receiver receives the packet.

The sum of the receivers packet counters give us the number of packets received and the sum of senders packet counter, the number of packet sent; the difference gives the number of lost packet .

Microsecond synchronization is easily maintained within a router today and exists within a number of newer commercial routers. These routers use separate hardware buses for time synchronization that directly connect the various synchronization points within a router such as the input and output ports; these buses bypass the packet paths that have variable delays. Hence, the time interval between sending and receiving of synchronization signals is small and fixed. Given that most of the variable delays and loss is within routers, our mechanism can immediately be deployed. Within routers to allow diagnosis of the majority of latency problems.

V. CONCLUSION

LDA is cheap simple mechanism that can embed directly in routers to cheaply provide fine-grain delay and loss measurement. Starting from the simple idea of keeping a sum of sent timestamps and a sum of receive timestamps that is not resilient to loss, we developed a strategy to cope with unknown loss values. It is unlikely that LDA will be deployed at all links along many paths in the near future. Latterly we use two techniques called the SNMP and the Net Flow. But they are not up to the task. And they use several external monitoring techniques to calculate the latency. But LDA is a cheap technique which can be implemented in the routers. LDA also reduces congestion in the network. If an end-to-end probe detects a problem, a manager can use the LDA mechanism on routers along the path to better localize the problem.

ACKNOWLEDGEMENTS

The authors would like to thank the teaching faculties of Mohandas College of Engineering.

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