Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 116 (2017) 393–400

Procedia Computer Science

www.elsevier.com/locate/procedia

2nd International Conference on Computer Science and Computational Intelligence 2017, ICCSCI 2017, 13-14 October 2017, Bali, Indonesia

An efficient method to compare latencies in order to obtain the best route for SDN

Lorenzo M. Elguea*, Felix Martinez-Rios

Universidad Panamericana, Facultad de Ingeniería, Augusto Rodin 498, México, Ciudad de México, 03920, México.

Abstract

Comparing two or more routes on Internet is difficult owing to the variability of the measurements resulting from the different routes or use conditions. With current tools such as SDN[1], it is important to determine with certainty which the best route between a user and an internet service. This will be achieved with fast measurements which do not affect the operation of the network. With trends such as IoT, the best routes can be identified based on latency and not just on the jumps between autonomous systems, fact that optimizes data traffic in a specific way whether it is IPv4 or IPv6.

As time elapses, it becomes more important to have a perfect setting for the LAN, which means optimal DNS, LDAP Servers appropriate number, etc. Thats why we propose a precise method that contemplates every possible variation of data, thus making a comparison by means of the use of confidence limits.

Keywords: SDN; BGP; Latency; Variance; Compare; Statistics

1. Introduction

Autonomous navigation vehicles, Internet of Things (IoT), Multimedia, Cloud Computing and other technologies need an optimal response time in the networks. Traditionally, routing protocols optimize networks based on parameters as fewer number of jumps between systems to get from source to destination. For the capacity of the routers these path are usually very adequate, but if what is wanted is the way with lower latency, it is necessary to review the route that is opted with each ISP, compare its characteristics, such as average latency and variance and with that information and SDN tools, modify the routes in the router to actually use the lower latency.

To compare different routes to the same destination, latency is the most important parameter. Latency depends mainly on the physical distance between the two connection points, but it can also influence parameters such as the

* Corresponding author. Tel.: +52-555-482-1666
E-mail address: lelguea@up.edu.mx

1877-0509
10.1016/j.procs.2017.10.076

protocol, the suturing of the network and the type or size of the provider [2]. There are methods for measuring latencies as accurate as those of US Pat. No. 7058706 [3]. To compare two or more latencies, we can use the method proposed below: Confidence intervals using the minimum and maximum possible variance of a sample of five measurements.

Because the network topology can change at any time, hard processes to determine the best route can provide obsolete results, and the results of the minimum and maximum average latency time can be determined using confidence intervals to know the best route. The method can be any one that provides a latency reference, which can be the result of pinging the destination (ICMP). This methodology can also be used to determine in the case of having 2 protocols such as IPv4 and IPv6, which protocol is the most appropriate and which can also be used to determine the smallest number of servers that provide the same service correctly sized to meet the demand without Oversize.

To measure latency, we need the average minimum and maximum time. With these three patterns, we can obtain a minimum and a maximum variance with the values for each path to be compared and dimensioned. It is evident that there may be more latency results. Therefore, we may obtain one result which is more approximate to the real variance. This will increase the sample size and in turn it will rise the time to determine these parameters for each Internet Service provider or a different path to analyze.

With 20 or 30 samples more precision can be given to the means and the variance, and although there is no minimum measure for the size of the samples, it is more important that they are independent. In this case, it is always in this way in order that each sample can be the result of the path that the packets follow for each ISP. Strictly, the sending follows different paths, especially at the beginning of the routes, but the return of the packages, could be so if they match in the same route. (This is the optimal route from the recipient to the source) This method mainly focuses on knowing the minimum and maximum variance that each provider has, in order to be able to compare the different paths. In that sense it can be implemented in the following algorithm that if this difference is high, the test is increased again the sample size, for example from 5 to 25 samples, in order to confirm that said path can vary between the minimum value and the maximum value determined with this method. There is some research on the size of very small samples such as J.C. deWinter[4] as opposed to the optimum sample sizes as explained by A.F. Lee [5].

The importance of smart devices and the demand for multimedia content involves optimizing latency and bandwidth [6]. For instance, a sensitive device in IoT needs low delay, and efficient and scalable broker architecture [7]. The latency importance in LAN, WAN or Cloud Computing is obvious [8] [9] [10].

Ruxton, G.D[11], show how in ecology and other sciences uses statistical test to compare whether the central tendencies of two groups are different. And for this, they use Students t-test, MannWhitney U test and the t-test for unequal variances.

Donald W. Zimmerman et al [12] compare and review Student t-test and Welch t-test, look at different parameters like unequal variances, sample sizes, different distributions and long-tailed distributions.

Exist simulations using a regular t-test with sample sizes as 2 and the Type I error rate did not exceed the value of 5% as J.C.F. de Winter explains in [4] and a very complete study of sample size for confidence intervals by David Erceg-Hurn, and Vikki Mirosevich. [13]

In this sense, the focus of this research is to limit the variance between the minimum and maximum variance, and to use the statistical tools to make an analysis of confidence intervals, which allows to compare with some limit of precision two or more parameters, in this case the latency.

1.1. Motivation of this method

The need for this research is due to the analysis of methods to compare different latencies to implement these algorithms in SDN projects. In a recent implementation of an algorithm that modifies the BGP routes using SDN, it is very important to be able to determine if the benefit that is intended when modifying the route or is simply a change that is not necessary due to its little or no contribution to the latency.

Siemens in his application note 8, mentions that there are four latencies in a switch and that 3 latencies are deterministic since it depends on the characteristics of the packets, i.e. the nature of the Ethernet protocol and there is a fourth component of the latency, frame queuing, which is probabilistic, and in that sense the calculation of total latency, sum of the previous latencies, with absolute certainty can be a challenge. (Is important in the LAN, but more important in the WAN) [14].

This probabilistic component prevents a direct comparison of measured latencies. This paper proposes a method where it first determines the limits of the variance and then performs a comparison using confidence limits.