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BANDWIDTH CAPACITY EXPANSION AND PREDICTION

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Abstract— **Internet is playing an important role in sharing and accessing the data. Due to the increase in usage of Internet, Network Traffic is growing. Internet traffic is usually measured in terms of flows, number of packets, packet size, starting time, duration, total and fraction of traffic, mean transmission rate, etc. Data set about Internet Traffic is available in the various websites for example www.caida.org, www.akami.com. Availability of Internet Traffic datasets attracts many researchers to address the issues related to Internet Traffic Analysis. One such domain is Capacity Expansion for Internet Traffic. Capacity Expansion in the need of the hours to increase the speed of access & sharing of data, reduce the traffic, data transmission delay. We propose an algorithm to predict the Capacity Expansion for Internet Traffic.**

Keywords - Traffic, Bandwidth, Capacity, Expansion, Prediction

I. I.INTRODUCTION

Internet users growing rapidly in world wide. Users expectations are also increasing based on access speed. Due to the heavy traffic internet, the needs of internet users are not yet fulfilled. So the area of Internet Capacity Planning & Expansion still has limitations and expected to be improved a lot.

Many researchers are doing then researches in Network Capacity Planning and Allocation. Parameters involved in Network Capacity Expansion and Planning are load, flows, packet size etc. Even though already many researchers have been done different researches under Bandwidth such as Capacity Planning, Capacity Optimization and Capacity Allocation, but there are open issues. In particular Capacity Expansion, Capacity Prediction and also has challenges to resolve.

This paper proposed a method for Capacity Expansion and Prediction based on Internet Traffic Data such as Load, Flows, Packet Size (IPV4 & IPV6) etc. This proposed method identifies the area where Capacity Expansion is needed and predicts the results. This paper organized as follows. Section 2 discusses about the Background Studies. Sections 3discusses about Proposed Work and Section 5 discusses about Result and Discussion, and Section 6 discusses about Conclusion.

II. BACKGROUND STUDIES

Zilong Liao et al [1] suggested an approach of Joint Bandwidth Optimization and Media Access Control to improve network throughput. 1-D Linear Multihop Network analysed based on the system analytical model. To improve the network throughput of Multihop UASNs (Multihop underwater acoustic sensor networks) They [1] find and formulated the maximum hop number by determining node's traffic and channel capacity then again find the optimal scheduling scheme to allocate the transmission bandwidth based on their node's traffic. For these findings Distributed Traffic-Based Scheduling MAC Protocol (DTSM) developed for Multihop UASNs. According to the packets ages this protocol schedules the node's transmission to optimize the bandwidth allocation. At each transmission round multiple packets are allowed to transmit and improve the channel utilization. Finally simulation indicates the protocol can achieve the best performance to its reasonable bandwidth allocation and high channel utilization.

Hatim S. Hussein et al [2] suggested a method to distribute bandwidth across Multipath MPLS Network. To identify the best shortest path, k-shortest path is used to route the network traffic from source to destination. Shortest Path First (SPF) algorithm is used to select the shortest path from Multiple Path Network for network traffic traverse from source to destination node. Constrained-Based Shortest Path First (CSPF) is used to select the shortest paths which meet certain requirements. For every five second Network Capacity Availability (NCA) updated to give real time information about Bandwidth Capacity.

Fahim A. Khandaker et al [3] suggested a Paradigm in Optical Networking and also proposed a Probabilistic Model to estimate the capacity requirements for Optical Network under certain density of statistical sharing. It determines the best shortest path from different routing approaches to maximize the probability to be achieved the peak rate when connection requested in Optical Network with statistical sharing. For a given threshold on the probability of achieving the peak rate determines the numbers of connection

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requested to be accommodating in the network. Finally simulation indicates that the Probabilistic Model can be used to estimate the network capacity and also used with the provisioning of spectrum resources.

M.Yousefvand et al [4] suggested a novel capacity-aware spectrum allocation mode for cognitive radio networks to maximize the network capacity. Cognitive users get the information about spectrum bands by sensing the spectrum environment and classify the available channels in terms of their quality level. Then secondary users raise their transmission power until any one of their neighbours exceeds its interference temperature threshold. And links capacity calculated based on the SINR and Shannon formula. Make use of an interference graph capture the co-channel interference between potential links. To find the optimal feasible set of simultaneously active links among all the potential links formulate the spectrum assignment problem in the form of a Binary Integer Linear Programming formulation to maximize the overall network capacity. Sparse areas in the search space removed by new radix tree based algorithm. Finally simulation indicates that this suggested model leads to an improved in overall network capacity and also decrease the time complexity to find the optimal solution.

III. PROPOSED WORK

This proposed work will be done in two Phases.
First phase will calculate the CEF (Capacity Expansion Factor) value used to make prediction. Second phase will generate the prediction based on the CEF values and Threshold.

Phase I
Step 1 Pre-processing
Step 2 CEF Calculation
Phase II
Step 1 Ranking
Step 2 Threshold Calculation Based on Year
Step 3 Prediction

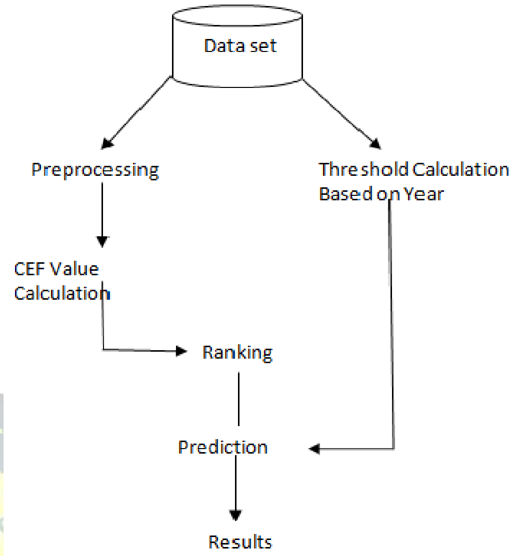

Fig.1. Proposed Work Architecture

The attributes in the data set considered for the proposed system are as follows

1. Start time of trace (UTC)
2. Duration of trace
3. Fraction of packet discarded during payload stripping
4. Number of IPv4 packets
5. Fraction of IPv4 packets (in units of 10^{-2})
6. Number of IPv6 packets
7. Fraction of IPv6 packets (in units of 10^{-4})
8. Fraction of other packets (in units of 10^{-4}).
9. This includes non-IP packets and packets for which the protocol could not be determined. For most of these packets the packet size could not be determined.
10. Transmission rate in packets per second
11. Mean transmission rate in bits per second
12. Mean link load as a fraction of the nominal maximum.
13. For an OC48 link the maximum load is 2.448×10^{9} bits/s; for an OC192 link 9.953×10^{9} bits/s.
14. Mean flows per second
15. Mean packet size for IPv4 packets (in bytes).
16. Median packet size for IPv4 packets (in byes).
17. Mean packet size for IPv6 packets (in bytes).
18. Median packet size for IPv6 packets (in bytes).

PHASE I

Pre-processing & CEF Calculation

Area wise Traffic data such as Load, Flows, IPV4, and IPV6 are the factors influencing traffic. CEF (Capacity Expansion Factor) Value is the deciding factor to be used for Prediction. Data about Load, Flows, IPV4, and IPV6 will be taken as

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input. Based on these values Capacity Expansion Factor (CEF) will be calculated using the formula

CEF = (0.3/L.S + 0.3/F.S +0.2/IPV4.S + 0.2/IPV6)

Where CEF – Capacity Expansion Factor
L.S - Load Score
F.S - Flow Score
IPV4.S - IPV4 Score
IPV6.S – IPV6 Score

This CEF value is calculated on monthly basis of the year for which capacity expansion need is to be evaluated. We have to compare this CEF value with the previous year statistics in order to predict the results. So PCEF values are calculated of past two year's CEF values. The PCEF is obtained by taking average of the previous CEF values.

PHASE II

A. Ranking Process

This process gives Rank/Score for the above calculated CEF value of particular year as well as the PCEF values. Once the ranks of CEF and PCEF are calculated we have to identify the correlation between the calculated value and the previous year statistics. For that the difference between the CEF and PCEF ranks are calculated.

B. Threshold Calculation Based on Year

Threshold value is calculated by finding average for PCEF Score of the particular year. For the dataset considered for experimental study, the threshold value is 5.

TABLE I

PREDICTION OF CAPACITY EXPANSION BASED ON CEF AND PCEF VALUE

Month	2015	CEF Rank	PCEF Ra nk	Difference	Prediction
Jan	0.071217	12	2	10	No Need for Capacity Expansion
Feb	0.263928	4	2	2	No Need for Capacity Expansion
Mar	0.073223	11	2	9	No Need for Capacity Expansion
Apr	0.4433	8			
May	0.601964	5	9	-4	Need for Capacity Expansion
Jun	0.756904	5	5	0	Need for Capacity Expansion
July	0.204761	5	10	-5	Need for Capacity Expansion
Aug	0.317272	8	11	-3	Need for Capacity Expansion
Sep	0.856666	2	4	-2	Need for Capacity Expansion
Oct	0.342936	6	8	-2	Need for Capacity Expansion
Nov	0.720923	3	3	0	Need for Capacity Expansion
Dec	0.51357	5	1	4	No Need for Capacity Expansion

Threshold = 5

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C. Prediction

The difference between the CEF value and the PCEF value of the corresponding month is calculated. If the difference is less than or equal to Threshold value means then the proposed algorithm will predict there is a need for Capacity Expansion. If the difference is greater than the threshold value means then there is no need for Capacity Expansion.

IV. RESULT AND DISCUSSION

The data set considered for experimental study is given below. In Table 1 for the year 2015, difference between CEF and PCEF ranks are displayed. The threshold value is 5. The output of the prediction is listed in the last column. In the month of May, June, July, August, September, October, November has the difference value is less than the Threshold value so these are the places where Capacity Expansion is needed.

V. CONCLUSION

Here the bandwidth capacity expansion prediction is done in two phases. In the first phase preprocessing and CEF values are calculated. In the second phase the threshold for prediction is obtained from the previous year statistics. With the help of the threshold value need for capacity expansion is predicted for the month on the particular place.

REFERENCES

[1] Zilong Liao, Deshi Li, and Jian Chen, "Joint Bandwidth Optimization and Media Access Control for Multihop Underwater Acoustic Sensor Networks", IEEE Sensor Journal, Vol. 15, NO. 8, August 2015

[2] Hatim S. Hussein, "Multipath Bandwidth Capacity Allocation and MPLS Internet Traffic Engineering", Journal of Advances in Computer Networks, Vol. 3, NO. 3, September 2015.

[3] Fahim A. Khandaker and Jason P. Jue, "*A Study of Statistical Capacity Sharing In Elastic Optical Netwoeks", IEEE ICC* 2015 – Optical Networks and Systems and Symposium.

[4] M. Yousefvand, Member, IEEE, N. Ansari, Fellow, IEEE, and S. Khorsandi, Member, *"Maximizing Network Capacity of Cognitive Radio Networks by Capacity – aware Spectrum Allocation"*, IEEE Transactions and Wireless Communications 2015

[5] Internet Traffic Dataset is available in WWW.Caida.org

[6] Internet Traffic Dataset is available in WWW.Akami.com