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Handling Traffic Dynamics in Multipath Routing Topology

K.Chennakeshavulu=, Mr S.K Prasanth*

1. Computer Science And Engineering,VCE,HYD

2. Associate Professor,VCE,HYD

Abstract-
To achieving a better quality of service and overall network performance, it is able to cope almost optimally with unpredicted traffic dynamics. Using multiple virtualized routing topologies, AMPLE (Adaptive Multi-topology traffic Engineering) system shows an effective routing performance. The proposed system consists of offline link weight optimization component that takes as input the physical network topology through the optimized setting of link weights it tries to produce maximum routing path diversity across multiple virtual routing topologies for long term operation. Based on these diverse paths, adaptive traffic control performs intelligent traffic splitting across individual routing topologies in reaction to the monitored network dynamics at real time. The proposed multipath routing system offers a promising solution for traffic dynamics in today's networks and also able to simultaneously tackle both traffic and network dynamics, for instance network failures.

***Keywords*-AMPLE,OLWO,ATC,TE**

I.INTRODUCTION

Traffic Engineering (TE) based on IGPs such as OSPF and IS-IS has recently been receiving numerous attentions in the Internet research community. In order to achieve near-optimal or even optimal network performance, it is suggested that both IGP link weights and traffic splitting ratio need to be optimized simultaneously. Network monitoring is responsible for collecting up-to date traffic conditions in real-time plays an important role for supporting the ATC (Adaptive traffic control) operations. AMPLE adopts a hop-by-hop based monitoring mechanism. Monitoring agent at every PoP node is responsible for collecting up to date traffic conditions and monitoring.

- The volume of the traffic originated by the local customers toward other PoPs (intra domain- PoP traffic is ignored).
- The utilization of directly attached inter-PoP links is efficient

II. AMPLE SYSTEM OVERVIEW

AMPLE (Adaptive Multi-topology traffic Engineering) system is virtualized IGP routing topologies for dynamic traffic engineering. The ultimate objective of Offline Link Weight Optimization is to provision offline maximum intra-domain path diversity in the routing plane, allowing the ATC component to adjust at short timescale the traffic assignment across individual VRTs in the forwarding plane. With MTIGP routing, customer traffic assigned to different virtual routing topologies (VRTs) follows distinct IGP paths according to the dedicated IGP link weight configurations within each VRT.

1.Path Diversity in the Network:

The fundamental issue in offline link weight optimization is to determine the definition of path diversity between the source and destination ends.The path diversity scenarios are two types

. PoP-level S-D pairs
. None of the S-D pairs have disjoint paths, but none of them are completely overlapping either.

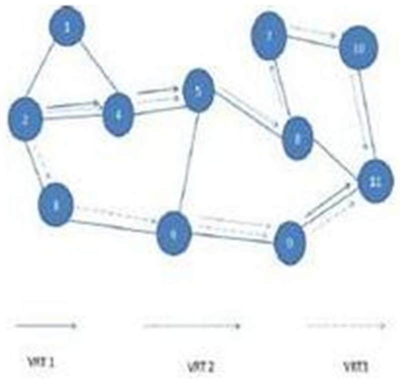

Fig.1 Path Diversity In Anetwork

Figure.1 illustrates how path diversity can be achieved for S-D pairs in the Point-of-Presence (PoP) level in the above network topology with three VRTs. considering as an example from node1 to node 2. the key task of the offline configuration is to compute MT-IGP link weights for providing maximum path diversity for every S-D.for example if the link between node 5 and node 6 is highly loaded, some traffic originally carried through the green path in VRT 1 can be shifted to the other two i.e. VRTs 2 and 3, respectively by adjusting the traffic splitting ratio across the three VRTs at node 2.

III. PROPOSED SYSTEM

1) Network monitoring:

Monitoring agent gathers data on the locally originated traffic volume from all the access routers (ARs) attached to customers at the PoP. In a periodic fashion (e.g. hourly),the central TE manager polls individual monitoring agents within each PoP and collects their locally monitored traffic volume and link utilizations. Traffic engineering information base (TIB) is needed by the TE manager to maintain necessary network state based on which new traffic splitting ratios are computed.

2) Offline Link Weight Optimization (OLWO):

Offline link weight optimization that takes as input the physical network topology and tries to produce maximum routing path diversity across multiple virtual routing topologies for long term operation through the optimized setting of link weights. The ultimate objective of OLWO is to provision offline maximum intra-domain path diversity in the routing plane allowing the ATC component to adjust at short timescale the traffic assignment across individual VRTs in the forwarding plane.

3) Adaptive Traffic Control (ATC:)

Based on these diverse paths, adaptive traffic control performs intelligent traffic splitting across individual routing topologies in reaction to the monitored network dynamics at short timescale. The optimization objective of ATC is to minimize the maximum link utilization (MLU), which is defined as the highest utilization among all the links in the network. The efficient ATC algorithm that can be applied for adaptive adjustment of the traffic splitting ratio at individual PoP source nodes to achieve this goal. In a periodic fashion, the following two operations are performed:

- Measure the incoming traffic volume and the network load for the current interval as described in the previous section.
- Compute new traffic splitting ratios at individual PoP source nodes based on the splitting ratio configuration in the previous interval, according to the newly measured traffic demand and the network load for dynamic load balancing**.**

The structure of our proposed TIB, which consists of two inter-related repositories, namely the Link List (LL) and the S-D Pair List (SDPL).The LL maintains a list of entries for individual network links. Each LL entry records the latest monitored utilization of a link and the involvement of this link in the IGP paths between associated S-D pairs in individual VRTs. More specifically, for each VRT, if the IGP path between an S-D pair includes this link, then the ID of this S-D pair is recorded in the LL entry. It is worth mentioning that this involvement information remains static after the MT-IGP link weights have been configured (static information is presented in black in during each ATC interval, the TIB is updated upon the occurrence of two events. The TIB is updated upon the occurrence of two events.

. First, upon receiving the link utilization report from the network monitoring component, the TE manager updates the link utilization entry in the LL and the ID of the bottleneck link for each S-D pair under each VRT in SDPL.

. Second, when the adaptive traffic control phase is completed and the new traffic splitting ratios are computed, the splitting ratio field in SDPL is updated accordingly for each S-D pair under each VRT.ATC is performed based on the up-to-date data maintained in the TIB.

4) Simulation Result:

The information of each node is maintained in TE manager. If the traffic or maximum load is there in the estimated path then the packets will choose the alternative path based on maximum link utilization to communicate with in the network.The TE manager polling the individual nodes is shown in the below figure.

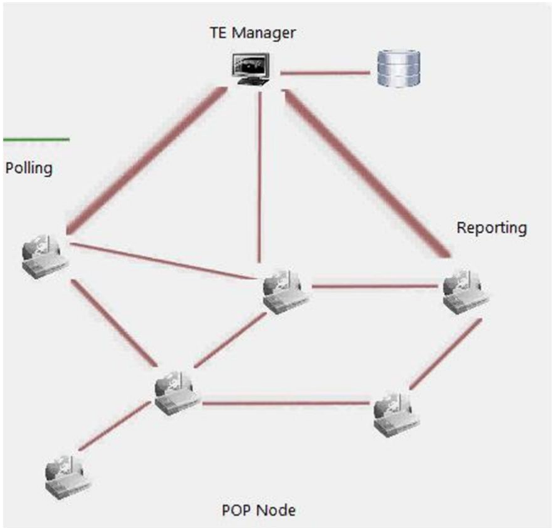

Fig .2 TE manager polling the individual pop nodes

IV.CONCLUSIONS

The TE system works as follows: First, optimized MT-IGP link weights are configured on top of the underlying MT-IGP platform and remain static until the next offline OWLO cycle. During this period, ATC(adaptive traffic control) adaptively re-balancing the load according to the traffic dynamics in short-time scales. The TE manager updating the traffic volume between each S-D pair in the SDPL and link utilization information stored in the LL of the TIB. The alternate path is chosen for the packet Transfer based on the obtained link utilization information from source to destination ends. A potential direction in our future work is to consider a holistic TE paradigm based on AMPLE, which is able to simultaneously tackle both traffic and network dynamics, for instance network failures.

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