Virtual Routing Topologies for Flexible Traffic Engineering System

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Abstract - **Contemporary network management system is, managing traffic flow in order to avoid network bottlenecks and consecutive service interruptions are one of the major tasks performed. Accustomed the simple but forwarding and rigid routing functionalities in Internet Protocol based environments, dynamic resource management and control clarifications against high traffic conditions is still yet to be accomplish. In this article, we introduce AMPLE — An Efficient Traffic Engineering and Management system that performs robust traffic control by using more number of virtualized routing techniques. The proposed system consists of two conclusive parts: "offline link weight optimization" that takes as input from the environmental network topology and tries to produce maximum routing path redirect across more number of constructive routing topologies for distant future operation through the customized setting of link weights. Based on these different paths, "adaptive traffic control" performs inventive traffic splitting across distinctive routing topologies in reaction to the monitored network dynamics at short time period. According to our assessment with real network topologies and traffic evidence, the proposed system is able to manage almost optimally with unexpected traffic dynamics and, as such, it constitutes a new presentation for action for accomplishing better quality of service and overall network performance in Internet Protocol networks.**

I. Introduction

Mobile ad hoc network (MANET) is a group of two or terminals or nodes or more devices with an efficiency of wireless communications and networking which accomplish them able to communicate with each other without the support of any centralized system. This is an independent system in which nodes are connected by wireless links and send data to each other. As we know that there is no any centralized system so routing is done by node itself. Due to its mobility and self routing efficiency nature, there are many defects in its security. To solve the security issues we need an Intrusion detection system, which can be categorized into two models: Signature-based intrusion detection and anomaly-based intrusion detection. In Signature-based intrusion detection there are some earlier detected signature or patron are stored into the data base of the IDS if any distraction is found in the network by IDS it matches it with the earlier saved patron and if it is matched than IDS found attack. But if there is an attack and its patron is not in IDS database then IDS cannot be able to identify attacks. For this periodically updating of database is compulsory. To resolve this defect anomaly based IDS are invented, in which mainly the IDS accomplish the normal profile of the network and put this normal profile as a base profile compare it with the monitored network profile. The benefit of this IDS technique is that it can be able to detect attack without prior knowledge of attack. Intrusion attack is very easy in wireless network as compare to wired network. One of the serious attacks to be considered in ad hoc network is DDoS attack. A DDoS attack is a large scale, coordinated attack on the availability of services at a victim system or network resource. The DDoS attack is launched by sending huge amount of packets to the target node through the co-ordination of large amount of hosts which are distributed all over in the network. At the victim side this large traffic consumes the bandwidth and not allows any other important packet reached to the victim.

II. System Overview

The below figure represents an overall view of the proposed AMPLE TE system, with Offline MT-IGP Link Weight Optimization (OLWO) and Adaptive Traffic Control (ATC) completes the key components. As discussed, the final objective of OLWO is to provision offline maximum Intra-domain path difference in the routing plane, allowing the ATC component to adjust at short timescale the traffic assignment across distinctive VRTs in the forwarding plane. An important novelty is that the optimization of the MT-IGP link weights does not depend on the availability of the traffic matrix a priori, which afflicts existing offline TE solutions due to the typical inaccuracy of traffic matrix estimations. Instead, our offline link weight optimization is only based on the characteristics of the network itself, i.e. the physical topology. The computed MT-IGP link weights are configured in distinctive routers and the corresponding IGP paths within each VRT are populated in their local

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routing information bases (MT-RIBs). While OLWO focuses on static routing configuration in a long timescale (e.g. weekly or monthly), the ATC component provides complementary functionality to enable short timescale (e.g. hourly) control in response to the behavior of traffic that cannot be usually anticipated.

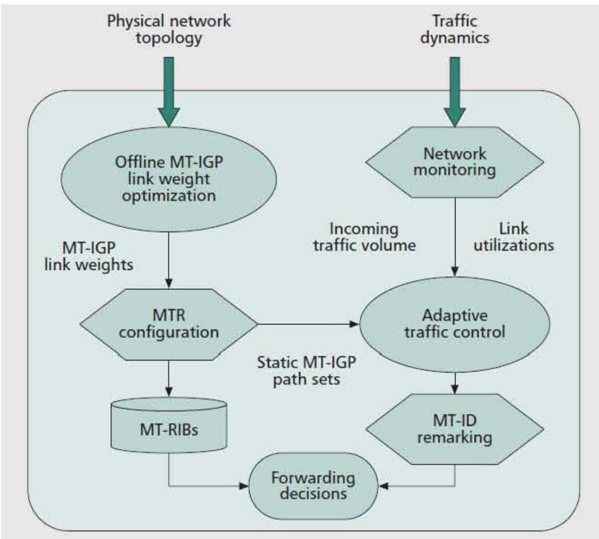

Figure 1 : AMPLE System Overview

As shown in the figure, the input for ATC includes: (1) the diverse MT-IGP paths according to the link weights computed by OLWO, and (2) monitored network and traffic data such as incoming traffic volume and link utilizations. At each short-time interval, ATC computes new traffic splitting ratio across distinctive VRTs for re-assigning traffic in an optimal way to the diverse IGP paths between each S-D pair. This functionality is handled by a centralized TE manager who has complete knowledge of the network topology and periodically gathers the up-to-date monitored traffic conditions of the operating network. These new splitting ratios are then configured by the TE manager to distinctive source PoP nodes who use this configuration for remarking the multi-topology identifiers (MT-IDs) of their locally originated traffic accordingly. The TE manager function can be realized as a dedicated server, but for robustness and resilience it can be implemented in a distributed replicated manner for avoiding the existence of a single point of failure. In the next section we present the detailed design of distinctive components in the AMPLE system.

III. Development Environment

a) Virtual Traffic Allocation

In this Module, the diverse MT-IGP paths according to the link weights computed by OLWO. Monitored network and traffic data such as incoming traffic volume and link utilizations. At each short-time interval, ATC computes a new traffic splitting ratio across individual VRTs for re-assigning traffic in an optimal way to the diverse IGP paths between each S-D pair. This functionality is handled by a centralized TE manager who has complete knowledge of the network topology and periodically gathers the up-to-date monitored traffic conditions of the operating network. These new splitting ratios are then configured by the TE manager to individual source PoP nodes, which use this configuration for remarking the multi-topology identifiers (MTIDs) of their locally originated traffic accordingly.

b) Offline Link Weight Optimization

In this module, to determine the definition of "path diversity" between PoPs for traffic engineering. Let's consider the following two scenarios of MT-IGP link weight configuration. In the first case, highly diverse paths (e.g. end-to-end disjoint ones) are available for some Pop-level S-D pairs, while for some other pairs individual paths are completely overlapping with each other across all VRTs. In the second case, none of the S-D pairs have disjoint paths, but none of them are completely overlapping either. Obviously, in the first case if any "critical" link that is shared by all paths becomes congested, its load cannot be alleviated through adjusting traffic splitting ratios at the associated sources, as their traffic will inevitably travel through this link no matter which VRT is used. Hence, our strategy targets the second scenario by achieving "balanced" path diversity across all S-D pairs.

c) Network Monitoring

In this Module, Network monitoring is responsible for collecting up-to-date traffic conditions in real-time and plays an important role for supporting the ATC operations. AMPLE adopts a hop-by-hop based monitoring mechanism that is similar to the proposal.

The basic idea is that a dedicated monitoring agent deployed at every PoP node is responsible for monitoring:

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

d) Adaptive Traffic Control

In this Module, Measure the incoming traffic volume and the network load for the current interval as 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.

IV. Brief Survey on Networks

Literature survey is the most important step in software development process. Before developing the tool it is necessary to determine the time factor, economy n company strength. Once these things are satisfied, then next steps is to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system the above consideration r taken into account for developing the proposed system.

a) What is Wireless Networking?

The term refers to any kind of networking that does not involve cables. It is a technique that helps entrepreneurs and telecommunications networks to save the cost of cables for networking in specific premises in their installations. The transmission system is usually implemented and administrated via radio waves where the implementation takes place at physical level.

b) What are the Types of Wireless Connections?

The types of networks are defined on the bases of their size (that is the number of machines), their range and the speed of data transfer.

c) Wireless PAN - Personal Area Network Wireless Personal Area Networks

Such networks interconnect devices in small premises usually within the reach of a person for example invisible infra red light and Bluetooth radio interconnects a headphone to a laptop by the virtue of WPAN. With the installation of Wi-Fi into customer electronic devices the Wi-Fi PANs are commonly encountered.

d) Wireless LAN - Local Area Network

The simplest wireless distribution method that is used for interlinking two or more devices providing a connection to wider internet through an access point. OFDM or spread-spectrum technologies give clients freedom to move within a local coverage area while remaining connected to the LAN. LAN's data transfer speed is typically 10 Mbps for Ethernet and 1 Gbps for Gigabit Ethernet. Such networks could accommodate as many as hundred or even one thousand users.

e) Wireless MAN - Metropolitan Area Networks

The wireless network that is used to connect at high speed multiple wireless LANs that are geographically close (situates anywhere in a few dozen kilometers). The network allows two or more nodes to communicate with each other as if they belong to the same LAN. The set up makes use of routers or switches for connecting with high-speed links such as fiber optic cables. WiMAX described as 802.16 standard by the IEEE is a type of WMAN.

f) Wireless WAN

WAN is the wireless network that usually covers large outdoor areas. The speed on such network depends on the cost of connection that increases with increasing distance. The technology could be used for interconnecting the branch offices of a business or public internet access system. Developed on 2.4GHz band these systems usually contain access points, base station gateways and wireless bridging relays. Their connectivity with renewable source of energy makes them stand alone systems. The most commonly available WAN is internet.

g) Mobile Devices Networks

The advent of smart phones has added a new dimension in telecommunications; today's telephones are not meant to converse only but to carry data.

h) GSM - Global System for Mobile

Communications Global System for Mobile Communications is categorized as the base station system, the operation and support system and the switching system. The mobile phone is initially connected to the base system station that establishes a connection with the operation and support station that later on connects to the switching station where the call is made to the specific user. PCS - Personal Communications Service is a radio band that is employed in South Asia and North America; the first PCS service was triggered by Sprint.

i) D-AMPS Digital Advanced Mobile Phone Service

Is the upgraded version of AMPS that is faded away due to technological advancements. TAN - Tiny Area Network and CANs - Campus Area Networks are two other types of networks. TAN is similar to LAN but comparatively smaller (two to three machines) where CAN resemble MAN (with limited bandwidth between each LAN network).

j) The Utility of Wireless Networks

The development of wireless networks is still in progress as the usage is rapidly growing. Personal communications are made easy with the advent of cell phones where radio satellites are used for networking between continents. Whether small or big, businesses uses wireless networks for fast data sharing with economical means. Sometimes compatibility issues with new devices might arise in these extremely vulnerable networks but the technology has made the uploading and the downloading of huge data a piece of cake with least maintenance cost. WEP - Wired Equivalent Privacy as well as firewalls could be used for securing the network. Wireless networks are the future of global village. For referring to security of wireless LAN networks you can refer to related articles in section below.

V. Conclusion

In this article we have introduced AMPLE, a novel TE system based on virtualized IGP routing that enables short timescale traffic control against unexpected traffic dynamics using multi topology IGP-based networks. The framework encompasses two major components, namely, Offline Link Weight

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Optimization (OLWO) and Adaptive Traffic Control (ATC). The OLWO component takes the physical network topology as the input and aims to produce maximum IGP path diversity across multiple routing topologies through the optimized setting of MT-IGP link weights.

Based on these diverse paths, the ATC component performs intelligent traffic splitting adjustments across individual routing topologies in reaction to the monitored network dynamics at short timescale. As far as implementation is concerned, a dedicated traffic engineering manager is required, having a global view of the entire network conditions and being responsible for computing optimized traffic splitting ratios according to its maintained TE information base.

Our experiments based on the GEANT and Abilene networks and their real traffic traces have shown that AMPLE has a high chance of achieving near-optimal network performance with only a small number of routing topologies, although this is yet to be further verified with traffic traces data from other operational networks when available. A potential direction in our future work is to consider a holistic TE paradigm based on AMPLE, which is passable to simultaneously tackle both traffic and network dynamics, for instance network failures.

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