

**CHENNAI – PONDICHERRY**

**Analysis of Practical Aspects of Multi-Plane Routing-Based Load Balancing Approach for Future Link-State Convergent All-IP Access Networks**

**Abstract:**

With the expected surge in the global IP traffic, service providers would need to adapt accordingly to operate disruption and loss free networks supported with the developing IP infrastructure. With the disposal of the hierarchical network structure, radio access networks are moving towards a flat-IP architecture and novel topological set-ups in the backhaul. Hence, a routing paradigm that employs suitable Traffic Engineering (TE) techniques aligned with the developing nature of future access networks must be applied. It becomes imminent that the routing considerations for IP access networks converge with the ones found in conventional intra-domain routing. In this paper, Multi-Plane Routing (MPR) that consolidates various aspects in all-IP infrastructure is extensively studied in access network structures. We propose a MPR-based TE approach considering two different scenarios to reflect the evolution in the architectural design of access network structures under a realistic traffic scenario with a varying range of internal/external traffic. Moreover, a new optimization framework for the offline and online TE mechanisms of MPR have been formulated. Accordingly, a practical performance evaluation testing the validity of the aforementioned scenarios is presented. Our simulation results demonstrate extensive analysis in terms of several performance criteria in networks. It is convincingly shown that for ranges of topologies, MPR’s utilization of whole topology in building path diversity in networks, allows for significant improvement of networks capacity, performance, and support for meshing.

**Existing System:**

Explicit routing and arbitrary splitting of traffic are enabled through MPLS. However, scalability and robustness become an issue due to the complexity and overhead associated with building and maintaining LSPs to which flows are mapped and the extra information added to each packet.

IP-based TE is implemented through the manipulation of link weights in case of Interior Gateway Protocols (IGPs) such as Open Shortest Path First (OSPF) which is a commonly used intra-domain dynamic link-state IP IGP. As opposed to MPLS TE, IP TE does not facilitate explicit routing and arbitrary splitting of traffic intrinsically as it is based on the shortest-path routing principle with relatively slow recalculation of paths.

Equal-Cost Multi-Path (ECMP) is an add-on option of OSPF based on which traffic is split roughly equally between multiple paths of equivalent cost through hop-by-hop forwarding. ECMP can not be configured in complex large-scale topologies as the quality of OSPF TE can become arbitrarily poor compared to optimal TE due to the computational intractability to derive optimal link weights for large-scale networks [3]. There are notable studies on improving the optimality of IP-based intra-domain TE mechanisms based on ECMP.

**Proposed System:**

We present optimization frameworks that formally describe the offline and online TE mechanisms of MPR. First, by leveraging the initial offline TE model for multi-topology construction that was built upon in the initial MPR, we combine our approaches to the offline TE enable hop-constrained path diversity across various topologies.

Moreover, since we take into account an increased pairing of traffic sources and sinks, we design a corresponding new online TE model based on a multicommodity flow problem associated with different classes of flow demands.

A thorough performance analysis of MPR is conducted investigating: i) diverse ranges of topologies and meshings; ii) realistic traffic scenarios with varying ratios of internal and external traffic; iii) traffic of both uplink and downlink nature where all the Ars and the GW can be Ingress/Egress. This extends the performance analysis of where a single topology was examined, hence providing novel and more concrete conclusions compared to the first analysis of the early versions of MPR (i.e., GW anchored traffic distribution scenario). To the best of our knowledge, such a thorough practical analysis that facilitates a comprehensive vision of the network’s performance is absent in literature. We conclude by recommending our analytical strategy for the study of other load balancing approaches.