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An In-Depth Look at Multi-Protocol Label Switching (MPLS) for Enhancing Traffic Engineering and Network Efficiency

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Abstract: *Growing data traffic and the need for more efficient, reliable and high-speed networks have also promoted Traffic Engineering technologies such as Multiprotocol Label Switching (MPLS). MPLS uses label-based packet switching, which in turn allows for increased route optimization, better latency and service quality. This paper reviews the fundamentals of MPLS, its architecture, and its role in traffic engineering (MPLS-TE). Some of the significant enhancements include Informative Path of MPLS-TE regarding network congestion avoidance, resilience guarantee, and bandwidth fruition. Additionally, challenges such as integration with multilayer networks, bandwidth-delay constraints, and the potential of software-defined networking (SDN) in MPLS are examined. This detailed research shows how MPLS creates a foundation technology that helps build new traffic engineering and network management capabilities.*

Keywords: MPLS, Traffic Engineering, MPLS-TE, Quality of Service (QoS), Label Switching, Network Scalability, Software-Defined Networking (SDN), Bandwidth Optimization, Congestion Management, Multilayer Networks