

Multi-Tenancy in Hybrid WAN Architectures: Ensuring Isolation and Fair Resource Allocation across SD-WAN and Cloud Layer

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Abstract

Since the hybrid WAN model integrating SD-WAN and Cloud is developing rather rapidly, efficient ways of managing resources in terms of multi-tenant isolation should be introduced to meet performance and security requirements. The most popular approaches nowadays include HNM (Hierarchical Namespace-based Multi-Tenancy Model) and DRS (Deep Reinforcement Scheduler). Although these solutions can address either isolation issue or dynamic scheduling efficiently, they cannot reach the optimal tradeoff between those factors. Hence, this research introduces a novel solution of addressing resource management issues in terms of SD-WANs. This solution includes the Multi-Tenant Isolation and Fair Resource Allocation Framework (MTI-FRAF), which guarantees full tenant isolation while allocating resources dynamically. The experiments conducted revealed the superiority of the newly developed MTI-FRAF framework compared to current models, based on several factors including the fairness index, throughput, latency, resource usage, isolation efficiency, and scalability. For instance, MTI-FRAF has reached an increase in the fairness index of 15% in comparison with the HNM Model and 8% compared to DRS with lower latency levels. Additionally, MTI-FRAF offers a high throughput and resource usage due to efficient resource allocation. Thus, the results obtained during the experiment prove the efficiency of the newly suggested approach.

Keywords

Multi-Tenancy, Hybrid WAN, SD-WAN, Resource Allocation, Fairness Optimization, Tenant Isolation, Cloud Networking, QoS, Network Slicing, Adaptive Scheduling.