Paper Title:
A Multi-Clustering Approach to Scale Distributed Tenant Networks for Mobile Edge Computing

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1 Summary:
1.1 Introduction

The advent of 5G mobile networks is not just about increased speed and connectivity. It is also about creating a deep integration between networks and applications, enabling new classes of heterogeneous application services. This is made possible through novel paradigms like Network Functions Virtualization and Edge Computing.

The role of Software-Defined Networking technologies, which are instrumental in managing network-induced performance issues during the migration of Virtual Objects or "microservices". These are components of modern, cloud-native applications that are perfect for "vertical deployment" onto 5G-ready infrastructures. This means they can be placed in geographically distributed computing facilities close to user equipment, and migrated seamlessly as needed.

But the real star of this development is an SDN-based mechanism called the Multi-Cluster Overlay. This is specifically designed to support mobile Virtual Objects at the network edge in a highly scalable manner. It achieves a significantly smaller number of forwarding rules than other SDN mechanisms, while also assuring high performance during reconfiguration operations.

1.2 Related Works

The research paper "A Multi-Clustering Approach to Scale Distributed Tenant Networks for Mobile Edge Computing" by Roberto Bruschi discusses the efficient management of Virtual Objects (VOs) and traffic steering in Software-Defined Networking (SDN). While much of the related work has focused on managing VOs and traffic steering within a single datacenter, the Multi-Cluster Overlay (MCO) approach proposed in this paper provides a broader scope by addressing multiple geo-distributed datacenters and their wide-area interconnection, which is essential in the Mobile Edge Computing environment.

In the context of Network Functions Virtualization (NFV) and Service Functions Chaining (SFC), there is a large body of literature dealing with resource allocation and network function placement. Some recent works have addressed the problem of Virtual Network Function (VNF) placement and chaining, taking into account various characteristics for optimality, and also considering user mobility in some cases.

The MCO approach proposed in this paper is complementary to the placement and chaining problems. It leverages SDN's configurability to address the provision of suitable communication channels once resource allocation mechanisms have performed the most efficient deployment of VNF/VO instances. The aim is to provide their interconnection within and among the distributed datacenters, allowing any required chaining and the capability of maintaining the connectivity whenever edge resources need to be migrated to follow the user mobility and comply with the resource proximity imposed by Quality of Service (QoS) requirements.

1.3 Methodology

MCO approach is an SDN-based mechanism designed to support the deployment of Virtual Objects (VOs) in a distributed tenant network across geo-distributed computing resources. It aims to provide suitable communication channels once resource allocation mechanisms have performed the most efficient deployment of VNF/VO instances.

The MCO approach is also designed to support the interconnection of VNFs/VOs within and among the distributed datacenters, allowing for any required chaining and maintaining connectivity whenever edge resources need to be migrated to follow user mobility and comply with the resource proximity imposed by Quality of Service (QoS) requirements.

1.4 Conclusion

The research paper discusses the challenges of supporting the heterogeneity and mobility of Edge applications in a shared Telecom infrastructure. While Software-Defined Networking (SDN) provides significant benefits, scalability remains a problem. The paper proposes the Multi-Cluster Overlay (MCO) mechanism, which offers high scalability in realizing wide-area Virtual Tenant Networks (VTNs) and seamless mobility of Virtual Objects (VOs). The MCO mechanism is shown to achieve a significantly smaller number of OpenFlow rules in the overlay implementation, demonstrating its high scalability. The paper also presents experimental results showing its low computational complexity and high performance.