**基于SDN网络的视频流媒体传输性能研究**

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摘 要

近年来，随着互联网与多媒体技术的迅速发展，视频流媒体应用在互联网上广泛使用，其严格的QoS要求在为人们的生活和工作带来便利的同时，也给网络的传输带来不小的挑战，传统网络存在的一些缺点常常造成视频在传输过程中的不稳定，严重影响视频传输的服务质量。软件定义网络（Software-Defined Networking，SDN）作为一种新型的网络架构，其转控分离、集中控制及可编程的思想为解决传统网络中的流量工程、QoS路由等问题提供了新的思路。本文利用SDN的特性，在SDN网络中对视频流媒体的传输性能进行研究，主要研究内容包括以下几个方面：

首先，本文对四种不同种类业务进行了优先级的区分，并设定了不同的优先级值，提出了视频流媒体的QoS控制策略。然后，基于遗传算法的QoS路由为视频流媒体（最高优先级业务）计算传输路径，基于Dijstra算法以跳数为代价为其他优先级业务计算传输路径，且当控制器检测到视频流媒体的传输路径出现拥塞时，采取动态路由措施更好地保障视频流媒体的QoS。其次，使用HTB队列规则在OpenFlow交换机上进行不同优先级业务的区分调度，优先保障视频流媒体业务的QoS，同时提供带宽充足时的借带宽机制，尽力保障其他业务流的QoS。

最后，对QoS控制框架的拓扑管理模块、链路信息测量模块、路由管理模块以及队列调度模块分别进行了实现，并在Mninet、Ryu控制器、摄像头等软件搭建的SDN网络传输环境中，对QoS控制策略进行了测试。通过一系列仿真实验，从链路时延抖动、吞吐率等视频流媒体的传输性能参数方面验证了本文控制策略的可行性。仿真实验结果表明，QoS控制策略能为视频流媒体选择一条符合需求的路径进行传输，能够对视频流媒体进行动态路由，能够在数据转发层区分保障不同优先级业务的QoS，较好地保证了最高优先级业务端到端的QoS需求。

**关键词：**软件定义网络；视频流媒体；QoS路由；遗传算法；队列调度

**Research on Video Streaming Media Transmission Performance based on SDN Network**

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**Abstract**

In recent years, as the Internet and multimedia technologies have been developed rapidly, video streaming is widely used on the Internet, Its stringent QoS requirements in bring convenience for people's life and working at the same time, also bring a big challenge to the network transmission, The disadvantages of the traditional network often cause the instability in the transmission process of video, which seriously affects the service quality of video transmission. As a new network architecture, software-defined Networking (SDN) provides a new train of thought for traffic engineering, QoS routing and other problems in traditional network by taking advantages of the separation of control, centralized control and programmable. In this paper, the performance of video streaming media in SDN is studied by using the characteristics of SDN, the main research content includes the following several aspects:

First of all, this paper makes a priority distinction between four different kinds of businesses, and sets different priority values, and puts forward the QoS control strategy of video streaming media. Then, the QoS routing based on genetic algorithm calculates the transmission path for the video streaming media (the highest priority business), and calculates the transmission path for other priority services at the cost of the jump number based on the Dijstra algorithm, and when the controller detects congestion in the transmission path of video streaming media, dynamic routing measures are adopted to better protect the QoS of video streaming media. Secondly, the HTB queue rules are used to make the differentiated scheduling of different priority services on the OpenFlow switch, and the QoS of the video streaming media service is guaranteed firstly, at the same time, it provides the borrowing bandwidth mechanism when bandwidth is sufficient, and makes every effort to guarantee the QoS of other business flows.

Finally, the Topology Management module, link information measurement module, routing management module and queue scheduling module of QoS control framework are implemented respectively, and the QoS control strategy is tested in SDN network transmission environment built by Mninet, Ryu controller, camera and other software. Through a series of simulation experiments, the feasibility of this control strategy is verified from the aspects of transmission performance parameters of video streaming media such as chain delay jitter and throughput rate. Simulation experimental results show that QoS control strategy can select a path that meets the requirements of video streaming media for transmission and can dynamically route video streaming media, and can distinguish the QoS of different priority business in the data forwarding layer, and ensure the QoS requirement of the highest priority service end-to-end.

**Key Words：**SDN; Video streaming media; QoS routing; Genetic algorithm; Queue scheduling