**基于SDN网络的视频流媒体传输性能研究**

**学 科：**模式识别与智能系统

**研究生签字：**

**指导教师签字：**

摘 要

伴随着互联网行业与多媒体技术的蓬勃发展，视频流媒体应用在互联网上大放异彩，其严格的QoS需求为人们的生活和工作带来了便利，但同时也给网络传输带来了不小的挑战，传统网络存在的种种弊端经常造成视频传输的不稳定，严重影响视频传输的服务质量。软件定义网络（Software-Defined Networking，SDN）是一种与传统网络结构有所不同的网络架构，其转控分离、集中控制、可编程的思想为网络中的流量工程、QoS路由等问题提供了独特的解决思路。本文旨在利用SDN的特性提高视频流媒体的传输性能，主要研究内容有以下几个方面。

首先，本文对四种不同类型的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Dijkstra算法以跳数为代价为其他优先级业务计算传输路径。当控制器监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交换机上实现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，尽力保障每个业务流的传输需求。

最后，对QoS控制策略中的拓扑管理模块、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，从链路的时延抖动、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；能在传输路径出现拥塞时为视频流媒体提供重选路机制；能够在数据转发层保障不同优先级业务的QoS，较好地保证了视频流媒体业务端到端的QoS需求。

**关键词：**视频流媒体；软件定义网络；QoS路由；队列调度

**Study the Performance of Video Streaming Media Transmission based on SDN Network**

**Discipline：**Pattern Recognition and Intelligent System

**Student Signature：**

**Supervisor Signature：**

**Abstract**

With the vigorous development of the Internet industry and multimedia technology, video streaming media applications on the Internet shine brilliantly. there strict QoS performancebrings convenience to people's life and work, but at the same time they also bring a great challenge to the network transmission. The disadvantages of the traditional network often cause the instability of video transmission, which seriously affects the service quality of video transmission. Software Defined Network (SDN) is a kind of network architecture which is different from the traditional network structure, its characteristics of transfer control separation, centralized control and programmability provide a unique solution to the problems of traffic engineering and QoS routing in the network. The purpose of this paper is to improve the transmission performance of video streaming media by utilizing the characteristics of SDN. The main contributions of our work are as follows:

Firstly, this paper makes a priority distinction between four different kinds of businesses, and sets different priority values, and comes up with the QoS control strategy of video streaming media. Then, the QoS routing based on genetic algorithm computes 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 Dijkstra algorithm. And when the controller monitors 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 implement the differentiated scheduling of different priority services on the OpenFlow switchs, which gives priority to guaranteeing the QoS of video streaming media services. At the same time, it provides the borrowing bandwidth mechanism when bandwidth is sufficient, so as to guarantee the transmission requirements of each service flow as much as possible.

Finally, the topology management module, link information measurement module, routing management module and queue scheduling module in QoS control strategy are fulfilled separately, and the QoS control strategy is tested in the SDN network transmission environment built by Mninet, Ryu controller, camera and other software. Through a series of simulation experiments, the feasibility of the control strategy is verified from the aspects of transmission performance parameters of video streaming media such as delay jitter and throughput rate of link. Simulation experimental results show that QoS control strategy can select a path that meets the requirements of video streaming media for transmission, it can provide a re-routing mechanism for video streaming media when the transmission path is congested, it can guarantee the QoS of different priority services at the data forwarding layer, so as to ensure the QoS requirement of the video streaming media service end-to-end.

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