預算法全 IP 核心網路品質管理中可彌補預測誤差的資源配置方法

摘要

網際網路的蓬勃發展造就了近年來通訊網路的重大改革，將原有 circuit switching 與 packet switch 網路整合成一個單一的 All-IP 網路已成趨勢，除了降低網路建置、維護與營運管理成本外，還提供一新的服務平台來支援所有的應用服務。新的網路造就新的應用服務，也產生了更形複雜的服務品質問題，針對這個問題，本研究團隊提出的 Budget-Based QoS 以分散預算的方式，採事先規劃、分散式的方法，簡化管理、追求效率與不增加管理複雜度為原則，提供端對端的網路服務品質保證。此架構下，核心網路的資源配置是由 Bandwidth Broker (BB) 統籌分配整個網域的資源，資源配置採以批發零售的方式，每個 Ingress Router 根據需求預測向 BB 預先批購資源，BB 再依此配置資源給各個 Ingress Router。為了彌補預測誤差所造成的資源浪費，本研究提出了數種資源配置的方式試圖提升網路資源的使用率，其中中央保留資源法以中央統籌的方式，即時的配置事先保留的資源給有需要的 Ingress Router；超額分配法則以類似航空公司訂位的方式，大膽地超額配置資源給各個 Ingress Router 試圖增加資源使用率。文章的最後以簡單的模擬與實驗數據來說明上述兩種資源配置法彌補預測誤差的效能，並提供網域的經營者參考，方便在不同的環境下對於不同的資源配置法做出選擇。

Forecasting Error Tolerable Resource Allocation in Budget-Based QoS Management for All-IP Core Networks

Abstract

Because of great progress of communication and computer technology, aggressive deployment of broadband fiber optical network, advance of Internet technology, and the global standardization of IP technology, the telecommunication industry is moving toward a converged network, which uses a single global IP based packet-switching network to carry all types of network traffics. In these types of network traffics, different traffic types require corresponding service to ensure end-to-end quality. For carrying all types of network traffics on All-IP network, BBQ (Budget-Based QoS) research group propose a QoS system architecture to provide end-to-end QoS guarantee. In this thesis, basing on BBQ QoS system, we propose resource pre-planning mechanism to management core network. According to demand forecast from historical data and considering pre-planning cost, pre-planning mechanism will find optimal policy to reduce management cost. In order to compensate the potential resource waste due to forecasting error, several resource allocation approach are proposed. Central Pool approach reserves resource in central pool and allocates it to those Ingress Routers who need. Overbook approach is similar to overbooking in airline booking system. It over-commits resource to Ingress Routers to improve resource utilization. In the end of this thesis, we simulate the two resource allocation approach and evaluate the performance through experiments under different circumstances. According to those evaluation, system provider can easily choose the proper allocation approach in different environments.