預算法全 IP 核心網路服務品質管理之分散式資源管理與允入控制

摘要

通訊與資訊科技的大幅進步，電信自由化帶來的激烈競爭，以及網際網路的蓬勃發展，刺激大量多媒體網路資訊的流通，為了因應此種趨勢，網路提供者已趨向合併數據及電信網路朝單一的 All-IP 網路方向發展。為了保證時效性服務在 All-IP 網路上的品質，網路服務品質(QoS)已成為 All-IP 網路的主要研究議題。不同的網路應用各有不同的特性與需求；對於那些比較不注重傳輸延遲時間的應用，增加網路頻寬或許就已足夠應付需求，但是對於那些具有互動特性(interactive)、重視傳輸延遲時間的應用，像 VoIP，除了增加網路頻寬外，All-IP 網路必須提供服務品質保證才能獲得網路營運者的支持。本研究團隊設計一個管理架構，在此架構上提供完整的 End-to-End QoS 保證，以符合 All-IP 網路上各種不同服務需求。我們提出以分散式搭配集中式的方式處理核心網路的資源規劃與分配。於分散式資源規劃方面，本文提出由邊界路由器主動預先批購頻寬的方式進行核心網路資源規劃，邊界路由器根據需求預測，考量批購成本期望值，決定出適當之頻寬預購值。於執行時段提出數個允入控制資源不足解決方案，並且配合執行時段頻寬管理機制，掌握頻寬使用情形，以達到順利允入網路訊務之目的。最後於 NS2 平台以實驗模擬的方式，評估本文中所提出之預先批購頻寬與執行時段頻寬管理機制，從結果中我們發現本研究所提出之頻寬預購方法可以有效預防因為預測誤差所造成之資源不足現象，配合執行時段頻寬管理機制可根據執行時期之資源使用狀況，在資源缺乏時提前進行頻寬補充，以順利允入訊務，提升使用率。

Distributed Resource Management and Admission Control in Budget-Based QoS Management for All-IP Core Networks

Abstract

In response to the great progress of communications and computer technologies, 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 services. Diverse types of services demand diverse QoS requirements making it a great challenge to support potential services with guaranteed QoS on All-IP networks. Our research group proposes a Budget-Based QoS (BBQ) management architecture to facilitate network operators of diversified networks. With BBQ management architecture, network operators can adjust their network architectures and management polities to support as many services as possible with end-to-end QoS guarantee. In this thesis, based on BBQ QoS architecture, we propose a hybrid resource planning methodology which integrates centralized and distributed resource planning mechanism. We proposes a methodology to help network operators plan their network resources based on the demand forecast extracted from historical data. This methodology will allow edge routers of a core network to determine the best amount of bandwidth to acquire. In addition, we also propose several solutions to avoid resource shortage at run-time. Through intensive evaluation in ns2, we demonstrate that our resource pre-planning can minimize resource cost and is tolerable to some forecasting error. Furthermore, to reduce the possibility of resource shortage with minimum resource reservation overhead, we propose a run-time resource management scheme, which can help to determine the best in-hand resource level during run-time execution.