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IEEE Vehicular Technology Chapter Presentation

Quantitative QoS and Efficient Resource Allocation in Differentiated Services Networks

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Abstract: The differentiated services (DiffServ) architecture has been widely accepted as a scalable traffic management model to provision quality of service (QoS) in both wireless and wireline networks. DiffServ defines differentiated per-hop behaviors (PHBs) and service level agreement (SLA) based network management architecture, but it leaves open the specific techniques to provision quantitative QoS and achieve efficient resource allocation. In this talk, we first develop a quantitative assured service, which is an enhancement of the DiffServ assured PHB to provision quantitative QoS guarantee. For such a service, a partitioned-buffer scheme and associated admission control algorithms are studied to achieve intra-buffer loss differentiation with quantitative loss probability guarantee. Accurate loss analysis techniques are developed for both large buffer and finite-size buffer cases with general input processes. Effective bandwidth based admission control is also investigated. We then discuss how to improve resource utilization by connection level or service level QoS control in the SLA-based resource management architecture, assuming the packet-level QoS issues are encapsulated by the notion of effective bandwidth. At the present time, static SLAs are mainly used, where the network is dimensioned based on an estimation of the average traffic load. In reality, when the actual traffic load deviates from the estimation, resources will be utilized inefficiently. We develop a bandwidth borrowing technique for dynamic inter-SLA resource sharing. It improves resource utilization by exploiting the spare capacity of underloaded SLAs to admit traffic for overloaded SLAs, while SLA compliance is always guaranteed via a novel call-level service differentiation concept. Moreover, distribution of the spare capacity in the network can be dynamically adjusted according to high-level policies and via a distributed algorithm to further improve the resource utilization.

Yu Cheng received the B.E. and M.E. degrees from Tsinghua University, Beijing, China, in 1995 and 1998, respectively, and the Ph.D. degree from the University of Waterloo, Waterloo, ON, Canada, in 2003, all in electrical engineering. From September 2003 to August 2004 he was a Postdoctoral Fellow in the Department of Electrical and Computer Engineering at the University of Waterloo. Since September 2004, he has been a postdoctoral fellow in the Department of Electrical and Computer Engineering at the University of Toronto. His research interests include Internet QoS, traffic engineering, service and network management, and wireless/wireline interworking. He received a Postdoctoral Fellowship Award from the Natural Sciences and Engineering Research Council of Canada (NSERC) in 2004.

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Invited By Professor Weihua Zhuang