

論文要旨

Thesis Abstract

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<p>主論文題名 (Title)</p> <p>Bandwidth allocation methods based on quality of experience considering users' characteristics for web-based services</p>			
<p>内容の要旨 (Abstract)</p> <p>The constant increase of Internet services as well as the rapid improvement and support from software and hardware devices have allowed users to easily access many types of Internet services such as news, email services, social networking, and even entertainment with audio and video anywhere and anytime. As a result, huge information exchanged among users has generated a large quantity of traffic on the Internet. While the network resource is limited, users always expect the better level of satisfaction. This poses the challenges of network resource allocation for not only network providers but also network planning and system design.</p> <p>There is no doubt that the Internet and its services are becoming an important role in people life. However, there are two difficult problems for network providers in allocating and distributing the internet bandwidth resource: how to allocate reasonably the limited network resource to users and still guarantee the perceived quality of users. In other words, the fairness in allocation and users satisfaction is the most important consideration in solving the resource distribution problem. The problem has motivated intensive research in the past few years to find the ways to balance the fairness in allocation among users while keeping a reasonable network performance.</p> <p>To address the above problems, in the dissertation I propose novel approach for bandwidth resource allocation schemes based on the quality of experience (QoE) for web-based services. Web-based services, one of the typical Internet services, which are widely used by Internet users, have been growing with a tremendous speed in the recent years. From the viewpoint of users, the proposed approach clearly shows the level of users satisfaction and the objective information, i.e., network metrics. In particular, this dissertation includes the following main points.</p> <p>First, I proposed a bandwidth resource allocation scheme, which is based on the fair QoE viewpoint to allocate the bandwidth to users. This scheme is based on the fact that users can experience the same satisfaction level even in the different network resource environment. It is caused by the effect of subjective factors such as users' situation, demands, or degree of relaxation. The main point of the proposed scheme is the applicability to multi-user types in real systems. In the dissertation, I analyzed the proposed method in case of two, three, four and generalized user situations. The numerical results show that the proposed method successfully allocates a fair QoE to users and improves the QoE for dissatisfied users.</p> <p>Secondly, I proposed a hybrid allocation method for three user types. The proposed method is based on the methodology that bandwidth consumption can be negotiated among users. It means that the proposed method tries to keep a similar level of users' satisfaction under the bandwidth limitation. The aim of</p>			

this method is to find a trade-off solution for the bandwidth allocation issues. The numerical results show that the proposed bandwidth allocation method can improve the QoE for some user groups and remain a suitable average QoE for all users. In addition, the method also proposes a bandwidth threshold for users. By using the bandwidth threshold, it enables to realize the proposed method in real system.

Finally, I proposed a theory of the participatory service that is a solution to realize the proposed bandwidth allocation schemes. Since user classification seems to be the most difficult to realize for the proposal, i.e., how to determine or classify users' behavior and characteristics. To treat this issue, I consider a participatory service in bandwidth allocation. The participatory service is used to connect users' requirements with the allocation policy. The methodology of the participatory service is that bandwidth usage or consumption is negotiable between network providers and users. Some users can share or give their bandwidth resources to others at this time, and next time, when they want to use more bandwidth resources, they can ask to receive bandwidth from others. It is expected that this service will bring the benefit for both network providers and users.