

A DYNAMIC CROSS-LAYER SCHEME FOR QoS SERVICES BASE ON CCSDS ADVANCED ORBITING SYSTEMS

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ABSTRACT. *The design of cross-layer scheme, which plays a key role in satellite resource management, is crucial for the data transmission in the CCSDS AOS. In this paper, a novel dynamic cross-layer scheme, which satisfies QoS service, is proposed. This scheme can utilize both the applications' QoS attributes and physical layer channel state information to change virtual channel bandwidth and transmission power in order to optimize resource and improve system performance. The performance of the proposed scheme has been evaluated via simulation. The proposed scheme achieves significant performance in the field of average transmission delay, loss packet rate and average throughput.*

Keywords: Cross-layer scheme, CCSDS AOS, QoS, Virtual channel bandwidth, Transmission power

1. Introduction. CCSDS is the Consultative Committee for Space Data System. In order to provide a flexible and convenient data processing service, the international consultative committee for space data system has developed Advanced Orbiting System (AOS). The CCSDS AOS provides video, image and audio transmission [1], and supports asynchronous and synchronized transmission mode. AOS provides enormous convenience for exchange and processing of information. Simultaneously, it is compatible to the conventional space data service [2].

However, space links present drawbacks which affect the service performance. These drawbacks are: variable link capacity, large propagation delays, packet corruption and channel asymmetry [3]. As a consequence, the wireless resource utilization is notably reduced. In order to resolve these problems, an optimized cross-layer approach [4-6] is required in the field where interactions between non-adjacent protocol layers are conceived to achieve a better adaptation of system dynamics [7]. In [8,9], based on satellite digital multimedia broadcasting (SDMB), a cross-layer scheme is proposed, but it only fits to the framework of SDMB. In [10], the cross-layer scheme is proposed to improve the TCP performance, but it cannot consider the quality of server (QoS) in application layer, and cannot fit to the data link layer in AOS. In order to improve the system performance of AOS and QoS, a cross-layer scheme is proposed in this paper.

This paper is organized as follows: an outline of the cross-layer design concept is presented in Section 2; in Section 3, a cross-layer structure in AOS is presented; the proposed cross-layer scheme is then presented in Section 4; we then proceed in Section 5 with the