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# ANALYSIS AND MODELING OF TRAFFIC CHARACTERISTICS FOR HIGH-EFFICIENT SCHEDULING IN TDRSS

**Abstract**

The tracking and data relay satellite system (TDRSS) deployed in geostationary orbit plays an important role in space information network. To improve the scheduling efficiency in TDRSS, most previous work focused on the scheduling models and its algorithms, rather than the translation procedure from the requirements of customers to the input traffic data for scheduling. In this paper, we propose a complete traffic characteristics model that captures the requirements of diversified customers based on the empirical distribution of real traffic. The proposed model contains five main components: processing time distribution, distribution of maximum acceptable latency and minimum time between contacts, joint distribution of time and space, traffic quantity distribution in overlapping coverage area and available time window and tightness distribution. Specifically compared with previous traffic models of TDRSS that concentrated only in the time domain, this model can depict the traffic characteristics in both time and space dimensions and consequently supply greater flexibility for TDRSS scheduling. To validate the efficacy and practicability of this model, the five main components are integrated and implemented as the system traffic generator software, whereby multiple types of traffic with different distribution can be accurately generated. Numerical simulations are conducted in two scheduling scenarios. In the second simulation scenario, twenty instances belonging to four sets of requests with different distribution are generated by the generator software and then processed by the scheduling software. By comparing between the scheduling results, some conclusions can be drawn as follows: (1) In distribution1, each request has only one available time window and is strictly fixed in it, for this reason the scheduled number is minimum.(2) In distribution2, as the request is allowed to slide in its available window, the scheduled rate increases by 19%on average.(3) In distribution3, some requests have two or three available windows and we furthermore improve the scheduled rate by 2.2% on average compared with distribution2.(4) Different from the other three types of distribution, the joint distribution of time and space in distribution4 is not uniform. That is to say, the system has imbalance load on each relay satellite. If the number of requests for relay satellite No.1 is two times than that for No.2, the scheduled rate decreases by 1.9% on average compared with distribution3. This model can also be used in the computer simulation of the whole system performance as well as the optimization of inter-satellite routing algorithms.