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A STUDY OF HTS NETWORK LOAD OPTIMIZATION BASED ON SUBSCRIBERS BEHAVIOR ANALYSIS

Abstract

The multiple spot beams of High-Throughput Satellite (HTS) allow a single satellite network can support millions of users, which is hundreds of times than traditional satellite network. And HTS support all-IP network architecture which will lead to load fluctuation for satellite network. In order to further increase system capacity, the Contention Ratio (CR) policy will be adopted HTS. However, the CR policy will lead to heavy network congestion and spare when more subscribers are permitted into network because it deals with the users with same weight but in fact the users are not. The other feature of HTS is that the diameter of spot beam is hundreds of kilometers and the time delay for single hop is over 250ms. And the DAMA scheme will occupy too much bandwidth and increase time delay. The complex protocol for LTE with small cellular network is inappropriate for HTS because the long time delay and complex processing. This paper argues that the subscribers in one beam rarely leave this area therefore the behavior of subscribers is less random and high complementary which means when some users do not use network there will be other users use the network and these bandwidth can be shared in the beam. This paper presented an improved k-means algorithm called Zk-means which can find the users group with similar behavior from time-throughput parameters automatically based on that. The Zk-means is fast convergence, consistency and stability than k-means. What is more, this paper presented the ZContention Ratio (ZCR) policy which adjusts the ZCR matrix coefficient according user group according to the result of Zk-means. Then the network can allocate subscribers according to ZCR matrix to maximize the HTS network load. The simulation result for typical HTS network showed that these network users can be separated to 10 groups and ZCR matrix is sparse and symmetric therefore the bandwidth can be reused for these users. The optimization result showed that the average network load is decreased 11.5% while the load peak and bottom is more close to the average.