

18th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
 Interactive Presentations - 18th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE
 FUTURE (IP)

Author: Mr. Longfei Li

Xi'an Microelectronics Technology Institute, China Aerospace Science and Technology Corporation
 (CASC), China, longfeisos@163.com

A MODIFIED TIME-VARYING GRAPH ROUTING ALGORITHM BASED ON DTN FOR SPACE
 INTERNET

Abstract

Delay tolerant networks (DTN), a general message-oriented overlay network architecture, have already evolved as a pragmatic solution to Interplanetary Networking (IPN). As the unpredictable changes in the network and the large varying delays in space communication, classical connection-oriented TCP/IP protocol is unsuitable in IPN. DTN allows storing data in satellite and ground station buffers until the contact with the next hop is available. Hence, routing in this kind of network is a crucial aspect. In DTN architecture, bundle layer is introduced over different network stacks and the “storage-carrying-forward” routing strategy is suggested. DTN has different routing techniques, among which Contact Graph Routing (CGR) is widely utilized in IPN. Therefore, this paper put emphasis on the adaptability and efficiency of routing algorithm in DTN, and put forward the improved routing algorithm based on CGR. This paper firstly introduces the characteristics of DTN network and the existing challenges of routing. Then, the CGR routing protocol is studied comprehensively. Through the analysis we found that although the CGR routing protocol has been widely used in IPN, CGR still has some deficiencies. The Dijkstra algorithm used in CGR only considered the contact window time and the remaining capacity of the next hop node, but did not take into account the remaining capacity of destination nodes that may be reached in the subsequent transmission. As a result, when the remaining capacity of the node is insufficient or the bundle survival time expires, bundles may be discarded, while causing the transmission failure. To solve this problem, in this paper, we propose MTG-CGR, a modified time-varying graph routing algorithm based on CGR. It uses MTG (Modified Time-varying Graph) model, which combines the characteristics of DTN and optimizes the storage space of time-varying graph. MTG-CGR detects the remaining capacity of all paths for routing, and the method used to represent Contact Plan is more efficient than the enumeration method in the CGR algorithm. Finally, we set up the simulation platform based on STK (Satellite Tool Kit) and ION (Interplanetary Overlay Network) to simulate and verify MTG-CGR. By changing the size of the transport bundle, the results show that compared with the CGR, MTG-CGR has an advantage in terms of average delay and network throughput.