Key Technology of Space Exploration (8)
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INFORMATION CENTRIC NETWORKING FOR SPACE EXPLORATION

Abstract

With the flourish of the space sensing technology, various space information systems are playing an irreplaceable role in space exploration. Many kinds of satellites and space probes are used for communication, broadcasting, earth observation, navigation, and deep-space exploration, etc. To achieve real-time information acquisition, efficient transmission and the full utilization of the shared information among the heterogeneous space systems, the idea of space internetworking for space exploration is proposed that the satellites and spacecraft can be treated as the Internet of Things (IoT). However, supporting IoT over space environment is a challenging goal, mainly due to the high number of heterogeneous and potentially constrained networked satellites or spacecraft, and harsh transmission conditions. In this paper, we study the demand of developing the IoT over space-terrestrial integrated information networks using Information-Centric Networking (ICN). Considering the advantages of satellite communications, such as its wide coverage and the inherent broadcast communications, and the disadvantages, such as high mobility and weak link, we analyze the major challenges and opportunities in utilizing ICN for Internet of remote Things scenarios. We focus on the advantages of the new information centric network compared with the traditional IP network, and we also propose the key technologies which are expected to be developed. Design choices of the new network architectures are discussed for future space networking, while providing the improved data dissemination efficiency and robustness for space exploration.