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Tools and Technology in Support of Integrated Applications (1)

Author: Mr. Xiaodan Wu
Shanghai Academy of Spaceflight Technology (SAST), China Aerospace and Technology Corporation (CASC), China

Mr. xiaochuan shuang
Shanghai Academy of Spaceflight Technology (SAST), China Aerospace and Technology Corporation (CASC), China

THE RESEARCH ON SYSTEM ARCHITECTURE SUITED TO INTEGRATED PAYLOADS BASED ON OPERATION SYSTEM CONCEPT

Abstract

With various micro satellites and nano satellites put into the aerospace markets,the functions and applications of satellite payload becomes more complex. Except of the traditional payloads in communication, navigation and remote sense fields, data collection and exchange payload like ADS-B, AIS, DCS, is becoming more important and showing high commercial value in the international market.According to their application fields, there are three types of data collection and exchange payloads: 1. ADS-B(Automatic Dependence Surveillance Broadcast), collect the signals transmitted from civil aircraft itself,to locate and surveillance the planes on real-time; 2. AIS(Automatic Identification System),collect the signals transmitted from ships, to locate and surveillance the ships on real-time; 3. DCS(Data collect system),collect the signals transmitted from buoy and other data gather equipment,to locate and surveillance various environment parameters. However, since the payloads above have their own working frequencies, signal systems, and processing methods, generally they need multiple and independent satellite systems to work effetely on orbit, which cost is very high.Furthermore,since the data comes from different orbits and satellite systems,the data application is fragmented. This paper dedicated to digging out the intersection and common characteristics among above data collect and exchange payloads, proposes a new system model for all-in-one space information collect and exchange payload which integrates the functions and features of ADS-B, AIS and DCS with one uniformed, general hardware and software platform. It resolves the hardware difficulties of receiving the different frequencies, different signal systems with one signle integrated hardware system by applying software define radio (SDR) technology and different-planes-structure antenna;and introduce the operation system concept of SMP technology(symmetrical multi-processing) into the hardware and software architecture, which can treat different subsystems as multi processes, and allow them share the common hardware resources like CPU, FPGA, DSP,by utilizing this technology,it can distributed the multiple functions of ADS-B, AIS and DCS on multi hardware cores like CPU and FPGA and make them worked as one stand-alone device. Since introduced the operation system concept,the software layer of the system regard the hardware layer as an entity, no matter receiving or transmitting, it is just one thread in the process, thus the system can scientifically and orderly distribute system cycle to process it without damage the whole system.