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Author: Mr. Claas Ziemke  
Private, Germany, claas.ziemke@gmx.net

Dr. Toshinori Kuwahara  
Tohoku University, Japan, kuwahara@astro.mech.tohoku.ac.jp

ONE SATELLITE PER COUNTRY - HOW EMERGING SPACE-FARING NATIONS CAN BENEFIT  
FROM TECHNOLOGY TRANSFER THROUGH FREE OPEN-SOURCE PROJECTS

**Abstract**

Today many developing countries are implementing or planning to implement a national space program. One of the main goals of these emerging space-faring nations often is the establishment of an own national space industry in order to avoid brain-drain and to foster the national economy. A problem faced by many of these nations is the inherent lack of heritage in the field of space technology. Because of this lack, these nations are dependent of technology transfer from other space-faring nations. A multitude of different mechanisms for technology transfer exist. Free open-source technology is one of the cheapest, yet most effective solution for technology transfer. This is because the source-codes and designs are free of charge and the underlying technology is open for inspection. This fact also minimizes transaction costs of communication, licensing and negotiations. Thus the available funds can be spent effectively for technology advance. In this paper the mechanism of technology transfer through free open-source projects is described and the mechanism is applied to space projects. Many universities and amateur groups in developed as well as developing countries maintain small-satellite projects. The vast majority of these projects are closed-source and thus are inherently redundant in technology aspects. If only a small percentage of these projects decide to open their sources and designs it seems to be possible to develop a catalogue of free open-source satellite hardware components and interfaces. The establishment of free interface definitions and communication protocols is especially important to foster interoperability and interchangeability. Also many small-satellites have very similar mission designs, leading to the belief that it is possible to define a set of baseline designs for free and open small-satellite platforms. The design principles for such a open small-satellite platform are established and described in this paper. The main design principles are the usage of commercial of the shelf parts and the focus on the “keep it simple, stupid!” principle. The conclusion is, that a “One Satellite per Country” project similar to the “One Laptop per Child” project is feasible and may lead to a huge increase in the speed of technology transfer not only in the area of space technology. The core of this project is formed by a set of existing open-source software projects which will be integrated to the OpenSatDK. The aim of this is to provide the possibility to do system engineering with dedicated open-source tools.