

SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (4)

Author: Dr. Christopher P. Bridges
Surrey Space Centre, University of Surrey, United Kingdom, c.p.bridges@surrey.ac.uk

Dr. Tanya Vladimirova
Surrey Space Centre, University of Surrey, United Kingdom, t.vladimirova@ee.surrey.ac.uk

AGENT COMPUTING FOR DISTRIBUTED SATELLITE SYSTEMS

Abstract

The 'virtual satellite' scenario offers opportunities in many different satellite capabilities including multi-point sensing, redundancy and cheaper mission costs. The latest DARPA F6 contract award to demonstrate a fractionated satellite mission shows the community's real interest in using clusters of satellites to perform distributed space missions where satellites work collaboratively together using wireless networking technologies. Surrey Space Centre has been working on distributed satellite systems for a number of years now, and particularly, in utilizing distributed computing techniques in clusters of satellites.

Following the needs of fractionated satellite model, modular hardware and software must be designed to accommodate various mission scenarios and computing services under various technologies. This paper presents work towards a solution to these needs using software Agents. Software Agents can perform various roles and tasks in software towards autonomous, proactive and reactive behaviors.

As the software design must take into account various scenarios and applications, this new design takes form using Agent's as mobile services that can distribute information in a number of ways. For example: high data or high priority applications, such as imaging, can employ a robust TCP/IP link in the typical Client-Server paradigm. But for low data applications, such as GPS signals, satellite management and other 'byte-size' data, the Peer-to-Peer paradigm can be used using UDP for multicasting or packet broadcasting. A novel system for reconfiguring the satellite network using ad-hoc technologies is also presented in the event of a satellite node failing or perturbed from the satellite network. Updating of newer services can also be distributed through the mobility of these Agents. By targeting different paradigms to different applications for these distributed satellite system scenarios in an ad-hoc and modular way, the overall satellite network efficiency can be improved.