

SPACE SYSTEMS SYMPOSIUM (D1)
System Engineering Tools, Processes and Training (1) (3)

Author: Mr. M.Rizwan Mughal
Politecnico di Torino, Italy, muhammad.mughal@polito.it

Mr. Anwar Ali
Politecnico di Torino, Italy, anwar.ali@polito.it

Mr. Haider Ali
Politecnico di Torino, Italy, haider.ali@polito.it

Prof. Leonardo M. Reyneri
Politecnico di Torino, Italy, leonardo.reyneri@polito.it

UML FOR SPACE SYSTEMS: FROM SPECIFICATION TO DESIGN AND IMPLEMENTATION

Abstract

Designing a space system is a very complex task. It must be split into simpler functions and subsystems. Each function and subsystem has to be specified, designed, reviewed, validated, implemented, tested, deployed, and most importantly documented. Development requires a wide number of tools, techniques and approaches. Designing a low cost or university satellite has to cope with a number of additional tough constraints: Firstly, the Individual designers and teams mostly consist of students who are available for a short period of time. They often appear and disappear quickly. Secondly, the designers and teams are often inexperienced and do not have much exposure to the vast variety of practical tools. Therefore, someone has to lay down specifications for heterogeneous teams. Innovative methodologies are therefore necessary that allow the integration of more and more complex systems with innovative design, testing and documentation. Unified Modeling language (UML) is a high level modeling language which comes with new approaches in the modeling, design, documentation, testing of embedded systems. It is an upcoming approach borne in the software community which is nowadays extending to other industrial domains and recently entering the space community. A key element of the AraMiS architecture (A small satellite built by the students of Politecnico Di Torino) is the specification, design, testing and documentation based on UML. Each subsystem has been associated with one or more students who fully developed it from specifications to implementation and testing again using UML. A variety of UML diagrams (use case, class, sequence, requirement, etc.) have been utilized for the development of each subsystem. A teamwork server allows every designer to work independently from anywhere and commit his work which can be reviewed by the project manager and updated in the main project and therefore, the other team is also fully aware of the updated task. Complete documentation report and software code of the system can be generated at the end of the design. The UML design approach is helpful to better understand the functionality of the system and overcome design limitations on the early stages of the system. Design complexity and development time is reduced by using proposed approach. At the end, we get a fully documented, tested, fault tolerant space system thanks to UML design approach.