An Approach for On-Board Software Reuse Applied to Small Satellites – IAA-LA-17-P13

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Abstract

In the development of engineering solutions one has to deal with recurring issues in order to achieve costs reduction while leveraging productivity without relinquishing reliability. Recurrence in on-board software development is one of these issues. Today, space agencies such as ESA and NASA as well as defense, DoD practice software reuse and have many lessons learned from problems they faced over a long period of experience and today recognize best practices due to failures overcome in the Reuse deployment process. Some similar failure cases were reported, for instance the explosion of Ariane 5 in 1996 and the crash of NASA's Mars Climate Orbiter probe in 1999. In both cases, problems with documentation or software reuse project are related to the failures. This work presents a technique and its case study for promoting reusability on space on-board software projects that may be applied in various domains. Software market specialists reckon that a considerable percentage of embedded applications are similar to existing developed systems. Hence this work proposes a reuse rationale based on its main approaches currently used such as: (a) Software Product Line (SPL), (b) ComponentBased Reuse and (c) Design Patterns. Some benefits of software reuse are: lower development costs as the life-time cycle decreases, SPL techniques helps also to decrease costs, increased productivity as components reuse is greater and improved reliability to comply to standards, recommendations and best practices. So this work discusses an approach seeking the accomplishment of the reuse within this context. At the end, a case study using small satellites will be presented in order to exemplify the use of the technique and demonstrate the economic data extraction, serving as a guide for users. Once the rationale is applied, it may help to return reuse benefits.

Keywords: Software Reusability. Design Patterns. On-Board Software. Small Satellites.