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Space product assurance — Reuse of existing software

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National foreword

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Assurance produit des projets spatiaux - Réutilisation de logiciels

Raumfahrtproduktsicherung - Wiederverwendung existierender Software

This Technical Report was approved by CEN on 13 September 2021. It has been drawn up by the Technical Committee CEN/CLC/JTC 5.

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European Foreword

This document (CEN/CLC/TR 17602-80-01:2021) has been prepared by Technical Committee CEN/CLC/JTC 5 “Space”, the secretariat of which is held by DIN.

It is highlighted that this technical report does not contain any requirement but only collection of data or descriptions and guidelines about how to organize and perform the work in support of EN 16602-80.

This Technical report (CEN/CLC/TR 17602-80-01:2021) originates from ECSS-Q-HB-80-01A .

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document has been developed to cover specifically space systems and has therefore precedence over any TR covering the same scope but with a wider domain of applicability (e.g.: aerospace).

Introduction

This handbook provides guidance on the approach that can be taken when defining the implementation of activities for the reuse of existing software within a space project.

Existing software is defined in ECSS-Q-ST-80 as follows:

- Any software from previous developments that is used for the project development as is or with adaptation. It also includes software supplied by the customer for use in the project development.
- Any software including any software developed outside the contract to which ECSS software standards are applicable.
- Any software including products such as freeware and open source software products.

In the development of software systems or products, different types of existing software artefacts can be reused, such as:

- Requirements, when reused early in the software product requirements definition.
- Components, when reused early in the software product architecture definition.
- Modules, when reused at detailed design level.
- Libraries and source code, when reused at coding level.
- Documents, plans, tests, and data are other software items that can be reused.

This handbook adopts a broader interpretation of the term 'existing software', and assumes that it can comprise the 'reuse' of tools for the development of any space software product.

Furthermore, the effective reuse existing software is based on the possibility to fully understand it with respect to properties such as functionality, quality, performance, dependability or safety and to find and adopt it to the development faster than it otherwise can be constructed.

However, whatever the level of reuse, the quality of the reused existing software is of utmost importance, as low quality can easily lead to system failure and thus loss of mission even for the lowest reuse level. Consequently, significant analyses should be carried out when using existing software. Furthermore, policies that favour reuse of existing software should be adopted with an understanding of the complex impacts of using the already available software.

1 Scope

This handbook provides recommendations, methods and procedures that can be used for the selection and reuse of existing software in space software systems.

This handbook is applicable to all types of software of a space system, including the space segment, the launch service segment and the ground segment software (including EGSEs) whenever existing software is intended to be reused within them.

This handbook covers the following topics:

- Software reuse approach including guidelines to build the Software Reuse File
- Techniques to support completion of existing software qualification to allow its reuse in a particular project
- Tool qualification
- Risk management aspects of reusing existing software

Existing software can be of any type: Purchased (or COTS), Legacy-Software, open-source software, customer-furnished items (CFI's), etc.

NOTE Special emphasis is put on guidance for the reuse of COTS software often available as-is and for which no code and documentation are often available.

Legal and contractual aspects of reuse are in principle out of scope; however guidelines to help in determine the reusability of existing software from a contractual point of view is provided in [ESA/REG/002].

Any organization with the business objective of systematic reuse may need to implement the organizational reuse processes presented in [ISO12207]. These processes will support the identification of reusable software products and components within selected reuse domains, their classification, storage and systematic reuse within the projects of that organization, etc. But these processes are out of scope of this handbook as the handbook is centred on the specific project activities to reuse an existing software product, not part of those organizational reuse processes more oriented to 'design for reuse' processes.

In addition, this handbook provides guidelines to be used for the selection and analysis of tools for the development, verification and validation of the operational software.