

Phase Cyclical Process Requirements for the development of Embedded Systems

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Abstract—Continuously Software Engineering seeks to increase the quality of all kinds of software products, however these different types have different characteristics that need to be observed also in a different way. Currently, the major concern is with the quality of Embedded Computing Systems, as they are a classification of software that are strongly present in our daily lives and often without notice. The greatest feature of such systems is the ability to perform extremely important tasks with little computational resource. In general, such systems have restrictions on development and operation, they require specific requirements. To ensure its functioning in its development, we need to use processes with defined procedures to identify these features. This article presents part of a study being carried out to develop a process framework covering all phases of the development process of embedded systems, organized into phases, activities and document templates that induce developers to carry out the good practices suggested by quality models. It is understood by development, all activities related either to new components or reuse.

Keywords – Embedded System, Hardware, Software, CMMI, MPS.Br, Critical Software, Process.

I. INTRODUCTION

Embedded computer system (SE) in general is a combination of hardware (HW) and software (SW) closely related, designed to perform a specific function [1], and inserted generally in electronics. The SE, are often critical system components when embedded in aircraft, medical equipment, automobiles, satellites, among others, which, in case of failure, may cause disasters. The SE usually have restrictions on development and functioning well as a close proximity between the HW and SW. Are capable of extremely important tasks featuring little computational resource.

To ensure that such systems function perfectly in its development, one should employ processes with defined procedures involving your request, understanding, design (selection or development of components), installation and use in perfect conditions.

The mission of the Software Engineering SE is to increase the quality of their development process, thus preventing failures rather than mend them, distributing the responsibility for the entire development process using maturity models. Software process maturity, is its ability to achieve the goals of the model, directly influencing the quality of the software product with the realization of good practices, this work represented by CMMI (Capability Maturity Model Integration), and model MPS.Br (Improvement of Brazilian Software Process).

II. PROPOSED WORK

The purpose of this study is to develop a process for the development of SE, organized structured in phases, which will allow for a more flexible project management and shared between SW and HW by conducting activities that meet best practices of CMMI models and in all MPSBr stage of the process.

As presented in figure 1, a process for development of SE must follow a life cycle specialized since its components develop specialized activities.

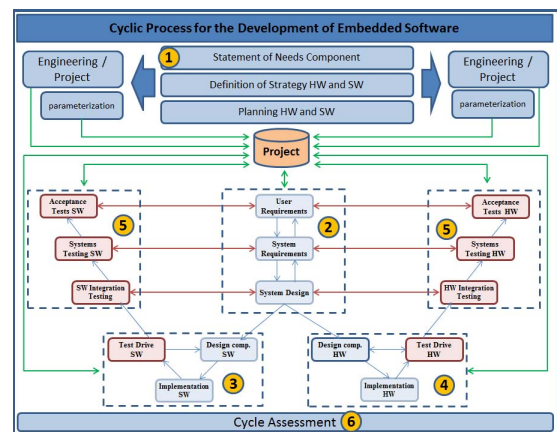


Figure 1 - Procedure proposed SE

The full study is being developed to specify a development process that performs the SE product designs SE so that at each stage of the process, each activity and each action is performed independently and being shared HW and SW components.

A. CYCLIC PROCESS

The cyclic process presented in this paper is structured in phases, consisting of activities and actions carried out by governed by procedures and documents (templates) that result in common artifacts that make up the product SE (software and documentation) as shown in figure 2.

The cycle concept was based from the adaptation of the concept proposed by Humphrey in TSP (Team Software Process) [3].

At this stage one should establish working relationships, define and distribute roles to team members as well as goal setting, strategy and work plan for all phases of the process, and when appropriate modifications of the process according to the result cycle assessment.

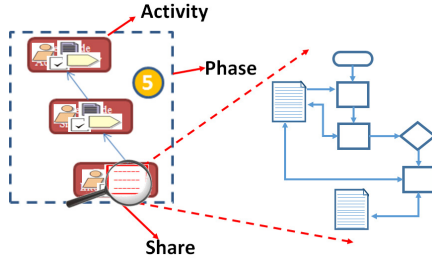


Figure 2- Components of the cyclic process.

B. PHASE: ENGINEERING

Each development cycle will result in one or more components of a SE (HW and SW) by performing the following activities: (a) Release (Statement of Requirement), (b) strategy, (c) Planning and (d) Preparation of Setting item 1 represented in figure 1.

C. PHASE: PRODUCT DETAILS

Has common activities for HW and SW which are identified and defined in detail as presented in item 2 of Figure 1

(a) User Requirements: Defining the needs and characteristics of SE in full context, (b) System Requirements Specification SE and restrictions, and area features, (c) System Design: Modeling the identification and definition of SE functions to be performed by the HW and SW, as well as identification of reuse or development of SW and HW.

These activities are independent for HW and SW components, producing shared artifacts as shown in Figure 3.

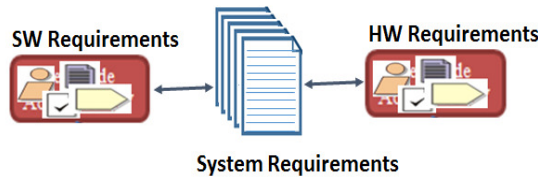


Figure 3 - Representation of the requirements phase.

At this stage the activities must meet the practices of the Area Requirements Management Process - (REQM) of the CMMI model and Expected Results for Requirements Management process - (GRE) Model MPS.Br.

TABLE I SPECIFIC PRACTICES – REQM - CMMI. [4]

Code	Description	Goal
SP1.1	Understanding Requirements	Working with providers requirements to obtain a better understanding of the meaning of the requirements.
SP1.2	Obtain commitment to the requirements	Get commitment of project participants with requirements.
SP1.3	Manage Changes to Requirements	Manage changes to the requirements as they evolve during the project.
SP1.4	Maintain Bidirectional Traceability of Requirements	Maintain bidirectional traceability between requirements and work products.
SP1.5	Ensure alignment between Work Products, Project Plans and Requistostos	Ensure that the project plans and work products remain aligned with the requirements.

TABLE II EXPECTED RESULTS - GRE – MPS.Br. [5]

Code	Description
GRE 1	The understanding of the requirements is obtained from the suppliers of requirements;
GRE 2	The requirements are evaluated based on objective criteria and a commitment of the technical team with these requirements is obtained;
GRE 3	The bidirectional traceability between requirements and work products are established and maintained;
GRE 4	Revisions in plans and work products of the project are conducted to identify and correct inconsistencies with the requirements;
GRE 5	Changes to requirements are managed throughout the project.

D. PHASE: DESIGN SOFTWARE

At this stage it is elaborated study of SW, as presented in item 3 in Figure 1 with the following activities: (a) Project (study reuse) of the SW component, (b) Implementation (reuse) SW (c) SW Verification.

E. PHASE: HARDWARE DESIGN

At this stage it is elaborated study of HW, as presented in item 4 of Figure 1 with the following activities: (a) Project (study reuse) the HW component, (b) Implementation (reuse) of HW, (c) Verification of HW.

F. VERIFICATION AND VALIDATION SYSTEM

Represented in Item 5 of Figure 1, phase where activities are carried out verification and validation of components:

(a) Test Plan HW, (b) Test Plan SW, (c) Test summary HW (d) Summary of Test SW (e) Integration Testing of SW and HW, (f) Integrated Tests (g) Evaluation of Integrated Tests.

G. PHASE: CYCLE ASSESSMENT

Analysis of activities in the cycle to adapt to the next cycle, represented in item 6 in Figure 1.

III. EXPECTED RESULTS AND CONTRIBUTIONS.

This work seeks to contribute to increasing the quality of SE with consistent procedures, activities and document templates. The breakdown of your activity stream enables procedures targeted to the characteristics of its different components (HW and SW) simultaneously and shared. The present study and the detailed specifications of the process may stimulate new research.

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