Engineering Change Management (ECM)

RECOMMENDATION

Engineering Change Order (ECO)
PSI 3-2 (Draft)
Version 0.9

ProSTEP iViP

Abstract

This Recommendation documents the ECO (Engineering Change Order) related results of the ProSTEP iViP/VDA project group ECM (Engineering Change Management). It includes the ECO Reference Process phases, scenarios and data model. The current version 0.9 is mature for validation by concept pilots.

This Recommendation was originally planed as Part 2 of the VDA Recommendation 4965 (VDA 4965). Since the demand of the project group to ensure their results by concept pilots could not be fulfilled, the ECM project group decided to close its work at the end of 2007. But since the gathered ECO content is seen as mature and valuable for public, it is documented by this PSI 3-2 (Draft) Recommendation, especially for the members of the ProSTEP iViP Association.

It is recommended to make familiar with the concepts of VDA 4965 to understand this Recommendation.

"The VDA 4965 is subdivided into individual parts reflecting the ECM Reference Sub-Process involved during the course of a change; this subdivision is subject to change as a result of further developments.

The main document gives an overview of and offers general recommendations for the overall ECM Reference Process, its modeling and a partner model. It describes fundamentals and basic recommendations valid for each ECM Reference Sub-Process. This document goes on to define

- *ECM reference sub-processes,*
- *interaction scenarios,*
- *messages for the communication,*
- *ECM data model objects and,*
- *mappings onto standards*

which are shared by and relate to the specific parts of the recommendation as follows:

Part 1 (ECR – Specification and Decision on Change) offers recommendations with respect to communicating Engineering Change Request (ECR) data to support the specification of proposed changes and the associated decisions. It describes the ECR Reference Process which permits synchronization of the different internal procedures of the partners involved using ECR Messages. It offers recommendations for permitted sequences of ECR Messages to provide support for business-typical ECR Interaction Scenarios (IS) within the scope of bilateral communication between the cooperation partners and recommendations with respect to the minimum requirements applicable to communication and message content. The change data contained in the individual communication steps is described in the ECR data model. The recommendation goes on to define how this information can be mapped to internationally accepted and established standards in order to permit implementation in the systems and interfaces involved.

This Recommendation was originally planed as Part 2 of the VDA Recommendation 4965 (VDA 4965). Until today these results could not be validated in industrial pilot applications. But as the gathered ECO content is seen as mature and valuable for public, the project group decided to publish it within this Draft PSI-3-2 Recommendation, ready to be used and validated in industrial pilot ECO applications.

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This Recommendation has been drawn up and is supported by the VDA and the ProSTEP iViP Association.

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Abbreviations, Definitions, References

Abbreviations

ECM **E**ngineering **C**hange **M**anagement
ECO **E**ngineering **C**hange **O**rder
ECR **E**ngineering **C**hange **R**equest
IS **I**nteraction **S**cenario
IT **I**nformation **T**echnology
OEM **O**riginal **E**quipment Manufacturer
UML **U**nified **M**odeling **L**anguage

Definitions

Activity

Processing step during the course of a process which is used in activity diagrams for detailed description of a reference process (cf. phase), i.e. with conditional branches etc.

Coordinator

The organization responsible for coordinating the ECO activities to solve an accepted implementation of an engineering change. Note: The coordinator will be in most cases the owner of the product(s) that have to be changed.

ECM Interaction Scenario (ECM IS)

Interaction scenarios defined within the scope of a specific ECM Reference Sub-Process. There are ECR Interaction Scenarios, ECO Interaction Scenarios, etc.

ECM Message

Messages defined within the scope of the ECM Reference Process or within the scope of a specific ECM Reference Sub-Process. There are common ECM Messages, ECR Messages, ECO Messages, etc.

ECM Reference Process

The overall reference process as it relates to ECM. The ECM Process comprises several ECM Reference Sub-Processes.

ECM Reference Sub-Process

ECR Reference Process, ECO Reference Process, etc. are ECM Reference Sub-Processes. Note that, for example, the ECR Reference Process and ECO Reference Process may overlap.

ECM Reference Sub-Process-independent

Indicates elements which can be used in each ECM Reference Sub-Process in the same way.

ECO Reference Process (synonym: Engineering Implementation of Change Process)

The specific ECM Reference Sub-Process which relates to an Engineering Change Order.

ECR Reference Process (synonym: Specification and Decision on Change Process)

The specific ECM Reference Sub-Process which relates to an Engineering Change Request.

Engineering change management (ECM)

The coordinated management and uniform tracking of changes, i.e. collecting ideas or need for product changes, elaborating one or more possible solutions, evaluating them with respect to technical and cost aspects and implementing them with respect to engineering and manufacturing.

Engineering Change Management (ECM):

Engineering change management according to this recommendation.

Engineering Change Order (ECO):

A request to implement an engineering change, consisting of its planning, design, acceptance, testing, etc, documentation, review and release. An ECO is processed in a number of processing steps defined by the ECO Reference Process.

Engineering Change Request (ECR):

A request to evaluate a change to one or more products involving changing parts, assemblies, documentation, or other items belonging to these products or by changing activities necessary to engineer or build these products.
An ECR is processed in a number of processing steps defined by the ECR Reference Process, thus enriching the ECR with the information required to enable a final decision to be made about its implementation by one or more ECO later on. (short: Change Request).

Interaction:

Results in an exchange of messages between partners[1]. An interaction can be a unidirectional interaction where a single message of the type notify is passed or a bidirectional interaction where one message each of the types *request* and *respond* are exchanged. Each unidirectional interaction comprises a send action on the part of the sender and a receive action on the part of the recipient. A bidirectional interaction comprises a second send and receive action with sender and receiver swapped.

Interaction scenario (IS):

Simplified description of the sequences used and the conditions under which data is exchanged between partners for a particular purpose using interactions[2] in order to implement process integration for a specific type of cooperation. This recommendation defines interaction scenarios between the two interaction roles coordinator and participant by 1) defining the interactions which can occur, must occur or must not occur; 2) defining the permitted sequences in which interactions or messages may occur using syntax diagrams; 3) assigning send and receive actions of *coordinator* interactions to specific points (synchronization points) in a reference process, thus defining additional permitted interactions and conditions and sequences for interactions (cf. protocol specification).

Mandatory:

Indicates all activities or data objects which are obligatory, i.e., which must be carried out under all circumstances, or data objects which are absolutely necessary.

Message:

Sequence of symbols which contain information[3]. This recommendation distinguishes between three types of messages: 1) *request* 2) *respond* 3) *notify*.

Milestone:

Describes a state in a process at which a particular process objective is achieved. Milestones are used in phase diagrams in particular.

Optional:

Indicates all activities or data objects which may be used as the need arises or which may be required in certain cases.

Participant:

A partner who is involved in an ECM Reference Process but who is not responsible for coordinating it.

[1] Based on N. Kavantzas, D. Burdett, G. Ritzinger, Y. Lafon (Eds.). "Web Services Choreography Description Language Version 1.0". W3C, Working Draft 12 October 2004.
[2] Ibid.
[3] H. Engesser, V. Claus. "Duden Informatik". 2nd Edition; Dudenverlag, 1993.

Partner:

All people and organizations who participate in an ECM Reference Process, i.e. both the *coordinator* and the *participants*.

Phase:

Subdivision in a process used in phase diagrams for a rough description of an ECM Reference Sub-Process. Phase diagrams are used as an easily read representation of an ECM Reference Sub-Process and its component parts. For this reason, a number of activities are typically grouped together to form a phase in this form of representation.

Protocol specification:

A protocol specification is used to precisely define the permitted message sequence per interaction scenario from a coordinator's and from a participant's point of view.

Reference process:

A workflow[4] for harmonized communication for data and process integration described using a schema. A reference process specifies the primary activities, possible interactions with partners and the sequence and conditions for activities and interactions. For the purposes of communication as per this recommendation, each partner maps his own internal process (i.e. terminology, process, data) onto a reference process.

Role:

Describes a set of responsibilities in a process which can be embodied by a person or an organizational unit. Two types of roles are used in this recommendation: 1) process roles, in which the persons/organizations fulfilling the role carry out activities in an ECM Reference Sub-Process, such as the *Requestor* etc. 2) interaction roles where organizational units fulfill the role and interact as *coordinator* or *participant* in an ECM Interaction Scenario by carrying out a number of process roles. Further modeling elements of the organizational structure, such as group, (organizational) entity and organizational unit are described in detail in the respective parts.

Synchronization point:

Defined point in an ECM Reference Sub-Process at which a specific interaction with a partner is possible to synchronize the private engineering change management processes of both the *coordinator* and *participant*.

References to standards

VDA 4965, Engineering Change Management (ECM), V 2.0; Verband der Automobilindustrie (VDA), www.vda.de/cgi-bin/paperorder.cgi[5] , 2007

SASIG ECM Recommendation, V1.0; Strategic Automotive product data Standards Industry Group (SASIG), 2008

[4] Based on: S. Jablonski, M. Böhm, W. Schulze (Eds.). "Workflow Management". Heidelberg: dpunkt-Verlag, 1997.
[5] To find the recommendation it will be necessary to choose "VDA-Empfehlung" in the field "Ressort (Bereich)". Afterwards click the button "Suche starten".