Templates For Software Configuration Management Documents

Deluxe Version 3.0

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Abstract

This document contains a set of templates for software configuration management (CM) documents to aid engineers and managers to implement software configuration management processes per the requirements specified in ISO/IEC standard 12207, *Software Life Cycle Processes (1995)*, including Amendment 1:2002 and Amendment 2:2004; and standard 15288, *System Life Cycle Processes (2002)* as it pertains to software elements. For software CM processes and related activities and artifacts, these standards-driven templates provide generic descriptions and instructions that, as needed, can be tailored to a specific organization's or project's needs. Thirteen templates are provided. They are:

<u>Template #</u>	Template Name
1	Software Configuration Management Policy
2	Software Configuration Management Strategy
3	Software Configuration Management Organization Charts
4	Software Configuration Management Plan
5	Software Configuration Management Process
6	Software Configuration Identification Procedure
7	Software Configuration Change Control Procedure
8	Software Configuration Status Accounting Procedure
9	Software Configuration Item Check-in and Check-out Procedure
10	Software Configuration Audits and Reviews Procedure
11A	Subcontractor Software Configuration Control Procedure
11 B	External Interface Configuration Control Procedure
12	Software Product Release and Delivery Procedure

In addition to the templates shown above, this document provides five different aids to help tailor the templates.

What's New in Version 3.0

Version 2.0 of this document, ably written by Ron Berlack, provided a set of software configuration management templates to enable software engineers and managers to implement software configuration management processes per the requirements specified in ISO/IEC standard 12207, *Software Life Cycle Processes*. In Version 3.0, these templates have been updated to add the software CM requirements of ISO/IEC standard 15288, *System Life Cycle Processes*. In addition to revising existing templates, we added three new templates and included new diagrams throughout the document. We also expanded and improved the document's text to make the document more readable and usable.

Version 3.0, with its added templates, improved graphics, and expanded text should prove beneficial to you as you begin to implement and execute the very important process of software configuration management. An itemization of Version 3.0 enhancements appears below.

Version 3.0 Enhancement	Description
Document updated to insure templates meet ISO/IEC 15288 standard as it pertains to software configuration management.	Templates can now be used to meet the requirements of both ISO/IEC 12207 and ISO/IEC 15288. Strategy document specifically added as part of this effort.
Added template for software CM strategy.	This template not only helps insure a better CM plan, but also insures compliance with the 15288 standard.
Added template for a check-in/check-out procedure.	This procedure enables version management of configuration items and uses a CM repository to store configuration management data.
Added template for product release and delivery.	This template added to insure compliance with specific requirements in the 12207 standard.
Added an introduction to each template.	Templates are preceded by introductory text to help readers understand the process being supported.
Added standards cross-reference table.	For each 12207 and 15288 CM process clause, this table shows what templates are needed to satisfy that clause.
Added several new diagrams.	10 new diagrams have been included in the document. They explain the topic area to which a template applies. These diagrams can be used for communicating CM concepts to affected organizations and individuals.

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1. Introduction

In the past decade, the need for establishing effective software configuration management policies and procedures has grown in conjunction with the need for systems that are complex, fast, accurate, secure, and safety-critical. From simple everyday systems that track bank accounts to the complex systems in airplanes, cars, medical devices, and industrial, or military products; there is a demand for highly reliable, error-free software that either supports the development and maintenance of these systems or is an integral part of them.

This document provides a set of templates for implementing a software configuration management process the meets the requirements of ISO/IEC standard 12207, *Software Life Cycle Processes* and ISO/IEC standard 15288, *System Life Cycle Processes*. These templates are easy to use, self-explanatory, and do not require expensive training or extensive experience.

To show how ISO/IEC 12207 and ISO/IEC 15288 standards are met, Section 1.6 provides a mapping of standard requirements to the templates that address them.

1.1 About Software Configuration Management

The inclusion of software configuration management as a top-level process in the software life cycle has proven to be a necessary and cost effective step in producing and delivering quality products on time and within specified time and dollar limitations. Effective configuration management of a system's software elements is accomplished by:

- Establishing a policy that requires the implementation of software configuration management.
- Defining a software configuration management strategy that drives subsequent plans and procedures.
- Establishing a scheme for software item identification.
- Identifying the controlled items and item types that are designed, developed, and delivered.
- Agreeing to a baseline configuration.
- Enabling the development of and changes to that agreed upon baseline.
- Recording the events of an item's evolution through status accounting records.

It is imperative for companies that build software to have a clear and concise policy on software configuration management as well as the procedures to implement it. A CM policy should be established by executive level management to provide top-level guidance and constraints to lower level plans and procedures. This guidance and constraint helps insure consistency across lower level procedures including compliance with key corporate objectives.

Because software CM procedures may affect the utilization of resources across company organizations, these procedures should be reviewed and approved by an appropriate level of management in those organizations. These organizations can include Quality Management,

Engineering, Testing, Project Management, and the customer (when applicable). The responsibility for defining and executing CM procedures must be clearly assigned down an organization as well as across it.

In large companies or organizations, different groups or projects may have their own unique CM requirements and resultant policies and procedures. In such cases, each organization must insure that their unique software CM plan, strategy, and procedures are aligned with higher-level CM documents.

1.2 How to Use This Document

This document is designed to aid a person, with some knowledge of software configuration management, implement a sound software CM system. Expertise in software configuration management is not required. This document provides templates and aids for software CM that can be applied to manual or automated methods and can be implemented by one or more persons depending on the scope and complexity of the project or organization. These materials are applicable to projects of all sizes, and are applicable for all types of products during their life span.

Figure 1 shows the thirteen software CM templates and five CM aids contained in this document and how they relate to one another. Note, for example, how higher level documents (organization, strategy, policy, plan) provide the overall guidance and direction for the establishment of lower level procedures.



Figure 1: Software CM templates, and aids, and how they relate.

Software CM Templates

Each subsection of Section 2 (2.1, 2.3, etc) is devoted to one of the thirteen templates shown in Figure 1. Preceding each template, which begins with a title page, is a brief overview of the area being addressed by that template. Guidance notations in the templates appear underlined and should be stripped from the implemented template. Template pages can be distinguished from other types of pages in this document by the occurrence of the word "Template" in their page header. Pages that are not part of a template do not have that word in their header.

The template serves as a framework for meeting the unique CM requirements of your organization. Thus, you will have to add text that provides the necessary detail to carry out the activities described in each template. Specific tools, data, and geographic distribution of work products and people will all affect the definition of an activity and will necessitate the tailoring of each template. The size and experience of your software staff will also affect the level of detail required. You may also have to modify text for specific domains and end-item types (embedded software, government software, classified software, etc).

Although specific details to a template may be added to make its resulting procedure useful, do not be afraid to start with minimal text. The important thing is to *document your procedures*! Once they are documented, you can begin the more important task of *executing* them along with measuring, monitoring, and improving them throughout the system life cycle.

Software CM Aids

Section 3 of this document provides additional aids for software configuration management. These aids and their relationship to the templates are also shown in Figure 1. These aids provide help concerning acronyms, standards, CM data records, and document approval. Documentation found in Section 3 can be incorporated into your CM procedures or simply used as reference material.

1.3 The Software Domain

Note again that all of the templates contained in this document are for *software* policies, plans, procedures, etc. At times, to streamline the text, the word *software* does not precede the words "configuration management" or the abbreviation "CM." Nevertheless, it is to be assumed.

1.4 Traceability to 12207 and 15288

The templates in this document satisfy the requirements of ISO/IEC 12207, *Software Life Cycle Processes (1995)*, including Amendment 1:2002 and Amendment 2:2004. These templates also satisfy the requirements of ISO/IEC 15288, *System Life Cycle Processes (2002)* as those requirements pertain to software configuration management. To facilitate the use of cross-reference tables where only clause numbers are used, each requirements clause number and its associated topic is listed in Table 1. Following that table, Table 2 cross-references ISO/IEC 12207 and ISO/IEC 15288 clauses to the templates that address them.

ISO/IEC 12207, released in 1995, was subsequently amended in 2002 and 2004 by Amendment 1 and Amendment 2 respectively. Amendment 1 makes a minor modification to CM clause 6.2, but more importantly provides a process model that enables users to measure the capability, maturity, and conformance of their CM processes and procedures. The Amendment 1 process model defines the purpose of configuration management and its required outcome. Released as part of Amendment 1, it was subsequently updated by Amendment 2 in 2004. Along with other standard requirements, CM process outcomes, as updated in Amendment 2, appear in Table 2 and are cross-referenced to the templates needed to produce them.

Neither ISO/IEC 12207 nor ISO/IEC 15288 specifically requires the development of a CM policy, but they refer to the *use* of a policy to tailor strategies and plans. This is consistent with the hierarchy of policy, strategy, plan, and procedures shown in Figures 2 and 3 in Sections 2.2 and 2.3 respectively. Accordingly, the CM policy template is shown as being required to meet selected standards.

For each requirement, an "X" has been placed in the column under the template needed to satisfy that requirement. Because the standards are written at a high level and the procedures are interrelated, each requirement is addressed by multiple templates. Depending on how you adapt your templates, you may need a different set of cross-referenced templates to meet a standard.

Table 1: Standard Requirements								
Standard	Clause #	Clause Topic						
	6.2.1	Process implementation						
07 Mgt.	6.2.2	Configuration identification						
122 ration ess)	6.2.3	Configuration control						
)/IEC Infigu Proce	6.2.4	Configuration status accounting						
ISO .2 (Cc	6.2.5	Configuration evaluation						
Q	6.2.6	Release management and delivery						
	F.2.2	Purpose of the configuration management process						
2	F.2.2 (1)	Outcome: CM Strategy						
nent (bcess)	F.2.2 (2)	Outcome: Identified, defined, baselined work products						
lendn gt. Prc	F.2.2 (3)	Outcome: Controlled work products changes and releases						
07, Am tration M	F.2.2 (4)	Outcome: Modifications and releases available to affected parties.						
SO/IEC 122 F.2.2 (Configu	F.2.2 (5)	Outcome: Work product status recorded and reported						
	F.2.2 (6)	Outcome: Work product completeness and consistency ensured						
	F.2.2 (7)	Outcome: Work product storage, handling, delivery controlled.						
	5.4.7.1	Purpose of the configuration management process						
cess)	5.4.7.2	Configuration management process outcomes						
88 gt Prc	5.4.7.3a	Define a configuration management policy						
2 152 ion M	5.4.7.3b	Identify items that are subject to configuration control						
ISO/IEC	5.4.7.3c	Maintain information on configurations with an appropriate level of integrity and security						
5.4.7 (C	5.4.7.3d	Ensure that changes to configuration baselines are properly identified, recorded evaluated, approved, incorporated, and verified.						

Table 2: Standards Clause/Template Number Cross Reference														
Standard		Template Number												
		1	2	3	4	5	6	7	8	9	10	11A	11B	12
se	6.2.1	Х	Х	Х	X							Х	Х	
Claus	6.2.2					Х	Х			Х		X	Х	
207 (6.2.3					X		Х		Х		Х	X	
C 12	6.2.4					X			X	X		Х	X	
)/IE	6.2.5					X					Х	Х	X	
ISC	6.2.6					X	X	X	X	X	X	X	X	Х
	F.2.2		X		X							X	X	
دە	F.2.2(1)	Х	X	X	X							X	Х	
07 Jause	F.2.2(2)				X	X	X			X		X	Х	
: 122 t 2 C	F.2.2(3)					X				X		X	X	
/IEC Imen	F.2.2(4)					X		X		Х		Х	Х	
ISO nend	F.2.2(5)					Х			Х			Х	Х	
AI	F.2.2(6)					X			X	Х	X	Х	Х	
	F.2.2(7)					X				X		Х		Х
se	5.4.7.1		X		X	X						X	X	
Clau	5.4.7.2		X		X	X						X	Х	
288 (5.4.7.3a	Х	X	X	X							X	X	
C 15	5.4.7.3b					X	X					X	X	
O/IE	5.4.7.3c					X				X		Х	X	Х
ISI	5.4.7.3d					X		X	X	X	X	X	X	

Legend: X = Template required to satisfy this standard clause.

1.5 Product Support

Within the first 60 days following your purchase of this document, SEPT will provide 3 hours of free consulting to help you better understand and apply these templates. This consultation is available at the SEPT Help Desk. Contact us at 425-391-2344 between the hours of 8 AM to 5 PM PST, Monday through Friday, or email your questions to Stanmagee@smartwire.net.

1.6 Warranties and Liability

SEPT makes no warranties, implied or stated with respect to this template, and it is provided on an "*as is basis*". SEPT will have no liability for any indirect, incidental, special or consequential damages or any loss of revenue or profits arising under, or with respect to the use of this document.

2. Software Configuration Management Templates

Listed below are the templates contained in this chapter. Each one of these templates is contained in a subsection of this chapter.

• Section 2.1 Template 1: Software Configuration Management Policy

CM policy provides the top-level instructions and directives that must be followed in the development and subsequent implementation and execution of configuration management strategy, plans, and processes. It reflects an organization or project's commitment to configuration management.

• Section 2.2 Template 2: Software Configuration Management Strategy

Strategy describes specific approaches to be followed, adaptations to be made, and objectives to be achieved in the implementation and execution of CM plans and procedures. Your CM strategy must fit within the dictates and constraints of your CM policy while defining, in more detail, how effective CM is to be achieved.

• Section 2.3 Template 3: Software Configuration Management Organization Charts This section provides example charts to illustrate where configuration management organizations or functions can fit into companies of various sizes in order to insure the effective oversight and implementation of CM.

• Section 2.4 Template 4: Software Configuration Management Plan

Guided and constrained by the higher level CM Policy and CM strategy, this plan describes what software items shall be placed under configuration management and it provides constraints and criteria for software CM procedures. This plan tells project and customer management *what* will be done to insure the integrity of the software. Lower level procedures describe the *how*.

• Section 2.5 Template 5: Software Configuration Management Process

This process provides a top level "parent document" for configuration management. Included in this parent document are the functions: Software Configuration Identification, Software Configuration Change Control, Software Configuration Status Accounting, Software Configuration Audits and Reviews, Subcontractor Software Configuration Control, External Interface Configuration Control, and Software Product Release and Delivery

Section 2.6 Template 6: Software Configuration Identification Procedure

This procedure defines activities necessary to insure that each configuration item and its related technical data can be uniquely identified and tracked through each release cycle.

• Section 2.7 Template 7: Software Configuration Change Control Procedure

This procedure describes the activities required to insure that software changes are properly recorded, analyzed, reviewed, approved (or rejected), and implemented. This procedure assures that changes are properly reviewed and approved (or rejected) by a Change Board and that change records and change impacts are documented as part of each release.

Software Configuration Management Templates

- Section 2.8 Template 8: Software Configuration Status Accounting Procedure This procedure defines activities that track the state of software configuration items as they move through the software life cycle.
- Section 2.9 Template 9: Software Configuration Item Check-in and Check-out Procedure

This procedure describes the activities, controls, and reports used in order for developers to remove configuration items (check-out) from the CM repository and then later return them (check-in). This procedure provides versioning of configuration items as well as verification of change authorization.

- Section 2.10 Template 10: Software Configuration Audits and Reviews Procedure This procedure defines activities that help insure project processes are being followed properly and that configured end items are being developed per their specifications.
- Section 2.11 Template 11A: Subcontractor Software Configuration Control Procedure

This procedure defines activities to insure that subcontractors are following agreed-upon configuration management processes.

• Section 2.11 Template 11B: External Interface Configuration Control Procedure This procedure defines activities to document, monitor, and control specifications of external interfaces.

• Section 2.12 Template 12: Software Product Release and Delivery Procedure

This procedure describes the activities that result in the creation of the final software product and documentation that is delivered to the customer or distributor.

2.1 Software Configuration Management Policy

An organization's CM policy reflects the top level guiding principles it wants to be followed while achieving desired results from software development and maintenance. CM policy provides key directives that provide boundaries and constraints within which lower level strategies, plans, and procedures must conform. It is a cornerstone of an organization's software strategy and plans. An organization desirous of implementing a configuration management process must first determine the organization's policy for that process.



Figure 2: CM Policy provides high-level guidance and control.

CM Policy is applied at all levels of the organization. For larger organizations this can be far reaching – from the boardroom to the shop floor. For small companies, this can mean from the owner/operator to his or her small group of employees. A configuration management policy provides the authority for lower level operating strategies, plans and procedures. It can be specific in some cases, but generally leaves most of the details for lower level operating documents. For example, your policy can require following a specific standard, but tailoring of that standard can be part of your configuration management strategy. Similarly, the CM policy defines basic responsibilities. For example, configuration managers are responsible for defining, implementing, and monitoring configuration management processes. Specific as to the "how to" are left to subsequent procedures and instructions.

Absence of a CM policy (and the authority it provides) can hinder the effective operation of your organization's other key functions such as finance, engineering, manufacturing, marketing, and quality control.

The text in this policy template is written as if the policy is for the entire company. In many large companies and organizations, lower-level organizations and/or projects may require their own unique policy that not only conforms to their corporate policy, but also incorporates

Software Configuration Management Policy

elements dictated by specific organization, product or contractual requirements. This template can be modified and adopted for such lower-level policy statements.

Figure 9 in Section 2.5 illustrates a hierarchy of policies. The CM policy template follows.

Template 1: Software Configuration Management Policy

<u>Title Page for Software Configuration Management Policy</u>

Software Configuration Management Policy

As appropriate, add:

- Version/Revision Number
- Company/Organization Name
- Program/Project Name or Product Name
- Contract Reference
- Prepared by/Approved by and Dates

Example:

Version 1.0

The XYZ Company Project: Ace Software Product Contract 001

Prepared by	Signature	Signature Date
Joe Smith		Jan 5, 2007
Approved by		
Sue Jones		Feb 1, 2007

Template 1: Software Configuration Management Policy

Policy Statement

The [*XYZ*] Company shall provide for the implementation of a configuration management process on all projects designed, developed, built or procured, tested and delivered, or sold, whether required by contract or purchase agreement. This process will meet or exceed all applicable industry-wide and organizational standards concerning configuration management.

Objective

The objective is to know at all times what the designed, developed, built or procured, tested and delivered configuration is on all products produced by the company. There will be traceability from one stage of the product to the next. The customer will have confidence that (XYZ) company has a system for controlling all stages of a product throughout the product life cycle.

Template 1: Software Configuration Management Policy

Responsibility

Function	Responsibility					
Organization's Chief Executive	• Ensure the implementation of a configuration management process through this policy and subsequent configuration management procedures.					
Executive Management (Depends on company size/organization)	• Ensure that the configuration management process is performed on all projects for which they are responsible.					
Project Managers	 Plan and provide for implementation of the configuration management process on their assigned project. 					
	• Authorize process tailoring as appropriate to meet unique project requirements while still meeting the objectives of this policy					
Configuration Managers	• Develop appropriate configuration management procedures and instruction material in accordance with project requirements as well as applicable industry-wide and organizational standards.					
	• Implement CM procedures					
	• Provide training and education to users of CM procedures.					
	• Maintain, monitor, measure and improve implemented processes					
Software Development and Maintenance	• Understand, utilize, and adhere to company, organization, and project CM requirements.					