



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

**Trusted Computing Exemplar:
Configuration Management Procedures**
by

Paul C. Clark, Cynthia E. Irvine, and Thuy D. Nguyen

12 December 2014

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14. ABSTRACT This document describes the Life Cycle Management Plan for the development of a high assurance secure product. A high assurance product is one for which its users have a high level of confidence that its security policies will be enforced continuously and correctly. Such products are constructed so that they can be analyzed for these characteristics. Lifecycle activities ensure that the product reflects the intent to ensure that the product is trustworthy and that vigorous efforts have been made to ensure the absence of unspecified functionality, whether accidental or intentional. The purpose of this document is to outline the procedures for the Configuration Management (CM) process. These procedures are meant to provide lower-level details necessary to implement the process laid out in the <i>Configuration Management Plan</i> and to ensure consistency in the exercise of the process. Additional procedures are provided to interface with CM-specific applications, as described in Appendix H.					
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Trusted Computing Exemplar: Configuration Management Procedures

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December 2014

ATTRIBUTION REQUEST

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The Cyber Academic Group (CAG) and the Center for Information Systems Security Studies and Research (CISR) at the Naval Postgraduate School (NPS) wish to facilitate and encourage the development of highly robust security systems.

To further this goal, the NPS CAG and NPS CISR ask that any derivative products, code, writings, and/or other derivative materials, include an attribution for NPS CAG and NPS CISR. This is to ensure that the public has a full opportunity to direct questions about the nature and functioning of the source materials to the original creators.

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Table of Contents

1	Introduction.....	1
1.1	Purpose	1
1.2	The Role of the CCB.....	1
1.3	Process.....	1
1.4	Archived Material.....	2
1.5	Waiving of Policy	2
2	Submitting a Change	2
2.1	Originator	3
2.2	CI Leader.....	6
2.3	CM Staff.....	6
3	Approving a Change	9
4	Checking Into the CM Server.....	10
5	Checking in an Archive	11
6	Checking Out Items From CM.....	12
6.1	Automatic Push to Development Server	12
6.2	Public Dissemination	12
6.3	Manual Distribution	13
	Appendix A – Initialization	15
	Appendix B – Change Request Status Database.....	16
	Appendix C – Configuration Item Map.....	17
	Appendix D – Submission Checklist	18
	Appendix E – Correcting Import Errors in the CM Server	19
	Appendix F – Change Request Form	20
	Appendix G – Review History Form.....	21
	Appendix H – Configuration Management System User’s Guide.....	22

Table of Figures

Figure 1	State Transition Diagram for Change Requests	2
Figure 2	Extracting Files from CM.....	12
Figure 3	Example Configuration Item Map.....	17
Figure 4	Change Request Form	20
Figure 5	Review History Form	21

Table of Tables

Table 2	State Table	16
Table 3	Configuration Item Map	17

1 Introduction

1.1 Purpose

This document has been written in support of a research project to publicly demonstrate and document how a high assurance product can be developed and distributed. A high assurance product is one for which its users have a high level of confidence that its security policies will be enforced continuously and correctly. Such products are constructed so that they can be analyzed for these characteristics. Lifecycle activities ensure that the product reflects the intent to ensure that the product is trustworthy and that vigorous efforts have been made to ensure the absence of unspecified functionality, whether accidental or intentional.

The purpose of this document is to outline the procedures for the Configuration Management (CM) process. These procedures are meant to provide lower-level details necessary to implement the process laid out in the *Configuration Management Plan* [1], and to ensure consistency in the exercise of the process. Additional procedures are provided to interface with CM-specific applications, as described in Appendix H.

1.2 The Role of the CCB

The Change Control Board (CCB) controls the items that are checked into CM. The Project Manager directs and authorizes work to be performed, but when work has been completed on a Configuration Item (CI), the CCB ensures that the proper process has been observed for the item in question, and that the quality of the work is satisfactory.

1.3 Process

The state diagram depicted in Figure 1 illustrates the specified process for getting a new or changed item checked into CM, as specified in the *Configuration Management Plan*. The states shown in Figure 1 are referenced in these procedures.

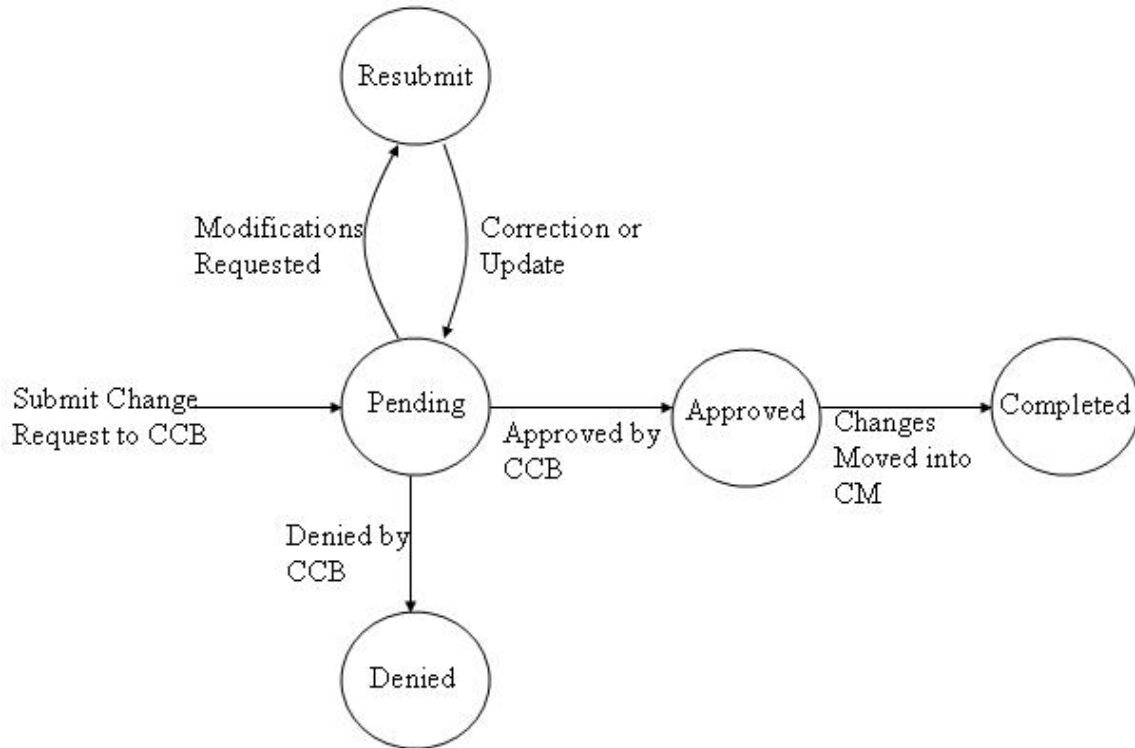


Figure 1 State Transition Diagram for Change Requests

1.4 Archived Material

In some cases there is a dependence on material that is produced outside of the development group, but which must be managed by CM, such as commercial installation CDs, documentation, and hardware. Such items are managed as “archives” within CM, meaning that the material is physically protected by CM, but is not checked into a software tracking system on a CM server. Archived material is still assigned to a CI, and changes are still controlled by the CCB.

1.5 Waiving of Policy

The policies, standards and procedures outlined in the *Life Cycle Management Plan* [2] can be bypassed or modified on a case-by-case basis with the approval of the CCB. Such waivers shall be documented in the CCB minutes with sufficient detail to describe the reasons for such exceptions.

2 Submitting a Change

When someone wants to add or change a controlled item, viz., an item “under CM”, the proposed change must be approved by the Change Control Board (CCB) before the item can be accepted. This section describes how to submit a change request. The review process and the check-in process are described in other sections that follow.

2.1 Originator

The originator of the request (e.g., an engineer, CI Leader, etc.), must complete a *Change Request* form, as shown in Appendix E. The steps for completing and submitting the form to the CI Leader are given below.

1. Write a high-level, short description of the change in the *Change Title* field. Do not exceed the space provided in the form.
2. Fill in the *Project ID* field with the CCB-assigned product identifier, indicating the product to be modified by the proposed change.
3. Fill in the *Originator* field of the form. This is the name of the person initiating the change request.
4. Check the appropriate box(es) under *Submission Type* to indicate the type of submission(s) being made.
 - Source code included
The *Source code included* box refers to project source code, not to source code that may be part of a third-party tool.
 - Document included
The *Documentation included* box refers to documentation written by members of the TCX project that is being submitted to CM.
 - To be archived
Refer to Section 1.4 for a definition of items that qualify for the *To be archived* designation.
 - Other
The *Other* box is for submissions that do not fall under one of the above categories, and is meant for items that are not associated with a CI. For example, a request to upgrade the development systems with a newer version of the operating system, or a request to upgrade memory in a development server, would both fall under this category.
5. Write a more detailed description of the requested change in the *Change Description* field.

If the description is too long for the space provided, then a continuation sheet shall be stapled to the form.

If the submitted material fixes a reported flaw, then that should be noted in this field, as well as the unique identifier for the flaw being fixed.

If the submitted material includes project source code, and the source code has known flaws, then a list of the associated unique flaw identifiers and a short

description of each flaw shall be included in this field. The list shall indicate which flaws existed in the previous submission of the CI, and which flaws have been identified since the previous submission. A justification for submitting flawed source code shall also be provided in this field, as required by the *Quality Assurance Plan* [3].

If the submitted material is source code that is not part of the evaluatable product (such as internally-developed tools), then a statement of that fact must be included in the *Change Description* field.

Requests to purge existing files within CM are prohibited. Instead, developers shall request that obsolete files be removed from the *Configuration Item Map* for a particular version of a CI. (See Appendix C).

6. Complete the *Changed Configuration Items* field by listing the following:
 - a. The name of the affected CIs.
 - b. The identifier for the CIs.
 - c. The CI version numbers that the changes will be merged with.
 - d. The full path and name of the affected files in the CM file hierarchy.

If the list is too long for the space provided, then a continuation sheet shall be stapled to the form.

7. Complete the *New Configuration Items* field by listing the following:
 - a. The proposed name of the CIs to be added to CM.
 - b. The proposed unique identifier for the CIs.
 - c. The initial version number of the CIs.
 - d. The full path and name of the new files to be added to the CM file hierarchy.

If the submitted material is to be archived, then file names are not required.

If the list is too long for the space provided, then a continuation sheet shall be stapled to the form.

A new CI will also require a change to the *Configuration Items List* under the *Changed Items* field.

8. Sign on the designated signature line as the originator.

Rationale: The originator signature is a crude authentication mechanism, providing some protection for those who submit change requests.

9. Submit the completed form to the respective CI Leader, along with the files to be checked in.

Electronic files shall be submitted on removable media with the form. Specific requirements are given below, based on the box that is checked on the *Change Request* form:

- Source Code Included

If the *Source code included* box was checked, then the associated object files must also be included in the submission, along with a completed *Review History* form. (See Appendix G).

In addition, procedures shall be provided for the CM staff to regenerate the object code on a standalone test system using the submitted files and perhaps other files that may already be baselined. The procedures shall include steps for comparing the regenerated object files with the submitted object files.

- Documentation Included

If the *Documentation included* box was checked, then a printed copy of the document shall be included with the submission package. In lieu of a printed version of the document (such as when the document is very long), it is permissible to submit a PDF version of the finalized document, as long as the PDF file is submitted on separate media that is clearly labeled “PDF only - do NOT import to CM”. In addition, a completed *Review History* form must also be included in the package. (See Appendix G).

Procedures shall be provided for the CM staff to regenerate the documentation using the submitted files and perhaps other files that may already be baselined. The procedures shall include steps for comparing the regenerated document with the submitted document.

- To be archived

If the *To be archived* box was checked, and the submission includes distribution media (e.g., CDs), then the media must be appropriately labeled. If the media is from a commercial source, then the original label is usually sufficient. If the media for an archival submission is not a commercial original, but rather is a copy or an internal creation, then the media label must contain the following:

- “Master Disk”
- The contents shall be clearly identified.
- The media series shall be identified, e.g., “Disk 1 of 2”.
- To help the CM Staff, labels for optical media shall state whether it is a CD or DVD.

- Other

The *Other* box pertains to miscellaneous items. It is up to the submitter to provide enough information to allow the CCB to determine whether the request should be approved.

If the change request covers multiple CIs, resulting in multiple affected CI Leaders, the form only needs to be submitted to and approved by the originating CI Leader. If the *Other* category was selected, then there may be no CI Leader associated with the change. If that is the case then “not applicable” may be written in the *CI Leader signature* field, and the *Change Request* form can be submitted directly to the CM Staff for processing.

2.2 CI Leader

1. Review the form and submitted material, then sign on the designated signature line.

If the CI Leader is the originator, then the signing of the *Originator signature* line is optional. The signature of the CI Leader is an indication that the CI Leader has reviewed the work for completeness, and that the leader has verified that the specified development process was followed for the items in question.

2. Personally deliver the completed form, the material to be checked in (e.g., design documents, attachments, source code, CDs, etc.), and any evidence that the required process has been followed to the CM staff for consideration by the CCB, such as those described in the *Software Development Standards* [4].

The entire submission must be given to the CM staff in one delivery: forms, printouts, electronic media containing files, etc. This provides protection against a malicious insider that presents one set of material to be reviewed, but a different set of material to be checked in later.

2.3 CM Staff

1. Review the Change Request form to make sure it has been completed fully and properly. Verify the following:
 - a. All the fields of the form have been completed properly.

The form must be signed by the originator and the CI Leader. If a CI Leader is the originator, then only one signature is required. If the *Other* box was selected as the *Submission Type*, a signature by a CI Leader is not required.

- b. If a flaw identifier is provided in the *Change Description* field, verify that it is a valid number, and that the flaw is still in the *accepted* state.
- c. A virus scanner does not detect malicious software on any removable media that might have been provided.

- d. All the new or modified files listed in the *Changed Configuration Items* and *New Configuration Items* fields are accounted for on the removable media.

This step can be skipped if the *To be archived* box is checked.

- e. Each file provided on the removable media is listed on the form.

This step can be skipped if the submitted material is to be archived.

- f. Proposed new identifiers are unique.

If there is anything wrong with the submission, the paperwork is returned to the CI Leader.

2. Based on the *Submission Type* box(es) checked on the *Change Request* form, do the following:

- Source code included
Re-generate the object files and verify that they are identical to the object files provided on the removable media using the procedures that were provided by the originator with the *Change Request* form.

Verify that a completed *Review History* form is included with the submission package.

If the regenerated object files do not match, or if the *Review History* is not included, return the submission package to the CI Leader.

- Documentation included
Regenerate the document(s) from the submitted source files using the procedures that were provided by the originator with the *Change Request*. The regeneration shall verify that there are no errors during regeneration.

After regeneration, determine that the submitted printed document (or PDF view) is visually identical to the regenerated document. This is not a word-by-word verification, but instead is an attempt to catch submission errors, such as forgetting to include an updated graphic file with a modified XML-based documentation file.

Verify that there is no “label” or other indication on the documentation that it is a “draft”, e.g., “DRAFT MATERIAL - DO NOT DISTRIBUTE”.

Verify that a completed *Review History* form is included with the submission package.

If any problems are found, return the submission package to the CI Leader.

- To be archived
Make two copies of each item (e.g, CD or printed document).

Label the copies appropriately, including a designation as a “Duplicate”.

If copies cannot be made for some reason, such as a flaw in the submitted electronic media, then return the submission package to the CI Leader.

Copying occurs at this point in the procedures to prevent problems later; if the submission is approved by the CCB, and the copying does not happen until afterward, it will not be possible to copy flawed media, and the whole process would have to be repeated for the submission, wasting time and effort.

- Other
Follow the procedures provided with the *Change Request*, if any.

3. If the request is new (viz., it is not a resubmission), assign a unique Change Request Number, and write it in the designated field of the *Change Request* form and the *Review History* form (if provided).

Change Request Numbers are unique per project. It is the responsibility of the CM staff to manage these numbers.

4. Notate the date of submission in the *Submission Date* field of the form.

If the request is a resubmission of a previous request, then add another date to the *Submission Date* field.

5. Write the Change Request Number on the transfer media.
6. Update the Change Request Status Database for the project.

If the request is new, notate the following information: the assigned number, the originator, the date the Change Request Number was assigned, the title of the change, and the current state (Pending).

If the request is a resubmission, change the state from *Resubmit* to *Pending*.

7. Route copies of the *Change Request* form and attached documentation to all members of the affected project's CCB.

Paper or electronic copies of files are made directly from the removable media, as applicable. For items in the *Documentation included* category, route the regenerated version of the documentation, not the printed version that came with the submission. They are forwarded to the CCB membership, as provided by the Project Manager. This membership list must minimally have names for the following positions/roles:

1. Project Manager
2. All CI Leaders
3. Security Analyst(s)
4. CM Manager
5. CCB Chair

Others can be added as needed or desired by the Project Manager, such as those responsible for Integration or Technical Support.

The original copy of the *Change Request* form and removable media are kept by the CM staff for safekeeping, and must be physically protected.

8. If the submission originator is not a member of the CCB, route a copy of the *Change Request* form to the originator so the originator may track the progress of the request via the Change Request Number.

3 Approving a Change

This section describes the process for considering a requested change.

The CCB only reviews *Pending* requests, ultimately leading to an approval or a denial, though the change request can be returned to the requesting CI Leader for further work before an ultimate decision is reached. The review process is given below.

1. It is the responsibility of the members of the CCB to review the change requests that are routed to them.
2. The CCB Chair schedules a meeting of the CCB, setting the agenda, and communicating this to the other members of the CCB.

CCB meetings can be held with any number of the CCB members present, as long as minutes are taken. However, no decisions can be made without the minimal participants noted above, with the following exceptions:

- A voting substitute can be sent, if approved or assigned by the Project Manager, and must be noted in the meeting minutes.
 - The absent CCB member communicated votes to the CCB Chair or Project Manager prior to the meeting.
3. Minutes of CCB meetings must minimally include the following information:
 - Date and time the meeting started
 - Attendees and their role(s) on the board

- Changes discussed
 - Decisions made
4. Decisions must be by unanimous vote of the entire CCB. The possible criteria to consider when granting final CCB approval are:
 - Was the specified process followed for the creation or modification of the item under review?
 - Is the item complete?
 - Is the item correct?
 5. Decisions must be documented on the original *Change Request* form during the CCB meeting.
 - a. Resubmit
No signature is required on the form, but the date must be entered in the *Resubmit Date* field.
 - b. Approved
The *Approved* state is circled on the form, and the date of approval is written in the corresponding block. Both the CCB Chair and the Project Manager must sign the form.
 - c. Denied
The *Denied* state is circled on the form, and the date of denial is written in the corresponding block. The CCB Chair must sign the form.
 6. Decisions of the CCB are relayed to the CM Staff.
 7. The CM staff updates the CM records.

The Change Request Status Database is updated with the date of the decision, and the state of the request is changed appropriately.

If the decision was a request for resubmission, then the original *Change Request* form is returned to the CI Leader. Otherwise, the original is kept by the CM Staff.
 8. The CM Manager shall forward a copy of the meeting minutes to the CCB members within 10 working days.
 9. If the originator of a request is not a member of the CCB, then forward a copy of the completed *Change Request* form to the originator.

4 Checking Into the CM Server

This section provides the steps performed by a member of the CM Staff when moving files into the official CM Server. If any discrepancy or error occurs during the following process, then the CM Manager and CCB Chair must be informed.

1. Verify that the associated *Change Request* form has been signed by the CCB Chair, and that the approval date has been entered.
2. Follow the procedures in the *Configuration Management System User's Guide* to import the files from the removable media into the CM server. (See Appendix H).
3. Update the CM records.

Update the *Change Request* form to note the date the change was completed.

Update the Change Request Status Database to show that the respective Change Request is completed.

If the change adds new files to the CI, increments the CI version number, or obsoletes CI files, update the *Configuration Item Map*. (See Appendix C).

If the description in the *Change Request* form notes that the change fixes a reported flaw, and also provides the unique flaw identifier, update the Flaw Tracking Database to reflect that the flaw has been fixed.

Have the CM Manager sign the *Change Request* form.

4. File the completed form and removable media and physically protect them, as described in the *Physical Security Plan* [6].

5 Checking in an Archive

This section provides the steps performed by a member of the CM Staff when receiving an archive submission into CM. If any discrepancy or error occurs during the following process, then the CM Manager and CCB Chair must be informed.

1. Verify that the associated *Change Request* form has been signed by the CCB Chair, and that the approval date has been entered.
2. File one of the duplicates in the designated off-site, physically protected area.
3. File the “Master Disk” and the second “Duplicate Disks” in the designated local, physically protected area.
4. Update the CM records.

Update the *Change Request* form to note the date the change was completed.

Update the Change Request Status Database to show that the respective Change Request is completed.

Have the CM Manager sign the *Change Request* form.

5. File the completed form and physically protect it.

6 Checking Out Items From CM

There are several defined methods for extracting official information from CM, as shown in Figure 2.

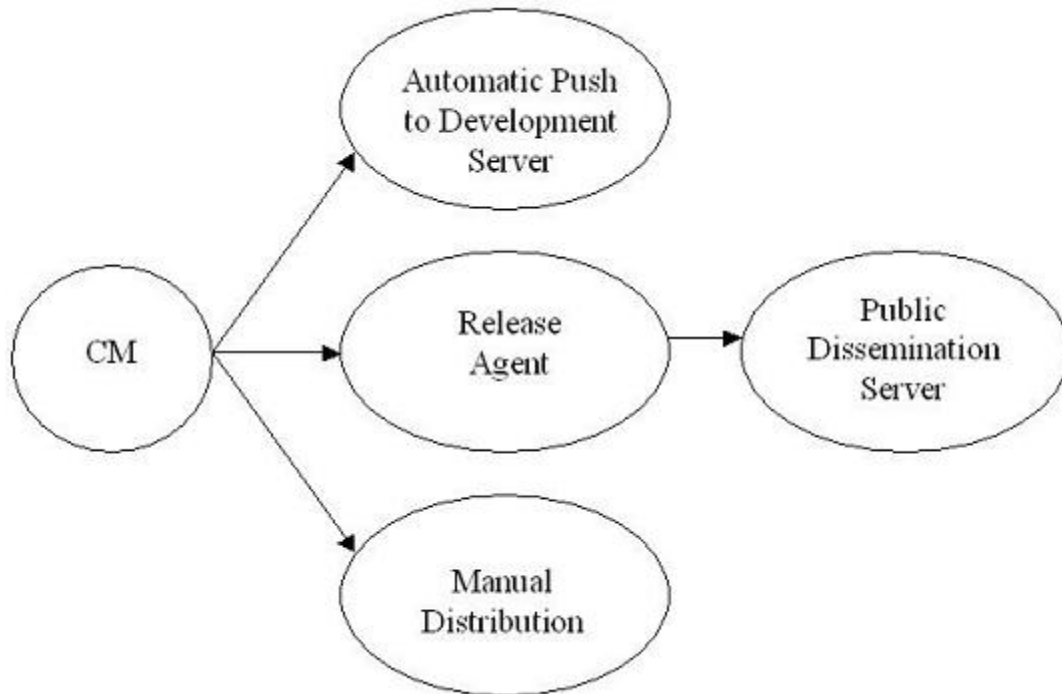


Figure 2 Extracting Files from CM

These checkout methods are described in the following subsections.

6.1 Automatic Push to Development Server

The automatic push to the development server is described in the *Configuration Management System User's Guide* (see Appendix H). The guide describes how non-archived material is pushed to the development network. However, because the CM System is physically separated from the development network, it is not an automated push of the material, rather, it is a manual procedure that is performed whenever material is checked into CM's file tracking system.

6.2 Public Dissemination

Because of the nature of the TCX project, many items will eventually be made available to the public. The TCX Project Manager, acting as a Release Agent, makes the ultimate decision about what items within the CM system shall be made available for consumption outside the development team. A list of publicly releasable items shall be provided by the Release Agent to the CM Staff, who shall make them available to the administrator of the Dissemination Server. Additional details of how this is done are described in the *Trusted Distribution Plan* [6].

6.3 Manual Distribution

CM staff shall limit the manual distribution of baselined TCX material to those persons approved by the TCX Project Manager. The Project Manager shall provide a list of personnel to the CM staff who have the privilege of obtaining such material. In addition, access can be limited to individual items on a case-by-case basis to people who are not associated with the project, as approved by the Project Manager and communicated to the CM staff. Those given such approval shall be informed of, and must agree to, the distribution limitations associated with the particular material.

6.3.1 Items Stored in the CM Server

When the CM staff receives a request for a manual distribution of TCX material from the CM file tracking system, they shall verify that the requester has been approved for such distribution. After verification, the requested materials shall be copied from the CM system to removable media and given to the requester. Such requests shall be tracked by the CM staff, as directed by the TCX Project Manager. The CM staff shall use the *Configuration Item Map* to know which files to copy.

6.3.2 Archived Items

When the CM staff receives a request for a manual distribution of archived TCX items, they shall verify that the requester has been approved for such distribution. After verification, the copy of the item labeled “Duplicate Disk” shall be checked out to the requester, using a checkout form that includes, at a minimum, the following information: date checked out, printed name of the person receiving the material, the person’s signature, the CI being checked out, and the date the material was returned.

Master disks shall not be checked out. Specific checkout periods, if any, may be established by the CM Manager on a case-by-case basis.

References

- [1] P. C. Clark, C. E. Irvine, T. Levin, T. D. Nguyen, and D. Warren, “Trusted Computing Exemplar: Configuration management plan,” Naval Postgraduate School, Monterey, CA, Tech. Rep. NPS-CAG-14-003, Dec. 2014.
- [2] P.C. Clark, C. E. Irvine, T. Levin, and T. D. Nguyen, “Trusted Computing Exemplar: Life cycle management plan,” Naval Postgraduate School, Monterey, CA, Tech. Rep. NPS-CAG-14-002, Dec. 2014.
- [3] P. C. Clark, C. E. Irvine, T. Levin, and T. D. Nguyen, “Trusted Computing Exemplar: Quality assurance plan,” Naval Postgraduate School, Monterey, CA, Tech. Rep. NPS-CAG-14-009, Dec. 2014.
- [4] P. C. Clark, C. E. Irvine, T. Levin, T. D. Nguyen, and D. Shifflett, “Trusted Computing Exemplar: Software development standards,” Naval Postgraduate School, Monterey, CA, Tech. Rep. NPS-CAG-14-007, Dec., 2014.

- [5] P. C. Clark, P. Hopfner, C. E. Irvine, T. Levin, and T. D. Nguyen, “Trusted Computing Exemplar: Physical security plan,” Naval Postgraduate School, Monterey, CA, Tech. Rep. NPS-CAG-14-006, Dec. 2014.
- [6] P. C. Clark, P. Hopfner, C. E. Irvine, T. Levin, and T. D. Nguyen, “Trusted Computing Exemplar: Trusted distribution plan – preliminary design,” Naval Postgraduate School, Monterey, CA, Tech. Rep. NPS-CAG-14-010, Dec. 2014.

Appendix A – Initialization

This section describes how the CM process for a project is started during the first meeting of a project's CCB. The approach taken here is a simple one, recognizing that there is an initialization problem.

The first action of a CCB for a new project is to approve a request to add a Configuration Items List to the project. The *Changed Items* portion of the *Change Request* form should indicate *Not applicable*, while the *New Items* portion of the form indicates the Configuration Items List.

The second action of the CCB is to approve a request to add documents to the project. The *Changed Items* portion of the *Change Request* Form lists the Configuration Items List. The *New Items* field should contain at least the following:

- Life Cycle Management Plan
- Configuration Management Plan
- Configuration Management Procedures
- Configuration Management System User's Guide

The above documents can be listed under a single Configuration Item, or as separate Configuration Items, or some combination thereof.

Once approved, they can be imported into the CM system.

Appendix B – Change Request Status Database

The Change Request Status Database will consist of two tables that have the format shown in Table 1 and **Error! Reference source not found.**Table 2. It is expected that there will be one database per product.

Table 1 Description Table

Record Field	Field Type
Change Request Number (Key)	Positive Integer
Originator	String up to 50 characters
Title	String up to 100 characters
Priority	Integer with the following valid values: 0=Low, 1=Urgent

Table 2 State Table

Record Field	Field Type
Change Request Number	Positive Integer
State	Integer with the following valid values: 0=Pending, 1=Resubmit, 2=Approved, 3=Denied, 4=Completed
Date of State Change	Date

The State Table keeps track of all state changes for change requests, such that a history can be queried from the database showing when each state transition was made for a given request number.

Appendix C – Configuration Item Map

The Configuration Item Map is a spreadsheet that is used as an aid to the CM staff. For example, it can be used to respond to queries for the objects that pertain to a particular CI. It maps all the files or archived material that are associated with each CI. Table 3 describes the contents of the map.

Table 3 Configuration Item Map

Column	Content Description
CI Identifier	The Configuration Item Identifier, e.g., TCX000-CMPL00-000000.
CI Name	The description name of the Configuration Item, e.g., Configuration Management Plan.
Path Root	The path name in the CM Repository for the root of all files and directories assigned to the CI.
CI Version	The current version of the CI.
CI Date	The “release date” for the CI. This is the date that is visible to end users. For XML documentation, it is the date given in the revision history. For source code CIs, this may not be applicable.
Developer Files	The files that are potentially required for a developer to modify the CI. For example, a Visio file that is used to generate a figure that is referenced in an XML document.
Consumer Files	The files that are required for a consumer of the CI to be able to use it. This is a subset of the developer files.

Figure 3 shows how the mapping would be done. Note that each version has an independent listing of all files.

	A	B	C	D	E	F	G
1	CI-to-File Mapping						
2							
3	CI ID	CI Name	Path Root	CI Version	CI Date	Developer Files	Consumer Files
4							
5	TCX000-CI1000-000000	Configuration Item List	TCX\shared\trunk\documentation\development\CM	1.0	2005-05-12	TCX-CI-List.xml	TCX-CI-List.xml
6				1.1	2005-10-30	TCX-CI-List.xml	TCX-CI-List.xml
7	TCX000-CMPL00-000000	Configuration Management Plan	TCX\shared\trunk\documentation\development\CM\plan	1.0	2004-09-28	CM-plan.xml	CM-plan.xml
8						CI-ID-format2.jpg	CM-plan.xml
9				1.1	2004-10-26	CM-plan.xml	CM-plan.xml
10						CI-ID-format2.jpg	CM-plan.xml
11				1.2	2005-06-30	CM-plan.xml	CM-plan.xml
12						CI-ID-format2.jpg	CM-plan.xml
13	TCX000-CMPL00-000000	Configuration Management Procedures	TCX\shared\trunk\documentation\development\CM\procedures	1.0	2004-09-28	CM-procedures.xml	CM-procedures.xml
14						change-request-form.doc	change-request-form.doc
15						state-diagram.jpg	state-diagram.jpg
16						state-diagram.ppt	state-diagram.ppt
17				1.1	2005-07-20	CM-procedures.xml	CM-procedures.xml
18						change-request-form.doc	change-request-form.doc
19						checkout-form.doc	checkout-form.doc
20						state-diagram.jpg	state-diagram.jpg
21						releases.jpg	releases.jpg
22						state-diagram.ppt	state-diagram.ppt
23						releases.ppt	releases.ppt

Figure 3 Example Configuration Item Map

Appendix D – Submission Checklist

This appendix needs to contain a checklist of tasks to be performed or items to include when preparing a package to the CCB, which will increase the likelihood that the submission meets the requirements on the first try.

Appendix E – Correcting Import Errors in the CM Server

There may be occasions when mistakes are made either by the originator of the change request or some member of the CM Staff. Each error must be resolved on a case-by-case basis by the CM Manager and the Project Manager.

For example, because of an error made by the originator when the transfer disk was created, files could be imported into the CM Server in the wrong location. After a discussion with the originator, the CM Manager, and the Project Manager, the following steps could potentially solve the problem, as long as it is approved by the Project Manager:

1. The errant files on the CM Server could be deleted without CCB approval.
2. A new media disk could be produced with the proper file hierarchy, with the CCB approved files copied to the proper location in the hierarchy.
3. The new media could be used to import the approved files in the proper location.
4. Both the original media and the new media would be kept on file by the CM Staff.

Though the above example does not require CCB action, there may be other situations that require CCB approval to correct. The Project Manager shall make the determination.

Appendix F – Change Request Form

Figure 4 shows what a Change Request form looks like, with respect to the procedures in this document.

Change Request		Change Request Number _____
Change Title: _____	Submission Type Source code included: <input type="checkbox"/> Documentation included: <input type="checkbox"/> To be archived: <input type="checkbox"/> Other: <input type="checkbox"/>	
Project ID: _____		
Originator _____		
Change Description		
Changed Configuration Items		
New Configuration Items		
Signatures	Originator _____ CI Leader _____ CCB Chairman _____ Project Manager _____ CM Manager _____	
Official Use Only		
Status: Submission Date(s): _____ Resubmit Date(s): _____ Approved / Denied Date: _____ Completed Date: _____		
Rev: 2008-04-15		

Figure 4 Change Request Form

Appendix G – Review History Form

Figure 5 shows what a Review History form looks like. This form is used to document discussions about proposed changes to a CI, including the dates and people involved in the discussions. It is also used to show that the relevant CI Leaders have reviewed the final changes and approved them.

Review History

Review and Approval Evidence for:

✚

Date of meeting (YYYY-MM-DD)	Names and TCX titles of those in attendance

□

The following Configuration Item Leaders have reviewed the proposed changes and approve its submission to the Change Control Board:

Printed Name	Signature

Rev: 2009-06-08

Figure 5 Review History Form

Appendix H – Configuration Management System User’s Guide

This document is very site-specific with respect to the operating system and CM software tools used. This document should minimally provide detailed instructions about the proper way for the CM staff to do the following:

- 1. How to import approved changes into the controlled software repository.*
- 2. How to copy the changes from the repository to the read-only version on the development server.*
- 3. How to perform backups of the controlled software repository.*
- 4. How to restore a software repository from backups.*

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