

Conducting Software Configuration Management Audits

Presented By: Linda Westfall

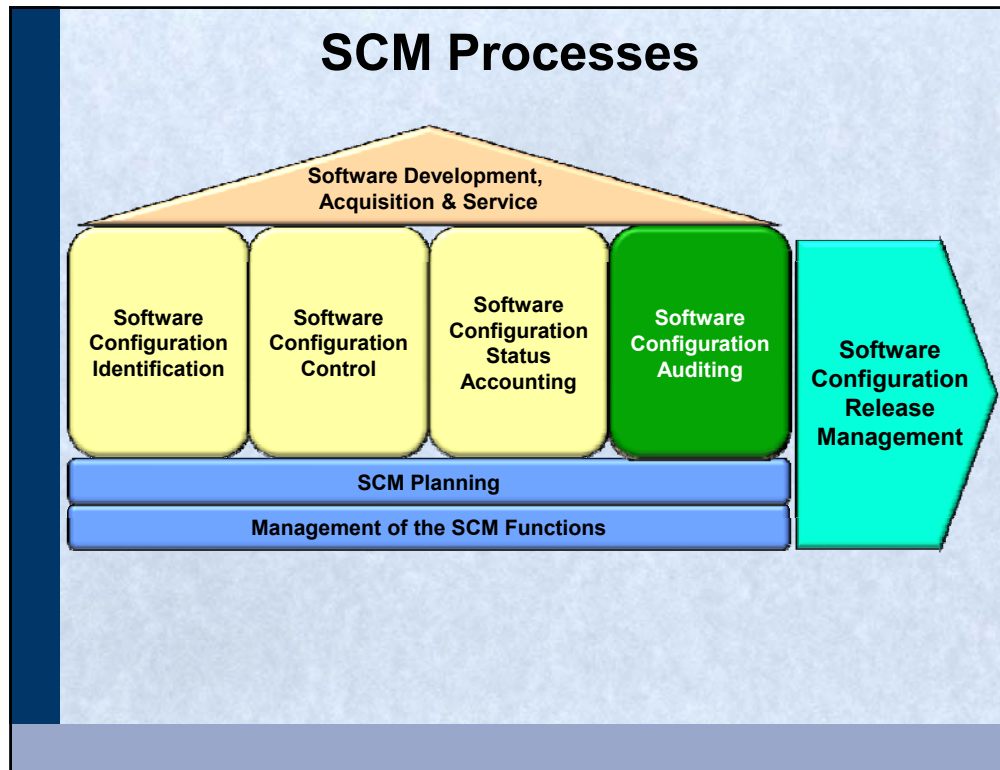
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Configuration Audits

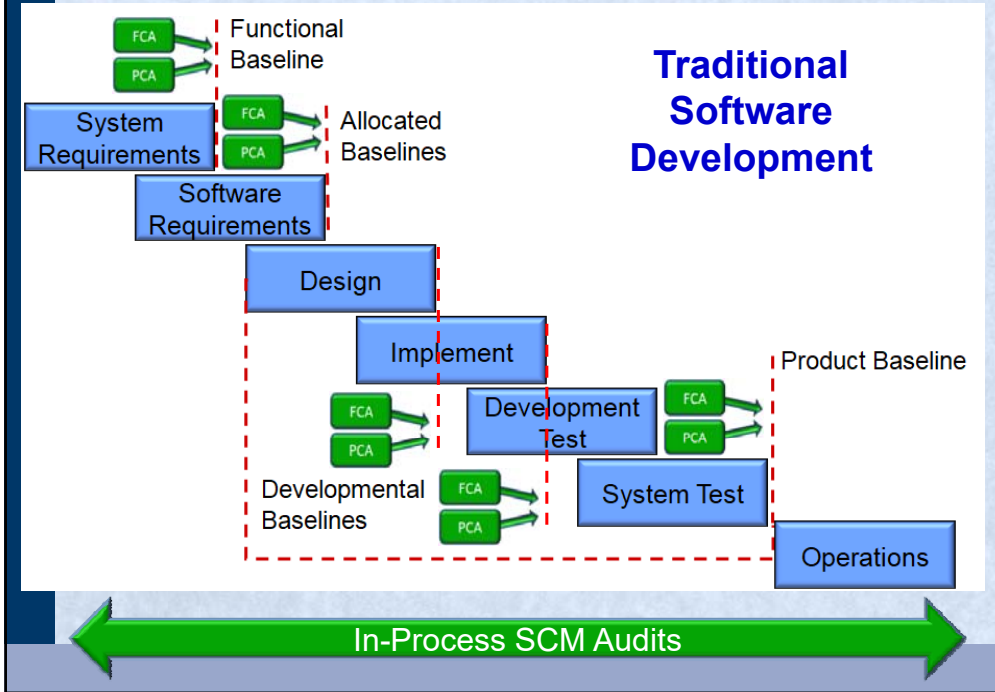
Audits of SCM provide objective assurance that:

- SCM processes are being followed
- Configuration items are being built as required

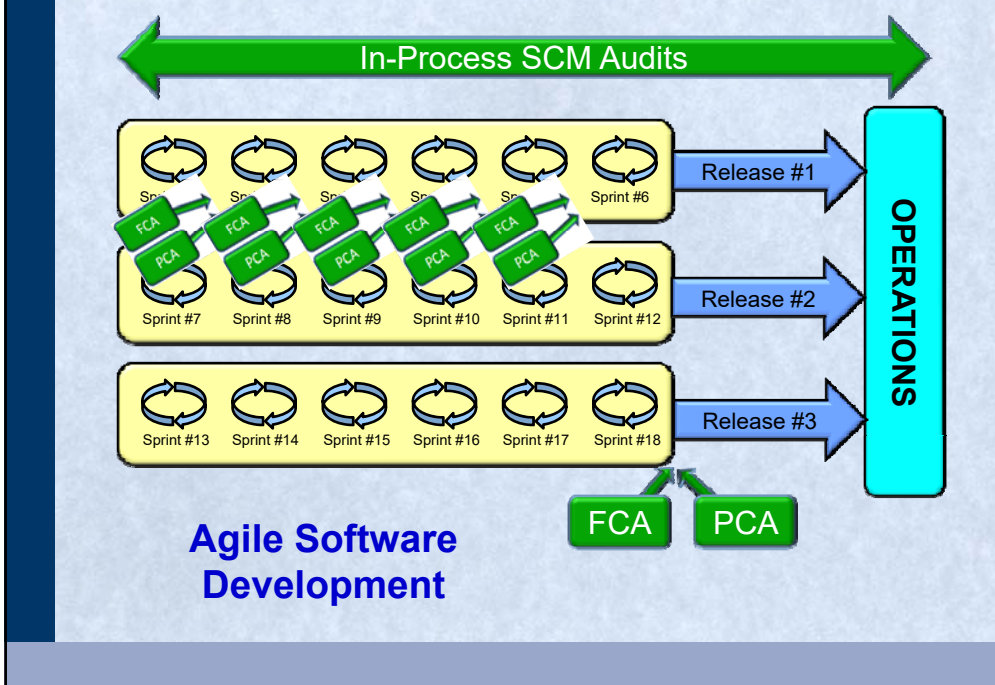
The primary purpose of SCM audits is to maintain the integrity of the configuration baselines

- Baselines are complete, correct & consistent in relation to functional & physical specifications
- Approved changes were correctly implemented & verified
- No unauthorized changes have occurred
- At delivery – the software products are ready to release

When are SCM Audits Conducted



When are SCM Audits Conducted (cont.)



Software Configuration Management Audits

Functional Configuration Audits (FCA)

Physical Configuration Audits (PCA)

In-Process SCM Audits

Functional Configuration Audit (FCA)

A FCA is conducted to verify that:

- The development of a configuration item has been completed satisfactorily
- The item has achieved the performance & functional characteristics specified
- Its operational & support documents are complete & satisfactory

[ISO/IEC/IEEE-10]

FCA Checklist – All Baselines

Checklist Item	Suggestions for Evidence Gathering Techniques
1. Does each baselined configuration item (CI) implement all and only the documented software/system requirements?	<ul style="list-style-type: none"> • Evaluate requirements-to-CI forward and backward traceability information for completeness and to ensure that no unauthorized functionality has been implemented. • Sample a set of requirements and using the traceability information, review each associated, baselined CI for implementation completeness and consistency. • Sample a set of approved enhancement requests and review their resolution status (or if approved for change, evaluate their associated, baselined CIs for implementation completeness and consistency). • Sample a set of baselined CIs and compare with the previous versions to identify changes. Ensure that each change corresponds to a requirement or approved change request.

Bi-Directional Traceability

Requirement Source	Product Requirements	Architectural Design Section #	Component Design Section #	Code Unit	Unit Test Case #	System Test Case #	User Manual	...
Business Rule #1	R00120 Credit Card Types	4.1 Parse Mag Strip	4.1.1 Read Card Type	Read_Card_Type.c Read_Card_Type.h	UT 4.1.032 UT 4.1.033 UT 4.1.038 UT 4.1.043	ST 120.020 ST 120.021 ST 120.022	Section 12	
			4.1.2 Verify Card Type	Ver_Card_Type.c Ver_Card_Type.h Ver_Card_Types.dat	UT 4.2.012 UT 4.2.013 UT 4.2.016 UT 4.2.031 UT 4.2.045	ST 120.035 ST 120.036 ST 120.037 ST 120.037		
Use Case #132 step 6	R00230 Read Gas Flow	7.2.2 Gas Flow Meter Interface	7.2.2 Read Gas Flow Indicator	Read_Gas_Flow.c	UT 7.2.043 UT 7.2.044	ST 230.002 ST 230.003	Section 21.1.2	
	R00231 Calculate Gas Price	7.3 Calculate Gas price	7.3 Calculate Gas price	Cal_Gas_Price.c	UT 7.3.005 UT 7.3.006 UT 7.3.007	ST 231.001 ST 231.002 ST 231.003		

FCA Checklist – All Baselines (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
<p>2. Are all the defects/anomalies reported during verification & validation (V&V) activities adequately resolved (or the appropriate waivers/deviations obtained and known defects with work-arounds are documented in the release notes)?</p>	<ul style="list-style-type: none"> • Review a sample set of approved defect/anomaly report records for evidence of adequate resolution. • Sample a set of defect/anomaly report records and review their resolution status (or if approved for change, evaluate their associated CIs for implementation completeness and consistency). • Review V&V iteration results data (e.g., re-peer review records, re-test/regression test logs, test case status, and/or metrics) to ensure adequate V&V iteration coverage after defect correction.

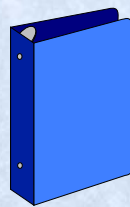
FCA Checklist – Product/Release Baseline

Checklist Item	Suggestions for Evidence Gathering Techniques
<p>3. Can each system/software requirement be traced forward into tests cases/procedures that V&V that requirement?</p>	<ul style="list-style-type: none"> • Evaluate requirements-to-tests traceability information for completeness. • Sample a set of requirements and using the traceability information, review the associated test documentation (e.g., test plans, defined test cases/procedures) for adequacy of V&V by ensuring the appropriate level of test coverage for each requirement.
<p>4. Is comprehensive system/software testing complete, including functional testing, interface testing and the testing of required quality attributes (performance, usability, safety, security, etc.)?</p>	<ul style="list-style-type: none"> • Review approved V&V reports for accuracy and completeness. • Evaluate approved test documentation (e.g., test plans, defined test cases/procedures) against test results data (e.g., test logs, test case/procedure status, test metrics) to ensure adequate test coverage of the requirements and system/software during test execution. • Execute a sample set of test cases to evaluate accuracy of test results.

FCA Checklist – Product/Release Baseline (cont.)

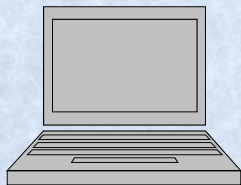
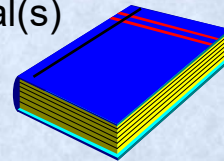
Checklist Item	Suggestions for Evidence Gathering Techniques
5. Is the operational & support documentation consistent with the requirements and as-built system/software?	<ul style="list-style-type: none"> • Review minutes from peer reviews and defect resolution information from operational & support documentation reviews for evidence of consistency. • Evaluate formal test documentation (e.g., test plans, defined test cases/procedures) against test results data (e.g., test logs, test case/procedure status, test metrics) to ensure adequate test coverage of the operational & support documentation during test execution. • Review sample set of updates to previously delivered documents to ensure consistency with requirements and as built system/software?

Operational & Support Documentation

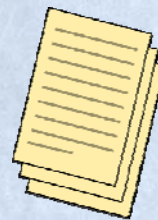


Development documents

User' & operator's manual(s)



Supporting web site

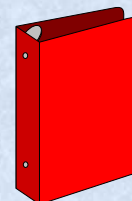


Installation instructions

Training materials



Version description documents



Software Configuration Management Audits

Functional Configuration Audits (FCA)

Physical Configuration Audits (PCA)

In-Process SCM Audits

Physical Configuration Audit (PCA)

A PCA is conducted to verify that:

Each configuration item, as built, conforms to the technical documentation that defines it:

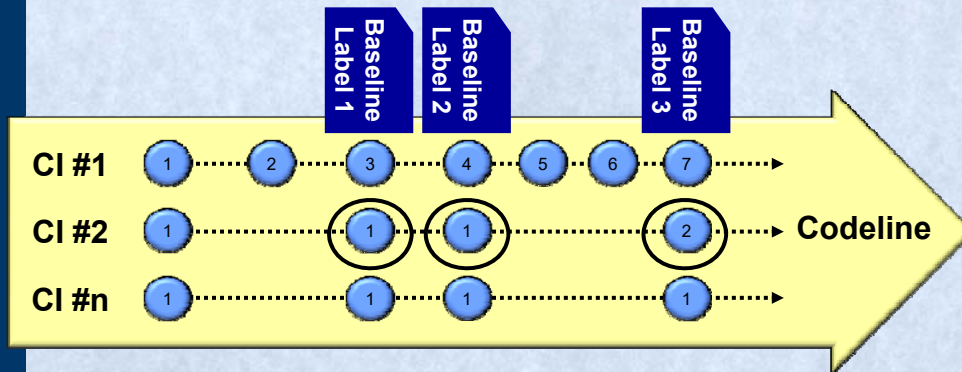
- All items identified as being part of the configuration are present in the product baseline
- The correct version & revision of each part are included in the product baseline
- Each item correspond to information contained in the baseline's configuration status report

[ISO/IEC/IEEE-10]

PCA Checklist – All Baselines

Checklist Item	Suggestions for Evidence Gathering Techniques
1. Has each nonconformance or noncompliance from the associated FCA been appropriately resolved?	<ul style="list-style-type: none"> Review findings from the FCA audit report, associated corrective actions, follow-up and verification records to evaluate adequacy of actions taken (or appropriate approved waivers/deviations exist).
2. Have all of the identified CIs been baselined?	<ul style="list-style-type: none"> Sample a set of CIs and evaluate them against configuration status accounting records to verify that the appropriate version/revision has been captured as part of the baseline.
3. Do all of the baselined CIs meet workmanship standards?	<ul style="list-style-type: none"> Sample a set of CIs and evaluate them against their associated workmanship standards (e.g., modeling standards, coding standards & naming conventions, documentation standards).

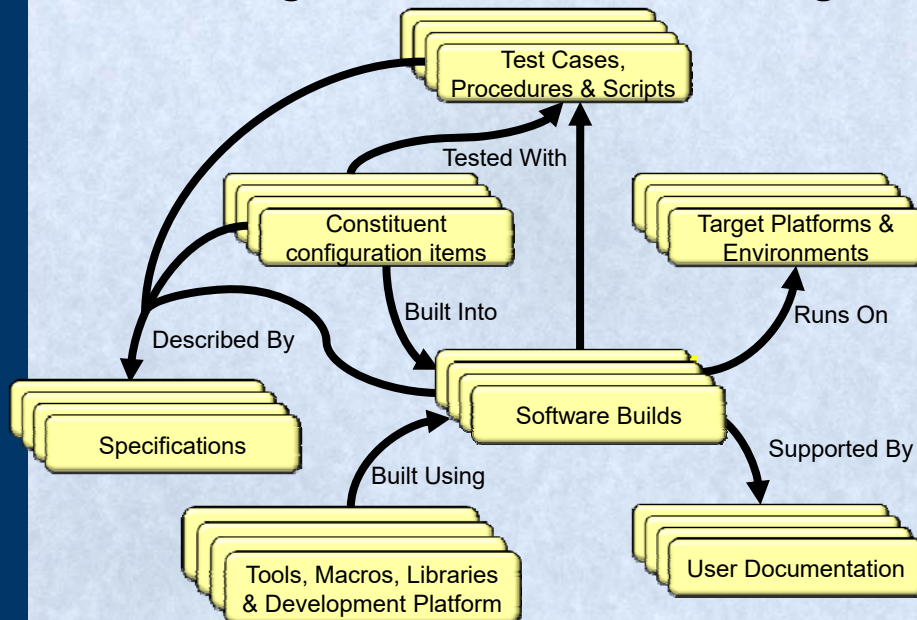
Correct Version & Revision



PCA Checklist – Product/Release Baseline

Checklist Item	Suggestions for Evidence Gathering Techniques
4. Has the software been built from the correct components and in accordance with the specification?	<ul style="list-style-type: none"> • Evaluate the build records against the configuration status accounting information to ensure that the correct version and revision of each module was included in the build. • Evaluate any patches/temporary fixes made to the software to ensure their completeness and correctness. • Sample a set of design elements from the architectural design and trace them to their associated detailed design elements and source code. Compare those elements with the build records to evaluate for completeness and consistency with the as built software.

Configuration Status Accounting



PCA Checklist – Product/Release Baseline (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
5. Is the deliverable documentation set complete?	<ul style="list-style-type: none"> • Evaluate the master copy of each document against the configuration status accounting information to ensure that the correct version/revision of each document sub-component (e.g., chapter, section, figure) is included in the document. • Sample the set of copied documents ready for shipment and review them for completeness and quality against the master copy. • Evaluate the version description document against the build records for completeness and consistency. • Compare the current build records to the build records from the last release to identify changed components. Evaluate this list of changed components against the version description document to evaluate the version description document's completeness and consistency.

PCA Checklist – Product/Release Baseline (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
6. Does the actual system delivery media conform to specification? Has the delivery media been appropriately marked/labeled?	<ul style="list-style-type: none"> • Evaluate the items on the master media against the required software deliverables (executables, help files, data) to ensure the correct versions and revisions were included. • Sample a set of copied media ready for shipment and review them for completeness and quality against the master media. • Sample a set of copied media ready for shipment and review their marking/labeling against specification.
7. Do the deliverables for shipment match the list of required deliverables?	<ul style="list-style-type: none"> • Evaluate the packing list against the list of documented deliverables to ensure completeness. • Sample a set of ready-to-ship packages and evaluate them against the packing list to ensure that media (i.e., CD, disks, tape), documentation and other deliverables are included in each package.

PCA Checklist – Product/Release Baseline (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
8. Have 3 rd party licensing requirements been met?	<ul style="list-style-type: none">Evaluate the build records against configuration status accounting information to identify 3rd party components and license information to confirm adequate numbers of licenses exist.
9. Have export compliance requirements been met?	<ul style="list-style-type: none">Evaluate the build records against configuration status accounting information to identify components with export restrictions and confirmed export compliance.

Software Configuration Management Audits

Functional Configuration Audits (FCA)

Physical Configuration Audits (PCA)

In-Process SCM Audits

In-Process SCM Audit Objectives

In-process SCM audits are value-added activities conducted to provide management with information about the:

- Adequacy of the organization's SCM plans, processes & systems
- Compliance to documented SCM plans, processes & systems
- Effectiveness of the SCM plans, processes & systems & their implementation
- Efficiency of resource utilization
- Identification of areas for continuous improvement

In-Process SCM Checklist

Checklist Item	Suggestions for Evidence Gathering Techniques
1. Are there defined SCM policies and/or standards associated with this process and are they adequate to meet the organization's defined objectives?	<ul style="list-style-type: none"> ● Perform a document review of the SCM policies and/or standards associated with the process being audited against the organization's defined objectives ● Interviews with key personnel to evaluate their knowledge of the connection between SCM policies and/or standards and organizational objectives.
2. Are there defined SCM project plans associated with this process and are they adequate to meet defined policies and/or standards?	<ul style="list-style-type: none"> ● Perform a document review of the SCM plans associated with the process being audited to evaluate adequacy against SCM policies and/or standards ● Interviews with key personnel to evaluate their knowledge of the connection between SCM plans and SCM policies and/or standards.
3. Are the procedures and/or work instructions for the processes adequate to implement defined policies, standards and/or plans?	<ul style="list-style-type: none"> ● Perform a document review of the SCM plans associated with the process being audited to evaluate adequacy against SCM policies, standards and/or plans.

In-Process SCM Checklist (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
4. Does each person performing SCM tasks associated with the process have access to applicable procedures or work instructions?	<ul style="list-style-type: none"> Interview a sample of personnel performing tasks to evaluate their knowledge of the existence, availability and content of the applicable procedures or work instructions.
5. Are the procedures or work instructions up-to-date (latest revision)?	<ul style="list-style-type: none"> Check revision numbers of the copies of procedures and work instructions in use by personnel and compare those against current baseline revisions, as interviews are conducted for checklist item 4.
6. Were the entry criteria to the SCM process verified before that process began?	<ul style="list-style-type: none"> Interview a sample of personnel performing tasks to determine what entry criteria were used and how they determined that those entry criteria were met before initiation the process and evaluate their answers against process requirements. Examine a sample quality records (e.g., completed entry criteria checklists) if applicable.

In-Process SCM Checklist (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
7. Does each person performing SCM tasks have the appropriate education, training, skills & experience?	<ul style="list-style-type: none"> Interview a sample of personnel performing tasks to determine their knowledge/skill level or to ask about training received and evaluate their answers against process requirements. Observe tasks being performed to ensure that they are being performed as specified. Examine a sample quality records (e.g., completed checklists, data records, minutes, reports) for compliance to specification.
8. Does everyone performing SCM tasks comply with the policies, standards, plans, procedures and work instructions?	<ul style="list-style-type: none"> Interview a sample of personnel performing tasks to determine how they think activities are being performed and evaluate their answers against process requirements. Observe tasks being performed to ensure that they are being performed as specified. Examine a sample quality records (e.g., completed checklists, data records, minutes, reports) for compliance to specification.

In-Process SCM Checklist (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
9. Are the environment, infrastructure and tools utilized during the SCM tasks adequate to achieve conformity with the policies, standards, plans, procedures and work instructions	<ul style="list-style-type: none"> • Interview a sample of personnel performing tasks to determine adequacy of environment, infrastructure and tools. • Observe tasks being performed to ensure that the environment, infrastructure and tools are adequate.
10. Were the exit criteria from the SCM process verified before that process was considered complete?	<ul style="list-style-type: none"> • Interview a sample of personnel performing tasks to determine what exit criteria were used and how they determined that those exit criteria were met before completing the process and evaluate their answers against process requirements. • Examine a sample quality records (e.g., completed exit criteria checklists, minutes, reports) if applicable.

In-Process SCM Checklist (cont.)

Checklist Item	Suggestions for Evidence Gathering Techniques
11. Are nonconformities/defects appropriately reported and tracked to closure?	<ul style="list-style-type: none"> • Interview a sample of personnel performing tasks to determine how nonconformities/defects are reported and tracked to closure and evaluate their answers against process requirements. • Examine a sample of quality records (e.g., nonconformance reports, corrective action reports, defect reports) if applicable.
12. Are the appropriate records being kept?	<ul style="list-style-type: none"> • Examination of the existence of required quality records and their storage and retention.
13. Were SCM processes effective.	<ul style="list-style-type: none"> • Look for evidence of escapes from the SCM processes (e.g., unauthorized changes, CIs that were not baselined appropriately, inability to recreate builds, lost intellectual capital and so on).

Questions?



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