

625-EMD-012

EOSDIS Maintenance and Development Project

Training Material for the EMD Project Volume 12: Configuration Management

Revision 02

July 2006

Raytheon Company
Upper Marlboro, Maryland

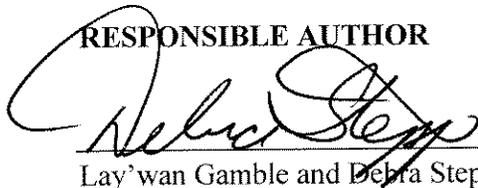
Training Material for the EMD Project Volume 12: Configuration Management

Revision 02

July 2006

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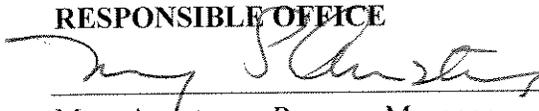


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Preface

This document is a formal contract deliverable. It requires Government review and approval within 45 business days. Changes to this document will be made by document change notice (DCN) or by complete revision.

Any questions should be addressed to:

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Abstract

This is Volume 12 of a series of lessons containing the training material for the Earth Observing System Data and Information System (EOSDIS) Maintenance and Development (EMD) Project. This lesson provides a detailed description of the different tasks that need to be accomplished in order to: record and manage proposed and approved Configuration Change Requests (CCRs); record, report, manage, and distribute changes to custom software, science software, and database control files; record, report, and maintain system-level changes to the as-built operational baseline; and generate the Configuration Status Accounting Records (CSARs).

Keywords: training, instructional design, course objective, Configuration Management, Configuration Change Request, software changes, Configuration Parameters, Configuration Registry, Configuration Status Accounting, Baseline Manager, Inventory/Logistical Management, Release 7.

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Abstract

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Introduction

Identification

Training Material Volume 12 is part of Contract Data Requirements List (CDRL) Item 23, which is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Maintenance and Development (EMD) Contract (NAS5-03098).

Scope

Training Material Volume 12 describes the processes and procedures for Configuration Management (CM). This lesson is designed to provide the operations staff with sufficient knowledge and information to satisfy all lesson objectives.

Purpose

The purpose of this Student Guide is to provide a detailed course of instruction that forms the basis for understanding Configuration Management. Lesson objectives are developed and will be used to guide the flow of instruction for this lesson. The lesson objectives will serve as the basis for verifying that all lesson topics are contained within this Student Guide and slide presentation material.

Status and Schedule

This lesson module provides detailed information about training for the current baseline of the system. Revisions are submitted as needed.

Organization

This document is organized as follows:

- | | |
|------------------------|--|
| Introduction: | The Introduction presents the document identification, scope, purpose, and organization. |
| Related Documentation: | Related Documentation identifies parent, applicable and information documents associated with this document. |
| Student Guide: | The Student Guide identifies the core elements of this lesson. All Lesson Objectives and associated topics are included. |
| Slide Presentation: | Slide Presentation is reserved for all slides used by the instructor during the presentation of this lesson. |

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Related Documentation

Parent Documents

The parent documents are the documents from which the EMD Training Material's scope and content are derived.

423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-46-03	EMD Task 101 Statement of Work For ECS SDPS Maintenance
423-46-02	Contract Data Requirements Document for EMD Task 101 ECS SDPS Maintenance

Applicable Documents

The following documents are referenced within this EMD Training Material, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this document:

420-05-03	Goddard Space Flight Center, Earth Observing System (EOS) Performance Assurance Requirements for the EOSDIS Core System (ECS)
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) (ECS F&PRS)
423-46-01	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) Science Data Processing System (EMD F&PRS)

Information Documents

Information Documents Referenced

The following documents are referenced herein and amplify or clarify the information presented in this document. These documents are not binding on the content of the EMD Training Material.

423-10-21	Earth Science Data and Information System Project Configuration Management Procedures
110-EMD-001	Configuration Management Plan for the EMD Project
609-EMD-001	Release 7.10 Operations Tools Manual for the EMD Project

611-EMD-001	Release 7.10 Mission Operation Procedures for the EMD Project
905-TDA-001	EMD System Baseline Specification
910-TDA-003	COTS Software Version Baseline Report
910-TDA-005	Site-Host Map Report
910-TDA-023	Critical COTS Software List
910-TDA-030	COTS [Software] Where Used Report
911-TDA-007	Release B0 Sun Solaris 2.5.1 Patch List
911-TDA-009	Release B SGI IRIX 6.5.22 O/S Patch List
911-TDA-010	Release B SGI IRIX 6.5.26 O/S Patch List
911-TDA-011	Solaris 8 Operating System (OS) Patches
911-TDA-012	Red Hat Linux 7.3 Redhat Package Manager (RPM) Required Packages
914-TDA-xxx	Software Release Notes
920-TDx-002	Hardware-Software Map
920-TDx-014	Operating System (O/S) and COTS Software (S/W) Patch Maps
920-TDx-015	Sun Platform UNIX Kernel Configuration Parameters
920-TDx-016	SGI Platform UNIX Kernel Configuration Parameters
920-TDx-019	Hosts' Custom Code Baseline
500-TIP-2110	Specification for Document Formats

Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify or clarify the information presented in this document. These documents are not binding on the content of the EMD Training Material.

305-EMD-001	Release 7.10 Segment/Design Specification for the EMD Project
313-EMD-001	Release 7.10 Internal Interface Control Document for the EMD Project
508-EMD-001	ACRONYMS for the EOSDIS Maintenance and Development (EMD) Project
152-TP-003	Glossary of Terms for the EOSDIS Core System (ECS) Project

Configuration Management Overview

Lesson Overview

This lesson describes the processes established to accomplish Configuration Management (CM) objectives. These processes include preparing Configuration Change Requests (CCRs), Configuration Change Boards (CCBs), implementation of approved hardware and/or software baseline changes, and Configuration Status Accounting (CSA). The lesson also provides practical experience in using the tools needed to perform baseline management and status accounting.

Lesson Objectives

Overall Objective - The overall objective of this lesson is proficiency in the methodology and procedures for CM of the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) during maintenance and operations.

Condition - The student will be given a baseline configuration for the system, common CM tools, a copy of 609-EMD-001, *Release 7.10 Operations Tools Manual for the EMD Project*, a copy of 611-EMD-001, *Release 7.10 Mission Operation Procedures for the EMD Project*, and a requirement for a change to the baseline.

Standard - The student will use CM tools in accordance with prescribed methods and complete required procedures without error to accomplish all coordination and actions necessary to effect the required change.

Specific Objective 1 - The student will describe the EMD CM activities.

Condition - The student will be given a copy of 609-EMD-001, *Release 7.10 Operations Tools Manual for the EMD Project*, and a copy of 611-EMD-001, *Release 7.10 Mission Operation Procedures for the EMD Project*.

Standard - The student will correctly identify the overall CM requirements in relation to each of the following: 1) configuration problem management, 2) configuration change adjudication, and 3) development, deployment and installation of changes.

Specific Objective 2 - The student will list the CCBs involved in EMD CM, identify their inter-relationships, and list their responsibilities and functions in EMD CM.

Condition - The student will be given a copy of 609-EMD-001, *Release 7.10 Operations Tools Manual for the EMD Project*, and a copy of 611-EMD-001, *Release 7.10 Mission Operation Procedures for the EMD Project*.

Standard - The student will identify the position of each CCB within the CCB hierarchy without error, and correctly list at least one major responsibility for each, and correctly list three functions of CM Administrators at the Systems Monitoring Center (SMC) and the Distributed Active Archive Centers (DAACs).

Specific Objective 3 - The student will execute the procedure to record, report, document, and distribute a change request.

Condition - The student will be given a requirement for a change to the baseline, access to the EMD Process Assets Library (PAL), a copy of 609-EMD-001, *Release 7.10 Operations Tools Manual for the EMD Project*, a copy of 611-EMD-001, *Release 7.10 Mission Operation Procedures for the EMD Project*, and access to the Distributed Defect Tracking System (DDTS).

Standard - The student will use DDTS correctly to enter data documenting the request, print a report on the request, and identify without error the proper distribution for the report.

Specific Objective 4 - The student will launch the Configuration Registry GUI and view parameters associated with computer software components on system hosts.

Condition - The student will be given a copy of 609-EMD-001, *Release 7.10 Operations Tools Manual for the EMD Project*, a copy of 611-EMD-001, *Release 7.10 Mission Operation Procedures for the EMD Project*, and access to the Configuration Registry GUI and database.

Standard - The student will use the Configuration Registry GUI correctly in accordance with appropriate procedures to display the parameters associated with computer software components on a given host.

Specific Objective 5 - The student will execute the procedure to access reports on system baseline information.

Condition - The student will be given a copy of 609-EMD-001, *Release 7.10 Operations Tools Manual for the EMD Project*, a copy of 611-EMD-001, *Release 7.10 Mission Operation Procedures for the EMD Project*, and access to a workstation/terminal on the M&O network from which it is possible to run Netscape.

Standard - The student will correctly use applicable procedures to access baseline reports, including hardware-software maps, a site host map, a list of critical COTS software, a hardware patch map, a COTS software version report, and a COTS software Where-Used report.

Specific Objective 6 - The student will execute the procedure to record, report, document, and distribute a change to the inventory.

Condition - The student will be given a copy of 609-EMD-001, *Release 7.10 Operations Tools Manual for the EMD Project*, a copy of 611-EMD-001, *Release 7.10 Mission Operation Procedures for the EMD Project*, a written description of the inventory change, and access to the Inventory/Logistical Management software.

Standard - The student will use the Inventory/Logistical Management software correctly to enter data documenting the inventory change and print a report documenting the change.

Importance

This lesson provides students who will be CM Administrators at the DAACs or SMC with the knowledge and skills needed for effective EMD configuration management. It also provides students who will be System Engineers, System Test Engineers, and Maintenance Engineers at the DAACs with background knowledge and skills for their roles in CM, including

implementation and documentation of system-wide changes directed by the Earth Science Data and Information System (ESDIS) CCB and changes directed by a local CCB and/or EMD CM. It ensures management of the capability to:

- Control operations across system functional segments and operational sites.
- Manage successful implementation of large numbers of anticipated system changes.
- Interface effectively with interfacing organizations and CCBs.
- Communicate changes and baseline definitions to all affected organizations.

It familiarizes students with:

- The importance of early customer involvement in changes.
- The CM tools to be used in all elements of the EMD Project during operations.
- The organization and interactions among hierarchical CCBs.
- The proper use and deployment of CM database assets to support all CCBs.
- The necessary coordination among all elements involved in accomplishing a change in the system.

It facilitates the achievement of a streamlined CM approach that ensures local organizations operate effectively with the needed autonomy to accomplish their missions, minimizing outside intervention to promote timely resolution of local problems and to enable change during continued timely production of data products.

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EMD Configuration Management (CM) Activities

The *Configuration Management Plan for the EMD Project* document, 110-EMD-001, establishes policies, methodologies and procedures, organizations, and change control boards for EMD configuration management. The policies presented in the CM Plan are implemented using the Project Instructions and associated forms, templates, checklists and other tools available in the EMD Process Assets Library (PAL). The Process Assets Library is accessible on the web at the following URL:

http://dmsserver.hitc.com/EMD_PAL/index.html

The Configuration Management team's primary responsibility is to provide and protect the integrity of the EMD baseline, and also to ensure that baseline changes are made using formal processes. Configuration Management works closely with NASA counterparts to ensure that the activities and functions performed on the EMD Program are in line with the objectives of ESDIS. The EMD Program Management Plan describes the formal interfaces with the Government through defined technical reviews and program status reviews.

Software Configuration Management (SCM) is executed by the ClearCase™ Support Group (CSG) and the Baseline Management Group (BLM). The primary role of CSG is to maintain the integrity of the ClearCase™ custom code baseline. CSG also provides access and control for merges, and performs intermediate and system level builds. Secondary roles include preparing and delivering COTS and custom software to the EDF, PVC, and VATC, as well as the remote sites, including the SMC, LPDAAC, GDAAC, LDAAC, and NDAAC. CSG also maintains the COTS and custom software archives. The BLM group administers the Change Control Boards (CCBs) and processes Configuration Change Requests (CCRs). Baseline Management functions, to include the administration of the CCBs and the processing of CCRs, is the responsibility of the Baseline Management Group (BLM).

Configuration Management Objectives

Configuration control is the systematic proposal, justification, evaluation, coordination, approval or disapproval of proposed changes to a baseline, and the subsequent implementation and verification of all approved changes in the configuration of EMD hardware, firmware, and COTS and custom software.

Configuration management provides visibility to components that comprise the EMD system. Unauthorized changes are made visible, as well as configuration drift from the approved EMD baseline. CM can approve CCRs that need to be implemented by the remote sites (DAACs), but CM does not have DAAC authority. It is the specific objective of Configuration Management, then, to provide the information base from which changes can be made, and to provide configuration information by using automated surveillance techniques through remote interrogation.

The objectives of EMD configuration control are to ensure:

- Changes are adequately defined, assessed for technical, cost, and schedule impacts by the EMD office(s), and formally considered by the appropriate CCB.
- Only approved changes are incorporated in the appropriate baseline in an orderly and systematic manner.
- Actions assigned by each CCB are monitored and brought to closure. These consist of:
 - Engineering Change Orders (ECOs) reflecting direction to change design.
 - Document Change Notices (DCNs) reflecting direction to change documentation.

Configuration Problem Management

Problems (corrective or perfective) are documented in a trouble ticket database and submitted to the Remedy™ trouble ticket database. At a regularly scheduled teleconference participants from EMD sustaining engineering and the DAACs review the impact, assign an initial priority, and assign problems for investigation. A more detailed description of these activities can be found in the relevant Project Instructions (refer to the EMD Process Assets Library).

Configuration Change Adjudication

The Deployment IPT includes the SCDV CCB chairperson and members from EMD Operations Deployment and DAACs. Using the results of the NCR (Non-Conformance Report) Prioritization Team, the IPT tracks NCR work-off and testing activity. The IPT conducts the PSR for patches and reviews the patches with the receiving SMC and DAAC. The PSR includes a description of the system changes and associated documentation changes including the test results (as found during testing in the EDF facility). The operations procedure changes, configuration baseline changes (including database changes), and installation instructions are also part of the PSR.

CM delivers the patch to the CCR designated sites using the ClearCase™ Delivery Tool. At this point, baseline changes are reflected in the EMD Baseline as delivered products.

For problems that require perfective changes to the operational baseline, the SCDV CCB reviews the CCR. If a perfective-change CCR is approved by the SCDV CCB, ECO and DCN are recorded and assigned to accomplish development, deployment and installation of the change. The SCDV CCB also statuses and reports the progress of the CCR/ECO/DCN closure actions.

If any proposed change results in a cost and/or schedule impact exceeding the SCDV CCB level of authority, or involves a change to System Level 3 requirements or external interfaces, the Class 1 CCR is forwarded to the EMD CCB for adjudication.

Development, Deployment and Installation of Changes

The EMD sustaining engineering organization develops custom software, procures COTS software, proposes changes, and tests the changes within the current operational baselined configuration at the EDF test facility. In addition to coordinating patch content and schedule as members of the Deployment IPT, the EMD sustaining engineering organization provides the installation instructions, configuration baseline changes, and requirements/design documentation changes.

CSG ships the physical media, or delivers the files using the ClearCase™ Delivery Tool to the designated sites. Custom code surveillance establishes the insertion times of the delivered custom code into OPS mode, and reflects the delivery and insertion within the Custom Code Tracking page.

DAAC Unique Extensions (DUEs)

The DAACs may identify and develop site-unique changes to their DAAC baselines in the form of DAAC Unique Extensions (DUEs) and provide required information to the SCDV CCB via CCR. A DUE may include hardware additions and re-configurations, operating system re-configurations, database modifications, COTS software configuration changes, and COTS software additions/reallocations to the baseline. The SCDV CCB reviews the DUEs for potential impact to the EMD Configuration Baseline System and for potential inclusion in the EMD Baseline System. If warranted, the SCDV CCB authorizes inclusion in the EMD Configuration Baseline System. DUEs that are recommended for baseline inclusion, but are thought to be out of scope, are forwarded to the ESDIS CCB for resolution.

Software Configuration Management (SCM)

Software Configuration Management (SCM) uses the CCR process to release COTS and custom software to the sites. A custom software component can only change with the issuance of an NCR using the Distributed Defect Tracking System (DDTS™) tool. The base upon which the change is made is the custom code design baseline, which is maintained by the ClearCase™ software configuration management tool. An NCR may originate in several ways, but the two primary methods are from the conversion of a DAAC Trouble Ticket (Remedy™), or an in-house observation from within of the VATC, PVC, or EDF lab.

Upon problem resolution, a Developer generates a Merge Form using STTS, and attends a daily merge meeting. Upon approval, the code is merged into a specified baseline. Once all merges are in, the ClearCase™ system baseline is ready for a build.

System builds are controlled by a UNIX® cron job. A cron job is a command string entry that executes automatically at a given time. The cron job needs to state the baselines that are targeted for rebuild. Once reprogrammed, the distributed and automated builds execute without any manual intervention, producing build products. System level builds are performed twice per day. A NightlyBuild web status page shows any build errors.

Build products and files are then selected, with a focus on those subsystem components that were affected by the just-merged code. The selections are conveyed by email to CSG. Upon receipt,

the Delivery Tool GUI is used to select the baseline, and assemble the file set stated in the email. The file sets may contain the entire build (a “Drop”), a set of packages (Patch or TE), and/or specific discrete files (Patch or TE).

The Delivery Tool automatically transmits the prepared files into the EDF, PVC, and VATC, for subsequent installation at the discretion of the site. No CCR is required for in-house transmittals. After installation, the files are tested to ensure that the NCRs for which they were merged are addressed.

A CCR can be submitted to the CCB for approval. A Delivery Notice is then issued, and upon receipt of the notice by CSG, the specified software is transmitted to the CCR specified sites (targets). All custom code deliveries are logged on the Custom Code Tracking page. The tracking page also includes certain dates, as well as NCRs, CCRs, and comprehensive file lists for each delivery. The Delivery Tool also notifies the sites’ configuration management personnel of the deliveries.

Once the CCR targets have received the code, they can install it into any mode according to site processes. The operating modes at all the DAACs are OPS and TS1, with some sites having TS2, TS3, TS4, etc.

Should any further software performance problems arise, the remote site(s) initiate(s) a Remedy™ trouble ticket, or a DDTS™ NCR is generated in-house and the cycle repeats.

Engineering Software Delivery

The Engineering Software Delivery Daemon is used to provide immediate fixes to any site as quickly as possible, without compromising the integrity of the custom code baseline. Insertion of the software into any mode is at the DAACs’ discretion. A tracking page documents all engineering software deliveries, and can be seen by everyone at the following URL:

http://cmdm-ldo.raytheon.com/baseline/CUSTOM_SOFTWARE/ESDeliveryTracking.html

Custom Code and COTS Software Surveillance

In order to provide configuration status metrics for the EMD program, automated surveillance methods are used. Direct interrogations of managed hosts, located at Landover and at the DAACs, are performed on a regular basis. The frequency of each type of interrogation is configurable. Currently, custom code interrogations are performed daily across all modes on all hosts at all sites. COTS software interrogations are performed on a weekly basis, as well as kernel operating system parameters and operating system patches interrogations.

The information is posted on both EMD Baseline Information System (EBIS) web servers. (Refer to **EMD Baseline Information System** under the **Software Configuration Management Tools** section of this lesson.) This “As-Built” data provides near real-time visibility of custom software files, and shows which CCRs have not been implemented.

Remedy™ ILM File Routing

Remedy™ COTS software is used for license management, property management, and maintenance. In support of these functions, CSG scripts are executed to export and import the files that are necessary for keeping enterprise accountability. The execution of the scripts is controlled by a CSG UNIX® cron job function. A drop down menu from within the ClearCase™ Delivery Tool allows the process to be stopped and started. The times of execution can also be modified.

Software Configuration Management Tools

A suite of Configuration Management tools is used to manage the information for the EMD program. Some of the tools are COTS software, some are enhanced COTS software, and some are entirely custom software.

Remedy™ Trouble Ticketing

Trouble tickets are created to electronically convey a description of a problem, an unresolved operational problem, or a question discovered at one or more DAAC sites. Trouble tickets are managed within the Remedy™ COTS software application. Remedy™ stores, maintains, and facilitates tracking of trouble tickets. A Problem Review Board (PRB) meets daily to review new, deferred, and aged trouble tickets. Non-conformance reports (NCRs) are generated into the Landover Distributed Defect Tracking System (DDTS™) to enable the original trouble ticket to be worked.

Distributed Defect Tracking System (DDTS™)

The DDTS™ COTS software product is used for the generation, tracking, and resolution of Non-conformance reports (NCRs). Software Configuration Management relies heavily on DDTS™'s ability to relate NCR numbers to software problems. DDTS™ has been configured for the EMD program.

Software Turnover Tracking System (STTS)

This custom tool is used as the merge interface to the system baselines. NCRs are required entries for STTS merge forms. STTS is a custom software utility that was designed and implemented on the ECS contract (NAS5-60000). By relating NCRs and specific custom software files within merge forms, STTS provides the functional bridge between the DDTS™ tool and the ClearCase™ tool.

ClearCase™ Software Configuration Management System (ClearCase™)

Development and CSG use the ClearCase™ tool and well-established configuration management processes to provide support for multiple custom software baselines. This enables development of new capabilities in parallel with the delivery of small incremental changes to the field.

Developers use ClearCase™ to maintain multiple private views of the software, enforce module checkout and check-in rules, and manage the process of merging changes. When a developer

completes a fix in his or her view, he or she submits a Merge Request using the custom STTS tool. This tool maintains merge and build requests, routes them to appropriate reviewers, and tracks their completion. The lead engineer for the affected software subsystem reviews and approves the Merge Request, or directs the developer to make necessary changes. If a merge needs to be made to multiple baselines, a Merge Request is submitted for each baseline.

ClearCase™ Baseline Manager (BLM)

This Configuration Management tool provides efficient and automatic change management for specific Technical Documents that are accessible on EBIS. Fourteen Technical Documents, including the Hardware-Software Map (920-TDx-002), O/S Patches (920-TDx-014), and four 910 Series Technical Documents are managed using this tool. In addition, approximately 275 “where-used” reports are generated with each baseline update. This tool uses ClearCase™ Versioned Object Bases (VOBs) for data and script storage, and uses a customized GUI and custom scripts. The tool provides all of the change visibility benefits inherent in the ClearCase™ tool.

EMD Change Manager (ECM)

The new EMD Change Management tool, which is based on Microsoft® Access2000®, will provide real time configuration management status accounting. Information reports will be accessible using any web browser. The new tool provides configuration status accounting and improved change visibility. The tool replaces the current CDMTS tool. All CCR fields are captured in the new database design, as well as the Engineering Change Order (ECO) line items and the Impact Signature sheet. Searches across any field are possible, with visibility of the CCR status as it progresses from the origination step, through the review steps, to the approval/disapproval step, to the ECO work-offs.

Proposal Assessment Board (PAB) Database

This tool will be used to facilitate the Modification Request function. Scope requests that are from ESDIS to be responded to by ROM or proposal will cause the creation of a System Enhancement Proposal (SEP). Formal requests that come in from ESDIS for new requirements or contract scope changes will be in the form of a Task Plan Request (TPR). All requests, including ROMS, SEPs, and TPRs will be managed through the Proposal Assessment Board. The PAB tool will use Microsoft® Access2000®.

Data Management Tool

The Data Management Tool will use Microsoft® Access2000®. It will manage the Data Management functions that CDMTS managed.

ClearCase™ Delivery Tool

The Delivery Tool is a custom tool that is used for the preparation and delivery of custom code software, as well as COTS software. The tool manages CD-ROM archiving of custom and COTS software.

Engineering Software Delivery Daemon

The Engineering Software Delivery process exists to ensure that rapid fixes can be made to configuration controlled hosts without compromising the custom code baseline. Complete change visibility is provided at the following URL:

http://cmdm-ldo.raytheon.com/baseline/CUSTOM_SOFTWARE/ESDeliveryTracking.html

Source Code Delivery Tool

This tool consists entirely of custom scripts. Its purpose is to deliver all EMD source files, object files, and libraries to the PVC. This tool accurately installs these files to support the debugger. Execution of the debugger allows developers to quickly resolve integration problems with the recently built code. Because the PVC is isolated from ClearCase™, the PVC hosts cannot directly access the ClearCase™ repositories.

Custom Code Installation Emulator

This tool generates an installation image of all custom code files for a particular Drop or Patch. It overlays any new releases onto the Real Time Delivered Custom Code Baseline technical documents, 920-TDx-019. The tool provides the information necessary to convey the expected files, file versions, file permissions, and files paths, dates, and authorizing CCRs, for every custom code file for every EMD host for OPS mode.

EMD Baseline Information System (EBIS)

The EMD Baseline Information System (EBIS) is used to convey the configuration states of all configurable items. All items managed within EBIS are versioned, using “Current” and “Previous” directories. EBIS is implemented with two physical web servers, **pete** and **cmdm**.

Server **pete** resides within the Landover firewall, and is not accessible to outside users of the Internet. Server **cmdm** resides outside the Landover firewall, and can be seen by anyone with Internet access. For security reasons, certain technical documents, such as those showing IP addresses and network diagrams, are only viewable internally on **pete**. More than 98% of all technical information is replicated to **cmdm**. The EBIS URLs are:

<http://pete.hitc.com/baseline/> (Internal EBIS web server)

<http://cmdm-ldo.raytheon.com/baseline/> (External EBIS web server)

Library Maintenance

The EMD program uses two distinct libraries. The first library is named the Document Center, and the second is named the COTS Software Library. The Data Management group maintains the Document Center, and the ClearCase™ Support Group of Configuration Management manages the COTS Software Library.

COTS Software Library

The COTS Software Library is used to maintain software media copies of all EMD COTS and custom software.

Configuration Identification

Configuration Identification consists of activities in the selection, creation, and specification of:

- Deliverable products.
- Internal work products.
- Acquired products.
- Tools.
- Physical and Functional Characteristics.

Configuration Identification also is the process of selecting, identifying, and preparing all of the documentation necessary to define the design of the system, as well as building, testing, and supporting the product through its life cycle. The purpose of configuration identification is to incrementally establish and maintain a definitive basis for control and status accounting throughout the life of a Configuration Item.

The EMD System Baseline Specification, 905-TDA-001, defines the configuration items for the EMD contract, including all technical documentation, commercial of the shelf (COTS) software, custom software, COTS hardware, operating systems (O/S) and O/S patches, databases, and their physical and functional attributes.

For purposes of configuration identification, certain criteria were used to determine the items to be managed. Configuration identification determination is complex for a system such as ECS, as there are literally millions of discrete items that comprise the system.

Control of all equipment and software modifications, including those required for the maintenance of the systems and those resulting from modification of system capabilities. Custom and COTS software modifications, as well as hardware modifications, are performed using the Configuration Change Request (CCR) process.

Several methods are used to track the file systems on each baselined EMD host. EMD first keeps track of the host's existence within the EBIS technical document 910-TDA-005. The host's function is managed by this document.

The next item that is tracked is the operating system and version. EMD uses six different operating systems amongst the hosts. The 910-TDA-003 technical document keeps track of all the EMD COTS software, including the operating systems, from vendors such as Sun® Microsystems, SGI, Red Hat®, IBM®, etc.

Operating systems are COTS software to the EMD program, but are custom code releases, with respect to the O/S vendors. The O/S vendors need to maintain their O/Ss, and do so with methods that are unique for each vendor. Sun® Microsystems uses O/S patches of the form

“101120-04”, while SGI uses an “SG0003715” format. Each O/S patch consists of one or more new versions of operating systems files that are overlaid onto the operating systems files. For the purpose of tracking the UNIX® file systems on Sun® hosts, the O/S patches are baselined, tracked, and audited. The 911-TDA-series technical documents and the 920-TDx-014 O/S Patch Maps are used to manage the O/S patches.

On top of each physical host’s Operating System and O/S patches is each host’s COTS software. The 920-TDx-002, Hardware-Software Map documents are used to manage the COTS products, versions, and installation paths. These reports comprise the COTS software design baseline, which shows all of the COTS software that must be installed on each EMD host. In line with the COTS products on these reports are the authorizing CCRs and Release Notes documents. The Release Notes documents, one per COTS product, generally, provide the installation instructions, which include any customization that must occur for the COTS software to run in the integrated environment. The CCR is provided for tracking purposes. It helps to resolve discrepancies between the design baseline and the “as-built” configurations.

The next layer consists of each host’s UNIX® kernel configuration parameters’ values. While most of these values are the default values from the original installation of the Operating Systems, they are tracked nonetheless. Some of these parameters need to be changed to non-default values, and these can be found in the 920-TDx-015 and 920-TDx-016 technical documents.

Finally, all custom software must be accounted. The 920-TDx-019 technical documents show the custom code files, checksum values, installation paths, and CCRs.

These software configuration identification methods ensure that from the system level all files are traceable to their origins. Origins may be O/S files, patched O/S files, COTS software executables, patched COTS software, or custom code scripts or executables, and their patches.

Configuration Status Accounting

Configuration Status Reports

Configuration Status Reports is an area that is being improved for the EMD program. The current CCR tool, CDMTS, is to be replaced by a more powerful tool, the ClearCase™ EMD Change Manager (ECM) tool. The CDMTS tool provides limited Configuration Status Accounting (CSA). The new web-based tool, ECM, is planned to provide the following items on servers **pete** and **cmdm**:

- On-line Engineering Change Orders.
- On-line attachments of all CCRs in process.
- Status accounting pages will allow a user to quickly view any CCR(s) of interest.
- The new tool will provide electronic signature capability.
- Status pages will also be continuously updated to show the CCRs that have been initiated, approved, deferred, rejected, and closed.

To Be Resolved (TBR)/To Be Determined (TBD) Reports

The 910-TDA-003, COTS S/W Version Baseline Report, tracks “TBD” information. This information has not yet been provided to CM. Discrepancy reports use color to indicate “TBR” information. *Yellow* is used for non-critical COTS software, and *red* is used for critical COTS software. If a critical COTS software is missing, then the product shows as *red*. The Operating System patch reports use *red* for missing and *gray* for “installed-but not-baselined”. In all cases, the *green* color is used to convey that the design baseline and the “as-built” are in agreement. These are the To Be Resolved reports, and are provided on both the Internal and External web sites on **pete** and **cmdm**, respectively. All of the report formats have been optimized to convey the most amount of information in the least amount of space. In HTML format, they are directly readable from web browsers without the use of Adobe® Acrobat reader.

As-Built Records Format, Content, and Process

Extensive use of automated scripts provide near real-time “as built” records. These records are provided on the EBIS web site under the “Interrogation” button. All reports are generated in html format, so that the web pages load quickly for the user.

Configuration Audits

Configuration auditing validates that all change control processes are functioning. Audits are conducted to verify that CCRs are being correctly executed for baseline Technical Documentation updates and host configuration changes. The audits compare the baseline Technical Documentation to the “as built” configurations of managed EMD hosts. Validation is accomplished by comparing what happens (as-built configurations) to what should have happened (approved CCRs). Discrepancies are noted and resolved.

Physical Configuration Audits

Physical Configuration Audits (PCAs) are formal assessments of the actual configurations of all baselined EMD hosts. Specific EBIS technical documents are used as audit references. There are two types of audits:

- **Software PCAs** compare the COTS software, custom software, O/S patches, and UNIX® kernel parameters of the actual hosts to the EBIS design baseline.
- **Hardware PCAs** compare the physical hardware to the EBIS design baseline, and covers items such as memory, disks, and host configuration.

Software PCA

Automated interrogation scripts provide the “as built” configurations in support of Software PCAs. Discrepancy reports are generated for each host at each site, and summary reports are generated. Formal summaries are posted at URLs specified in the process and work instructions.

Software PCAs are conducted for each baselined EMD host, and include COTS software, Operating System (O/S) patches, custom code, and UNIX® kernel parameters. Each attribute is

checked for presence or absence, correct/incorrect version, and correct/incorrect installed path, or correct/incorrect value. Automatically generated discrepancy reports are analyzed and corrective actions are taken. The stated purposes of the software PCAs are to ensure that the design baseline is accurately reflected in the actual systems, and to ensure that approved CCRs that affect COTS software, O/S patches, custom code, and UNIX® Kernel Parameters, have been executed.

In conjunction with the 920-TDx-002, Hardware-Software Map, documents, complete change traceability is provided. By looking at a particular COTS software product for a specific host in the 920-TDx-002 document, in-line entries for the authorizing CCR and the applicable Release Notes information are found.

Hardware PCA

Hardware PCAs ensure that the hosts' hardware configurations are in accordance with the hardware design documentation. By comparing the systems' floor configurations to the design baseline, the integrity of the design baseline and change control processes are maintained.

Functional Configuration Audits

Functional Configuration Audits (FCAs) are conducted to assure that each EMD product meets its specified performance requirements to the extent that can be determined by testing. The Quality Assurance Office conducts the FCA with CM assistance.

Audit Reports

Audit reports are presented at Consent to Ship Reviews (CSRs) and/or Release Status Reviews (RSR) as scheduled. Audit reports summarize the configuration integrity of the design baseline, "as built" configurations, as well as change control processes, for software and hardware.

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Configuration Control Boards (CCBs)

Configuration Control Boards

ESDIS/EMD CM consists of a hierarchy of boards that control the configuration. The hierarchical organization of ESDIS configuration control boards is shown in Figure 1.

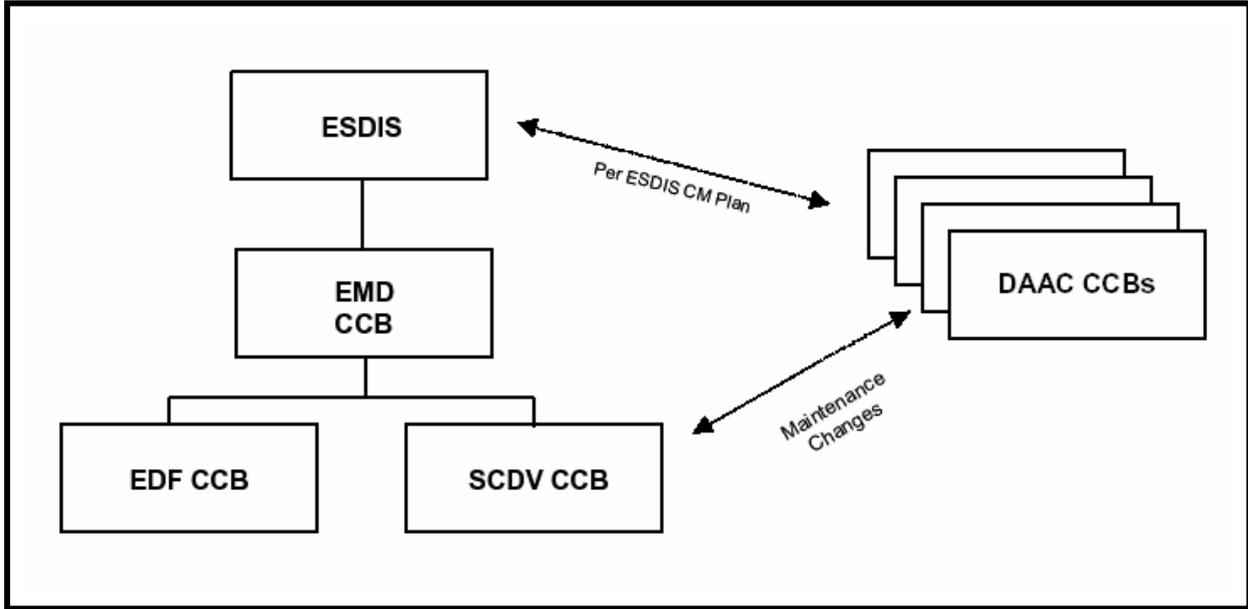


Figure 1. Configuration Control Boards

ESDIS CCB

The ESDIS CCB is a Level 2 board and is responsible for:

- Interfacing with higher-level boards for changes that affect Level 1 requirements.
- Controlling Level 2 requirements.
- Approving specified documentation.
- Procurements.

Specific responsibilities of this board and details of the ESDIS Change Control process can be found in 423-10-21, Earth Science Data and Information System Project Configuration Management Procedures.

EMD CCB

The EMD CCB is responsible for establishing and managing the configured baselines at the project level.

Additional responsibilities of this board are:

- Overall system Life Cycle responsibility.
- Delegation and allocation of authority and responsibility to subordinate CCBs.
- Preliminary IRD, internal and external ICD, inter-segment ICD and any other non-release specific documents.
- All Class I CCR (enhancements with cost/schedule impact).
- All Cross-Release or Cross-Segment Class II CCR.
- Requirements baseline identifications for both internal and customer-driven milestones.
- All purchases with project funds that are within the contractual baseline.

EDF (Infrastructure) CCB

The EDF (Infrastructure) CCB is responsible for establishing and managing development, to include:

- Controlling developmental configurations.
- Recommending EDF procurements to the EMD CCB.
- Approving all non-procurement internal CCRs to change the EDF configuration, COTS hardware/software, networks, facilities, and related procedures.
- Controlling all EDF documents.
- Installation/removal of all evaluation COTS in the EDF.

SCDV CCB

The Science and Development (SCDV) CCB has the authority and responsibility for controlling system releases. For the EMD program, the ECS M&O CCB and ECS SCDV CCB were consolidated into a new EMD SCDV CCB. All ECS M&O CCB roles are now added to the EMD SCDV CCB. The EMD SCDV CCB meets once per week to consider:

- Changing the configurations of the EDF test environments (VATC and/or PVC), and/or the DAACs.
- Authorizing segment turnovers and/or toolkit distribution and migration.
- Approving Class II release-specific changes.
- Approving release-specific CDRL documents and others.

- Approving, at the Chair’s option, drafts (including EMD CCB-controlled documents), white papers, and technical papers.
- Approving system Technical Baseline Document changes.
- Approving distributions of system software and hardware outside of the ECS Development Facility for use within the EMD project. (All other distributions require Raytheon Contract Office authorization.)
- Recommending to the EMD CCB procurements that are within the contractual baseline.
- Approving minor enhancement (“perfective”) requests to the operational system.
- Reviewing DAAC-sponsored, DAAC-unique extensions (DUEs) to the operational system. The DUEs will be reviewed for potential impact to ECS systems and for consideration of future inclusion into the system.
- Forwarding major enhancement requests to the appropriate higher-level board.
- Assuring Requirements Traceability of:
 - Level 3 Requirements to IRD mapping.
 - Traceability of L3s to L4s.
 - Test Information.
 - Mapping of Acceptance Tests to Requirements.

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Configuration Change Requests (CCRs)

All requests for change are documented using a CCR. A CCR contains the problem description, operations impact, recommended priority, proposed configuration change and/or solution, sites affected, and lists the CI and affected documentation. CCRs are generated against the database, document/drawing or software/hardware product affected by the proposed change. These requests are submitted to the appropriate CCB for consideration as described in this plan. The CCR also is used for deviations and waivers.

Change Classes

Class I and Class II changes are defined in the ESDIS Project Configuration Management Procedures (423-10-21), and are determined by the technical or contractual content of the change.

Class I change is an out-of-contract scope change that affects the form, fit, or function of the ESDIS Project CCB controlled items in one or more of the following ways:

- The technical baselines and the System Specification.
- Configuration Items (CI) as specified in the contract.
 - Technical requirements.
- Non-technical contractual provisions, to include:
 - Contract cost and fee.
 - Schedules.
 - Deliverables.
- Other factors, to include:
 - Government-furnished equipment (GFE).
 - Compatibility with support equipment and training devices/equipment.
 - Configuration to the extent that retrofit action would be taken.

Class II change is an in-scope contract change that does not fall within the definition of a Class I change.

Changes that affect the ECS development facility (EDF) are classified as IN. These CCRs are used by Infrastructure to track internal changes and assign work orders.

CCR Submissions

Changes are implemented only after completion and approval of a change request generated against the product's technical documentation. All changes indicate a “need date” and are only

approved when it is determined that necessary resources are in place to implement the change by the need date.

All change requests are submitted to the appropriate CCB administrator using the CCR and an attached change definition package defining the proposed changes to the applicable drawings or specifications. The organization originating the change request is responsible for providing the information required on the CCR Form and for defining the proposed changes to affected documentation.

CCRs are distributed by the CCB administrator and reviewed for technical, cost, and schedule impact on a scheduled basis by the appropriate CCB. Special CCB meetings are scheduled as required to consider urgent or emergency change requests. Impacts, including those from subcontractors, are reviewed at the CCB meeting and CCB Chairman has final approval/disapproval authority. For Class II changes, the CCB Chairman's approval constitutes authorization to implement the change.

The EMD CCB has sole authority for approval and submittal of Class I changes. Upon approval by the EMD CCB, the CCR is forwarded to the ESDIS CCB as a recommendation. Approval by the ESDIS CCB does not constitute authorization for the contractor to implement changes. The contractor must receive contractual direction to implement any Class I change.

CCB Proceedings

The new EMD Change Manager CCR tool allows efficient evolution and approvals for new CCRs. The tool provides reports to support the CCB meetings, including the generation of the components that comprise the agenda. The CCB Chairman may assign additional actions required to close this CCR as part of board proceedings. All CCB direction is recorded as a part of CCB proceedings. Engineering Change Orders (ECOs) and Document Change Notices (DCNs) are employed to record board direction.

Implementation of CCB Direction

The following paragraphs summarize the principal CM-related forms and documents that are used in the EMD CM process. Forms and other process documentation are revised as needed to support continuous process improvement.

Document Change Notices and Histories

All CCB-approved changes and revisions to configuration-controlled documentation are implemented by Document Change Notices (DCN). As DCNs are incorporated into documents a history log is updated in the front of the document to define the current configuration of the document in accordance with NASA Specification 500-TIP-2110. DCNs are issued via a transmittal memo.

Document Revisions

Revisions include any changes necessary to bring the document up to date, incorporation of DCN, or other actions specified by the CCB. Revisions are forwarded to the CCB along with

details on changes made to the baselined document as a result of the revision. Once approved by the CCB, the document is posted to the EMD baseline.

Document Action Tracking

Open CCRs and any action assigned by the CCB (to include ECO and DCN) are tracked by Configuration Change Control using a suspense date. The CCB routinely reviews these to assure actions are completed by the required date and are closed appropriately.

Configuration Change Documentation

CM regularly records information on CCBs, CCR dispositions, action items, and Engineering Change Orders (ECOs) use the new EMD Electronic CCR Tool.

Electronic CCRs (beginning in the year 2005) can be viewed on the EBIS website. (Refer to the **EMD Baseline Information System** topic in the **Changes to the Baseline** section of this lesson.)

Configuration Control Support Activities

Rough Order of Magnitude (ROM) Board

EMD receives requests from ESDIS for ROM impact analyses of ESDIS CCR. Once received these are directed to the ROM Manager for processing. CM provides administrative support to the board and ensures that all actions are recorded, assigned, and dispositioned.

Deployment Integrated Product Team (IPT)

The IPT tracks NCR work-off, testing activity; and prioritizes work that must be accomplished to test and verify the NCR. The IPT proposes Patch/Release contents and schedules to the appropriate CCB.

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Software Baselines and Changes

This section describes the delivery of software from the Landover facility to a remote site (a DAAC), and subsequent installation of the software onto target hosts, in accordance with configuration management controlled processes.

The EMD sustaining engineering organization develops custom software, procures COTS software, proposes changes, and tests the changes within the current operational baselined configuration at the EDF test facility. In addition to coordinating patch content and schedule as members of the Deployment IPT, the EMD sustaining engineering organization provides the installation instructions, configuration baseline changes, and requirements/design documentation changes.

CSG ships the physical media, or delivers the files using the ClearCase™ Delivery Tool to the designated sites. (Electronic delivery is performed via secure copy (scp) to target DAACs.) Custom code surveillance establishes the insertion times of the delivered custom code into OPS mode, and reflects the delivery and insertion within the Custom Code Tracking page.

The Delivery Tool is a custom ClearCase™ tool that was developed to ensure accurate and controlled release of software. Software installation is controlled by each site's Configuration Change Board (CCB). EMD CSG prepares and releases the software to the DAACs, but the DAACs control the installation of the software into their operational modes.

The DAAC CCB approves the installation of the delivered software into a DAAC Operational Baseline (e.g., a mode, "OPS", "TS1", etc.). The software is installed in accordance with CCR installation instructions, and in accordance with local DAAC procedures/processes.

Configuration Parameters and the Configuration Registry

There are many configurable parameters associated with system software. Some of them are set by default to values that may be appropriate for most operating conditions. Others may be set to values that may or may not be appropriate for the requirements of operations at a particular DAAC. Some parameters may be changed using the custom-developed Graphical User Interfaces (GUIs) specifically designed to monitor and control functions related to particular subsystems. Others may require changes to a configuration file (i.e., edit the file using UNIX vi editor) or database (typically done by the Database Administrator). **Note: Before changing any configuration parameter, make certain either that it is not under configuration control or that you have obtained any necessary approval specified in local Configuration Management policies and procedures.**

Configuration Registry

System configuration parameters are manageable by a *Configuration Registry*. The Configuration Registry Server provides a single interface to retrieve configuration attribute-value pairs for system servers from the Configuration Registry Database, via a Sybase Server.

The Configuration Registry Server maintains an internal representation of the tree in which configuration attribute-value pairs are stored. General configuration parameters used by many servers are stored in higher nodes in the tree. Parameters specific to a single system server are contained in the leaf nodes of the tree. A script tool has been provided for loading the Configuration Registry database from data in configuration files. This loading is a one-time event to populate the Registry database with the information contained in .CFG files (future releases of the system will store additional information, perhaps from .ACFG and .PCFG files). Once the Configuration Registry is loaded, if the configuration files are moved or otherwise made inaccessible to the software, the software goes to the Configuration Registry to obtain needed configuration parameters. There is also a Configuration Registry GUI to view and edit configuration data in the database. Changes to the Configuration Registry typically are under the control of Configuration Management and the Database Administrator.

Figure 2 shows the Configuration Registry login window and GUI. Data in the Registry database are stored hierarchically, sorted by hostnames. An application may have multiple entries, each under a different hostname where it runs. The GUI queries the database directly. The GUI shows the Attribute Tree on the left. It displays parameters and their values in the Attribute Listing on the right. It provides the operator with capability to create, read, update, and delete database entries. A click on a parameter name in the Attribute Listing launches a pop-up window, shown in Figure 3, permitting the operator to update or delete the parameter.

There is also a command-line query tool provided with the Configuration Registry. It was created to work with certain scripts (e.g., DSS CheckArchive, Rmesdt, Addestdt) and would not normally be used to view parameters.

Use the following procedure to launch the Configuration Registry GUI and display configuration parameters.

Display Parameters using the Configuration Registry GUI

- 1 On workstation **x0dms##**, at the UNIX prompt in a terminal window, type **/usr/ecs/mode/CUSTOM/utilities/EcCsRegistryGUIStart mode &** at a UNIX command prompt and then press the **Return/Enter** key (where *mode* is likely to be **TS1**, **TS2**, or **OPS**).
 - NOTE: The *x* in the workstation name will be a letter designating your site: **g** = GSFC, **m** = SMC, **l** = LaRC, **e** = LP DAAC, **n** = NSIDC, **o** = ORNL, **a** = ASF, **j** = JPL; the **##** will be an identifying two-digit number (e.g., **g0dms03** indicates a data management subsystem workstation at GSFC). If you access the workstation through a secure shell remote login (ssh), you must enter **setenv DISPLAY <local_workstation IP address>:0.0** prior to the ssh before entering the command after the ssh. The **<ipaddress>** is the ip address of **x0mss##**, and **xterm** is required when entering this command on a Sun terminal.

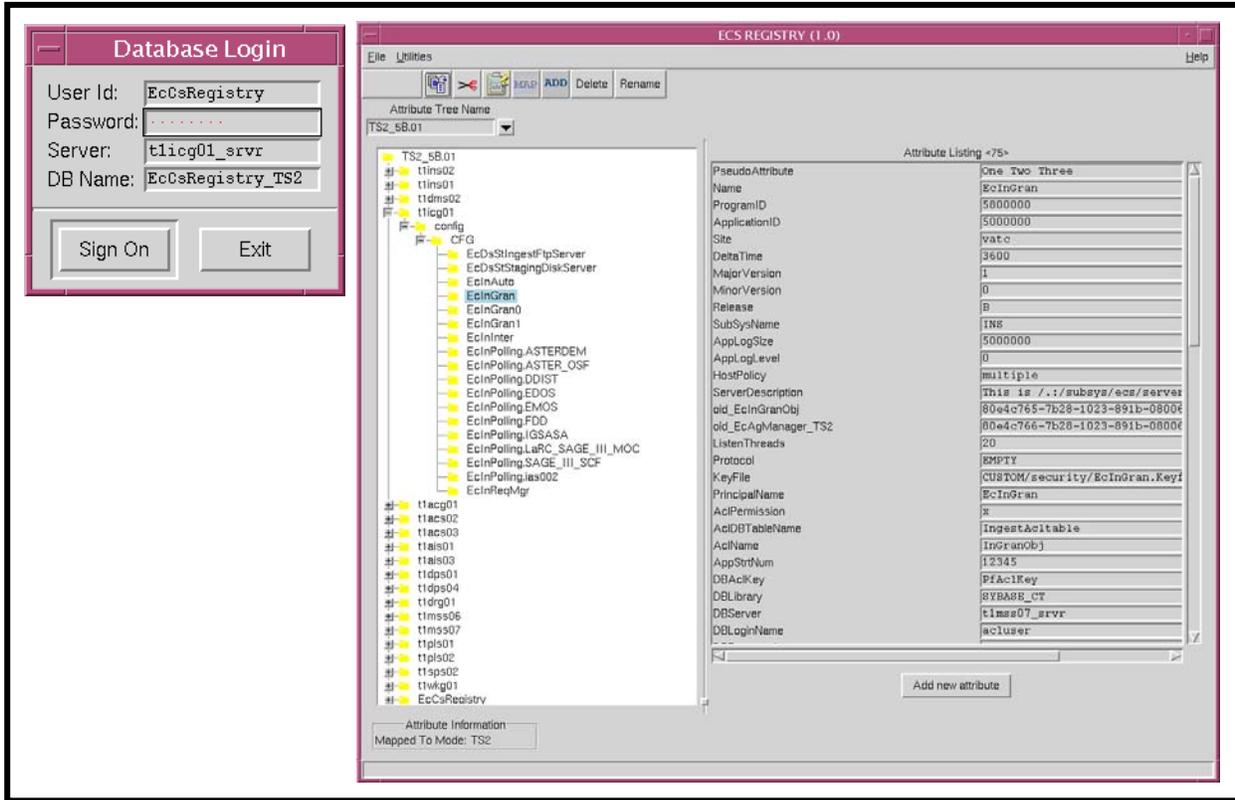


Figure 2. Configuration Registry Login Window and GUI

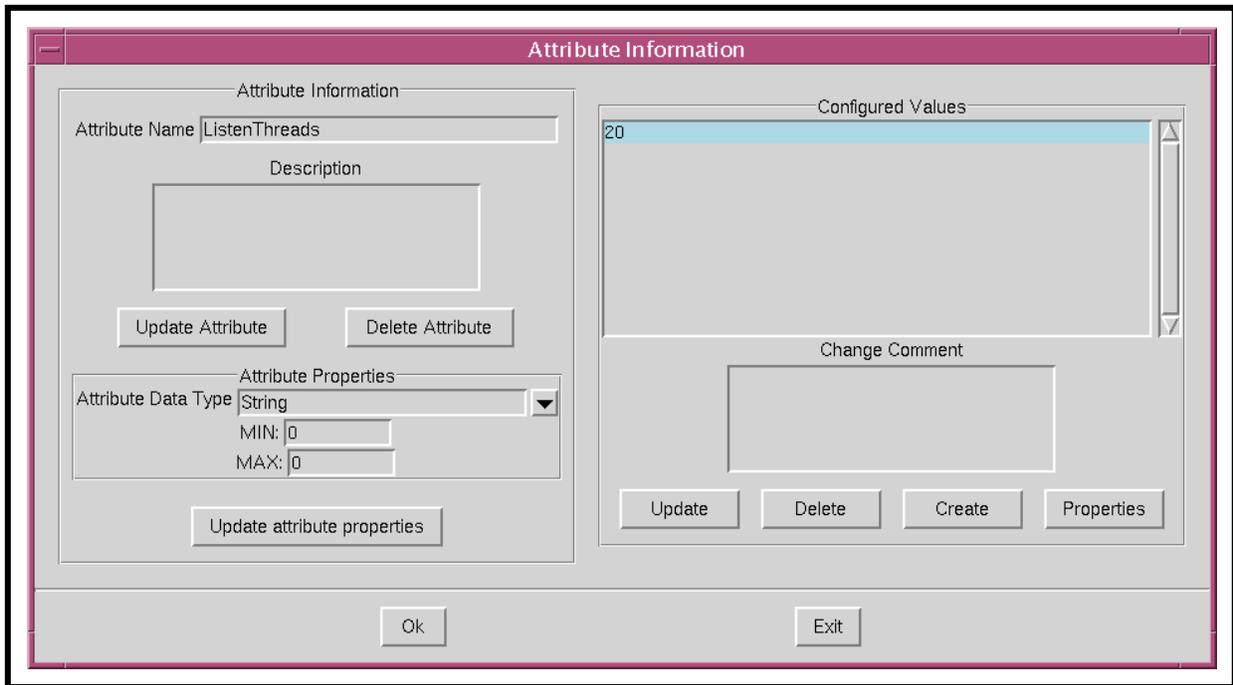


Figure 3. Configuration Registry Attributes Pop-Up Window

- The Database Login window is displayed with entries filled in for **User Id:** (e.g., **EcCsRegistry**), **Server:** (e.g., **x0icg02_srvr**), and **DB Name:** (e.g., **EcCsRegistry_mode**).
- 2 In the Database Login window click in the **Password:** field and type the password.
 - The typed password is not displayed (dots are displayed in place of the password).
 - 3 Click on the **Sign On** button.
 - The Database Login window is closed and the Configuration Registry GUI is displayed.
 - 4 On the tree showing system hosts displayed on the left side of the GUI, click on the "+" sign next to one of the hosts for which parameters are to be displayed.
 - The tree displays a **config** branch.
 - 5 Click on the "+" next to **config**.
 - The tree displays a **CFG** branch.
 - 6 Click on the "+" next to **CFG**.
 - The tree displays the computer software components for the selected host.

- 7 Click on one of the listed components (or its folder icon).
 - The **Attribute Listing** field displays the configuration parameters associated with the selected component. If there are a large number of parameters, the right side of the window will have a scroll bar that may be used to scroll down the list.
 - 8 Click on one of the listed parameters.
 - The **Attribute Information** pop-up window for the selected parameter is displayed, showing detailed information concerning the parameter.
 - If you are logged in with an account authorized with appropriate permissions, the **Attribute Information** window permits changing or deleting the parameter.
 - 9 To exit from the Configuration Registry GUI, follow menu path **File→Exit**.
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Changes to Hardware Baselines

Changes to the hardware baselines require CCB action under the following types of circumstances:

- *A COTS hardware repair that requires a CCR* -- a COTS hardware problem that is repaired, under emergency conditions and with the approval of the site manager, with a part that does not conform to the baseline (e.g., timely repair is essential and the only spare part available is a later version) requires a CCR to document the configuration change and the authority for the change.
- *A system enhancement* – any change in hardware configuration that occurs in a new release, or as an upgrade, requires a CCR.

Hardware Installation

Repair with a part of same make, model, version may be made by the vendor's maintenance technician; the Maintenance Engineer simply records the action and enters the serial number of the new part in the property management system.

If no spare of the baseline make, model, and version is available to make a timely repair for a system that must be returned to service immediately, but a workable part is available (e.g., a later version), the site manager may authorize that part to be used for repair if tests conclude that it works properly. Nevertheless, this constitutes a change that requires the following CM actions:

- Preparation of a CCR to document the change.
- Review/approval by the site CCB.
- Review by EMD/ESDIS to assess impacts/applicability to other sites.
- Provision of controlled document updates to Document Maintenance and entry into CM.
- CM system updates (e.g., baseline, inventory) to reflect the approved change.
- Audits (i.e., FCA/PCA) supported as described previously.

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Changes to the Baseline

Changes to configuration items typically require use of several software tools for their management, implementation, and documentation. This subsection provides a brief review of the role of the Management Subfunction Trouble Ticket software in baseline changes, and then briefly addresses the use of two additional tools used primarily at the development facility:

- The Baseline Manager (BLM)– a ClearCase application for maintaining data defining the system baseline and recording changes to that baseline.
- The Inventory/Logistical Management (ILM) tool – a Remedy application for maintaining records related to inventory changes (e.g., item identification data, such as serial numbers, part numbers, manufacturers, vendors, or other data).

Management Subfunction and Trouble Ticket System

You will no doubt remember that the impetus for a change may often be a system event that results in a Trouble Ticket. Many changes involve the management subfunction software. Specifically, the management software includes the Trouble Ticket System (TTS), which is a tool used at the DAACs, SMC, and EOC to record and report problems with the system. Most of the problems encountered are fixed locally, but some problems involve system-level issues. For those, the EMD Problem Review Board (PRB) (which hosts a daily teleconference, known as the PRB Telecon) may use a telecon to discuss the issues. Problems that may have such system-level implications are those that may be related to groups of trouble tickets (TTs), that may affect more than a single site, that must be referred to the ESDIS Project Office and EMD Sustaining Engineering, or that require coordination for multi-site change implementation. The teleconference, with members from EMD sustaining engineering and the DAACs, review the impact, assign an initial priority, and assign the problems for investigation. A more detailed description of these activities can be found in the relevant project instructions (PIs).

Baseline and Inventory Management: Processes

The EMD Project has BLM and ILM tools to assist in documenting changes to the baseline and inventory, and to maintain a historical record of those changes. The BLM tools are used at the ECS Development Facility (EDF) and/or the Systems Monitoring Center (SMC) function to maintain system-level records and site-level records; baseline reports are accessible at the operational sites. The sustaining engineering staffs at the DAACs, EOS Operations Center, and the SMC use ILM tools to maintain records that describe all inventory items, as well as their Equipment Inventory Number (EIN) structures, repair histories, and locations.

Baseline Terms and Concepts

Baseline management is a process to identify and control baselined versions of hardware and software, to provide a standard configuration of systems throughout all sites, and allow unique

site-configured systems and baselines. It identifies interdependencies between hardware and software items, and permits maintenance of a complete history of baseline changes throughout the life of the project. For EMD baseline management and BLM tools, certain terms and concepts are key to understanding how data on the system baseline are stored and tracked.

- Control Item* – any EMD item under version control by Configuration Management.
- Configuration Item* – an aggregation of hardware, firmware, software, or any discrete component or portion, which satisfies an end-user function and is designated for configuration control.
- Baseline* – a configuration identification document or set of such documents formally designated by the Government at a specific time during the life cycle of a configuration item (CI).
- Configured Article* – a control item reportable as part of the Configured Articles List (CAL).
- CIL* – a Configuration Items List (CIL) identifies the approved set of CIs that are subject to CM requirements and procedures.
- CAL* – a Configured Articles List (CAL) describes all CIs, critical item hardware and software, and supporting documentation by which the exact configuration definition of the hardware and software can be determined.

Additional terms, some of which address specific entries in the BLM tool, further define how data on the system baseline items and structure are tracked.

- Assembly* – an item made up of other items.
- Bill of Material* – the list of items that comprise an assembly.
- Product Structure* – the parent-child pairings that define the bill of material for an assembly; each product structure record specifies the effective dates and quantities for a single component of a parent for each engineering change.
- Active Date* – the date a component becomes effective in an assembly's bill of material. This date is the CCR approval date.
- Inactive Date* – the date a component is no longer effective in an assembly's bill of material. This date is when a new CCR displaces or affects the item.
- Engineering Change* – a mechanism for grouping, reporting, and controlling product changes collectively
- Revision* – the sequence number of a product structure change to an assembly; it signifies a change to the configuration of an assembly that does not alter its form, fit, or function.

Implementation Status – a record describing the deployment of a control item to a site and the current state and associated date of its implementation; each control item has one record for each site to which it is deployed.

Exporting Data – creating a formatted file or records extracted from the BLM database; control item engineering change, product structure, and interdependency records may be extracted and sent to other application software at any site.

Importing Data – loading BLM data from a formatted file.

At the lowest level, the baseline is composed of configured articles that are the specific types of items that make up EMD and are tracked using the BLM tool. It is important to recognize, however, that we impose a conceptual structure on those configured articles to help us think about the system. In fact, it is possible to conceptualize the structure of the system in a number of different ways, and we may select a different conceptual structure based on the requirements of the situation. The EMD baseline management approach and the BLM tool permit recording and tracking these different conceptual baselines, which can be related to the same records of the configured articles.

For example, system designers may conceptualize the system in terms that will help them track subsystems and the configuration items for which each subsystem team is responsible. This may produce a baseline structured according to a design view, such as that illustrated in Figure 4.

At an operations site, the concept reflected in the upper layers of the Design View baseline structure may not be particularly useful. Although the same configured articles are involved, it may be desirable, for instance, to track items from the viewpoint of network administration. The resulting baseline product structure may reflect that shown in Figure 5.

Even if an operations site is to view EMD product structure as composed of subsystems, it is likely that the concept of CIs will be of little use. Instead, the site is likely to be focused on what hosts make up the subsystems. Therefore, the subsystem view at an operations site may be similar to that illustrated in Figure 6.

The Baseline Manager database implemented at the EMD Development Facility reflects EMD-developed product structures, and site personnel may not normally need all the data necessary to define these product structures. Instead, BLM tasks are likely to be limited to areas such as noting system changes, perhaps in the context of site-unique requirements and data. However, an understanding of the different ways of conceptualizing the system will help in interpreting baseline data reflected in the BLM.

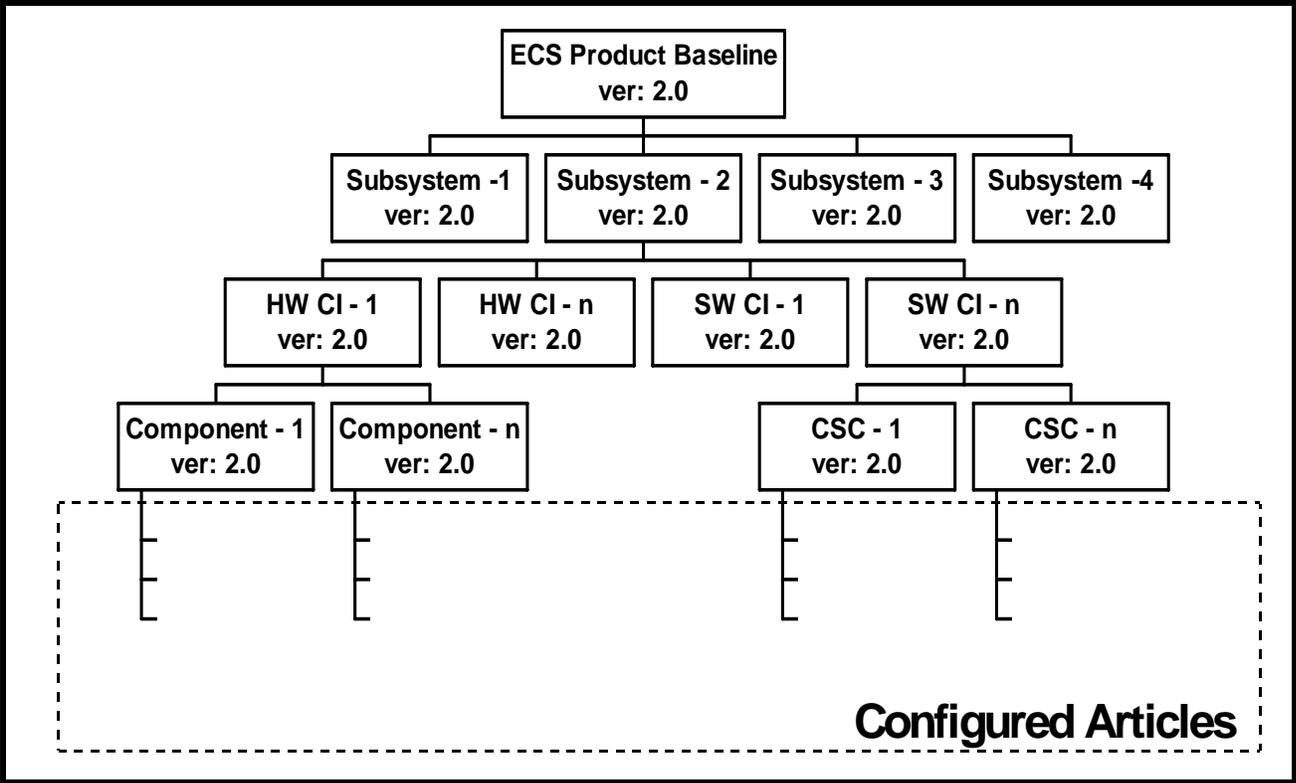


Figure 4. ECS Baseline Concept from a Design (CIL/CAL) View

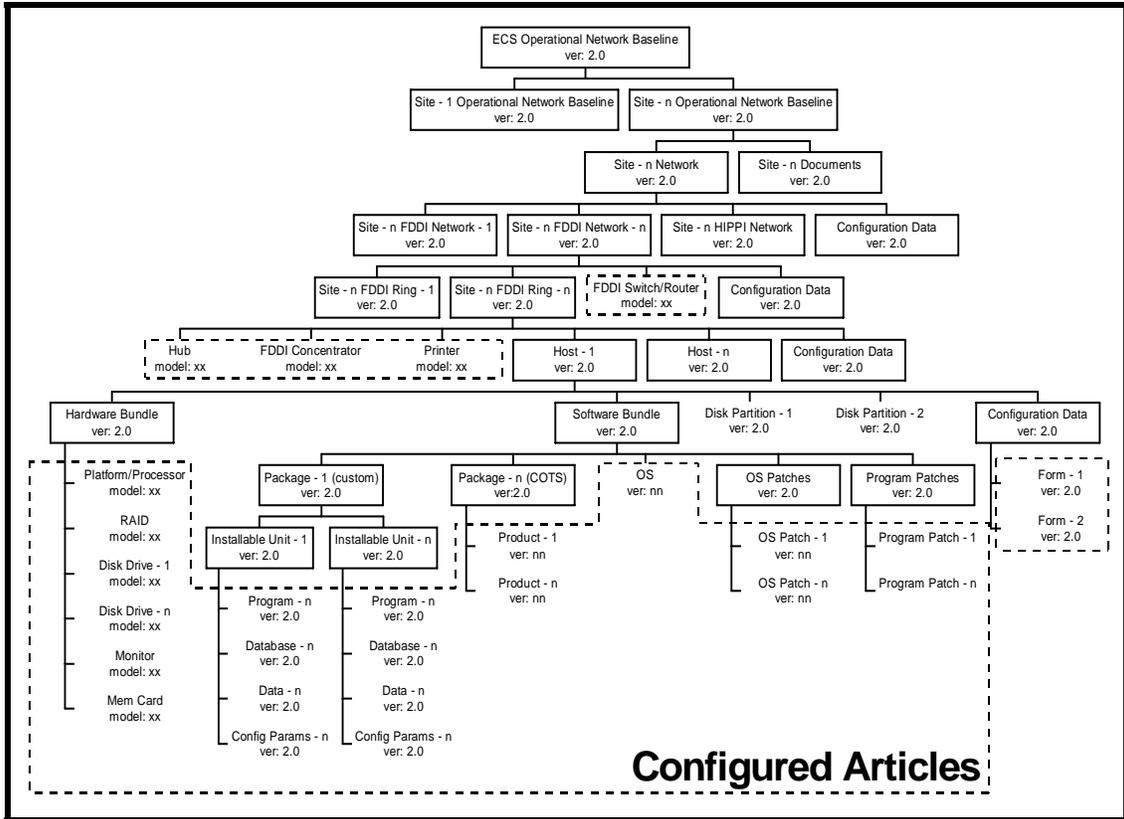


Figure 5. ECS Baseline Concept from an Operational (Network) View

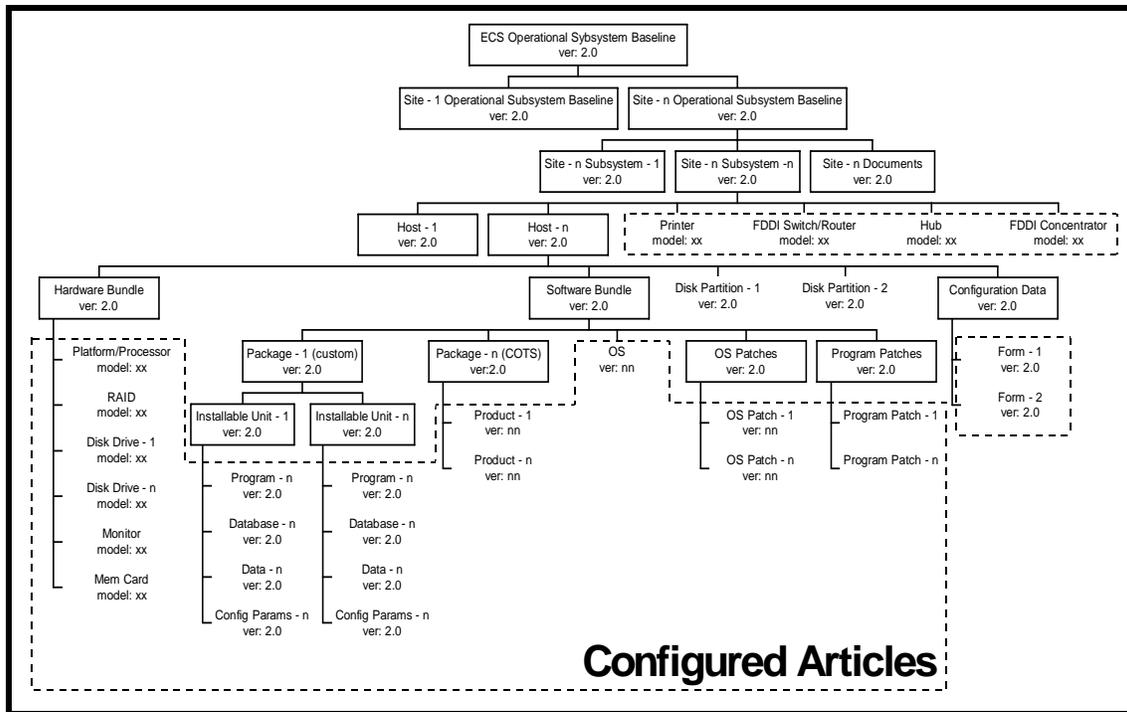


Figure 6. ECS Baseline Concept from an Operational (Subsystem) View

Baseline and Inventory Management: Tools

The Baseline Manager (BLM) tool is an application of *ClearCase*, and the Inventory/Logistical Management (ILM) tool is an application of *Remedy*. The BLM tool provides access to functions for maintaining control item and bill of material information. The ILM tool provides access to functions including entry and management of EIN (Equipment Identification Number) information and management of the EIN structure for the EMD inventory.

The BLM manages the COTS software, operating system patches, and COTS software patch baselines. The BLM records, including information on all scripts, data, and GUIs, are maintained and managed at the EDF using *ClearCase*. The BLM tool produces some of the 910/920 Technical Document reports, with automated posting to the EMD Baseline Information System (EBIS) and replication to the mirror site (<http://cmdm-ldo.raytheon.com/baseline/>). The reports include the following documents that affect all sites:

- COTS Software Version Baseline Report 910-TDA-003
- Site-Host Map Report 910-TDA-005
- Critical COTS Software List 910-TDA-023
- COTS [Software] Where Used Report 910-TDA-030

The reports also include the following documents that are site-specific:

- Hardware-Software Map 920-TD x -002
[x = Distributed Active Archive Center (DAAC) designation: Goddard = G; Langley = L; NSIDC = N; LP DAAC = E]
- Operating System (O/S) and COTS Patch Maps 920-TD x -014

All BLM records are related to approved Configuration Change Requests (CCR) and Release Notes documents (i.e., series 914-TDA- xxx).

The Configuration Management (CM) organization is the principal user of the BLM tool, using it to implement changes to the baseline. The system is used daily to describe CCB-approved system components and to track sites and machines where version-controlled items are baselined. In addition BLM supports other functions such as configuration audits, system engineering and deployment activities. The BLM records describe the hosts for each site. The sites are the operational Distributed Active Archive Centers (DAACs), Verification and Acceptance Test Center (VATC) and Performance Verification Center (PVC). The system also tracks the COTS software and patches that are mapped to their respective hosts. The EBIS accommodates the identification of other baselined items such as documents, and disk partitions.

The BLM capabilities are used to:

- Maintain records that identify what items comprise individual, baselined, system configurations.
- Identify the versions and variants of hardware and software items that are currently baselined together with the assemblies (e.g., hosts, subsystems, and networks) that use them.
- Record item interdependencies and the sites to which baselined items are deployed.
- Keep chronological histories of baseline changes and traceability of items to predecessor versions and system releases.

The ILM capability is implemented with the Remedy COTS package. The ILM tools are deployed at the EDF in Landover, the DAACs and the SMC. The system is used daily at the EDF for maintaining property, repair, and software license data about EMD contract purchased items. The sites use the ILM tools locally to create Maintenance Work Orders (MWOs) that record equipment maintenance activity. The EDF maintains the principal data repository and processes all inventory changes. All MWO changes are sent daily from the DAACs and merged into a consolidated ILM database. The ILM data changes made at the EDF are distributed daily to affected sites.

The ILM capabilities are used to:

- Track and maintain all of the key data pertaining to EMD contract purchased equipment including hardware, COTS software and software licenses, COTS

documentation (hardware and software), spares and consumable items, and Government Furnished Equipment.

- Store and maintain detailed maintenance data on hardware, to the component level, including corrective maintenance.
- Keep chronological histories (a record of transactions) of receipt, installation, and relocation of inventory items.

Baseline Manager (BLM) Outputs Useful at the Sites

When the EMD software baseline is changed (e.g., addition of a script, update or replacement of a Graphical User Interface (GUI) package), the change must be reflected in the collection, or “catalog,” of control items that make up the affected Computer Software Component (CSC) assembly in the EMD product structure. In the BLM software at the EDF, to document the change it is necessary to add the new element to the catalog of version-controlled items, define an engineering change for the CSC assembly, and include the element in the list of items that will now make up that assembly. Once the change is documented, baseline reports reflect the new information. These reports may be accessed through the EMD server for the EMD Baseline Information System (EBIS).

EMD Baseline Information System (EBIS)

The EMD Baseline Information System (EBIS) is used to convey the configuration states of all configurable items. All items managed within EBIS are versioned, using “Current” and “Previous” directories. EBIS is implemented with one physical web server, **pete**, for **internal use**. External users (DAACs) get EBIS copied on to their **local file systems for individual utilization**.

Server **pete** resides within the Landover firewall, and is not accessible to outside users of the Internet. For security reasons, certain technical documents, such as those showing IP addresses and network diagrams, are only viewable internally on **pete**. More than 98% of all technical information is replicated on EBIS. The information on EBIS is arranged in eight groups:

- **Technical Documents** – EMD baseline technical documentation includes the 900 series documents. General baseline information is provided within the 900 series.
- **Custom Code Drop Tracking** – For each release of customs software, tables are updated to show the patch, custom code nomenclature, date, CCR, NCRs, files, and targeted sites. The CCR, NCR, and files cells are hyperlinked to provide ready access to the related information.
- **Engineering Software** – For each automatic delivery of Engineering Software, a table is updated indicating a Sequence Number, nomenclature, sender, date, NCRs, files, and sites. The NCRs and files’ cells are hyperlinked.
- **COTS Software Tracking** – For each COTS software delivery, the COTS Release number, nomenclature, date, CCR, and target sites are provided.

- **Technical Directives** – Engineering Technical directives are listed in a table that indicates the ETD number, title, date, and CCR number for each Technical Directive. The document title and CCR numbers are hyperlinked.
- **Release Notes** – Release Notes are provided along with the approved CCRs. Versions and dates are also provided. The page is searchable for titles, component COTS software, versions, and CCRs. The document and CCR cells are hyperlinked.
- **Pre-Ship Reviews** – This collection of documents provide customer with in-work versions of Release Notes documents for review.
- **CCRs** – This provides a listing of all approved CCRs. Each CCR is retrievable for viewing.

These EBIS web page provides most of the information needed to define what comprises the EMD system, as well as the histories of the EMD system. The data is to be used as a reference from which proposed design changes to the EMD system can be made.

A click on the **ECS Baseline** button results in the display of the EBIS page, as illustrated in Figure 8. On the EBIS page, the EMD Baseline Information Technical Documentation is accessible through use of the **Technical Documents** button at the top of the row of buttons on the left side.

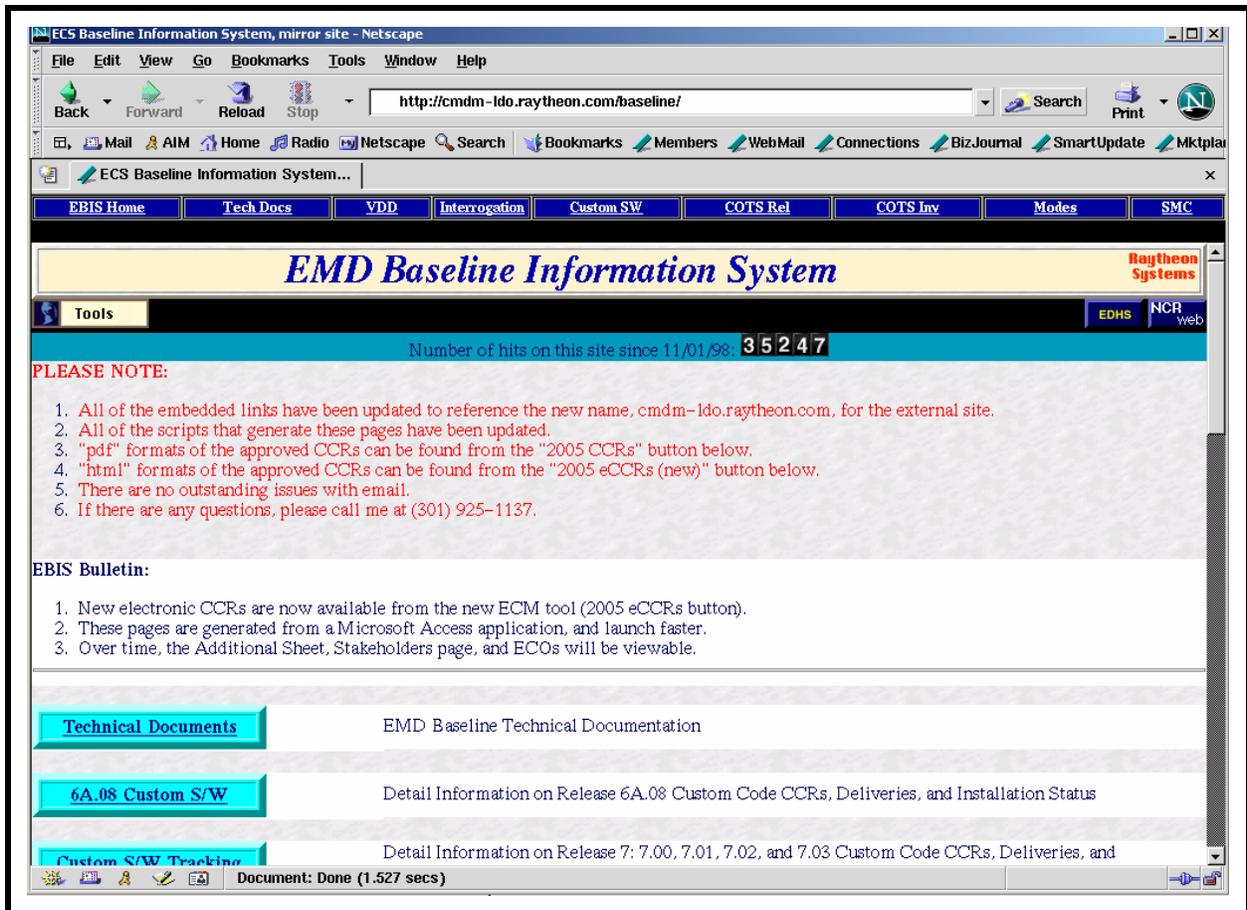
A click on the **Technical Documents** button results in the display of the list of technical documents. Figure 9 shows the top of the list on the **ECS Baseline Technical Documentation** page. As illustrated, the page lists the document series, title, and document number. The document numbers are links that provide access to the listed documents. Note that the titles of some documents indicate BLM origin by inclusion of the parenthetical notation (**ClearCase BLM**).

The following procedure is applicable for retrieving baseline reports.

<http://pete.hitc.com/baseline/> (Internal EBIS web server)

The DAAC accesses their locally assigned server for the EBIS URL address

LPDAAC	http://e0ins01.edcb.ecs.nasa.gov:10160/baseline/
GES	http://g0ins01.gsfc.ecs.nasa.gov:10160/baseline/
LaRC	http://l0ins01.larc.ecs.nasa.gov:10160/baseline/
NSIDC	http://n0ins02u.ecs.nasa.gov:10160/baseline/
SMC	http://m0mss04.ecs.nasa.gov:10160/baseline/



Obtain ECS Baseline Reports

Figure 8. EMD Baseline Information System (EBIS) Page

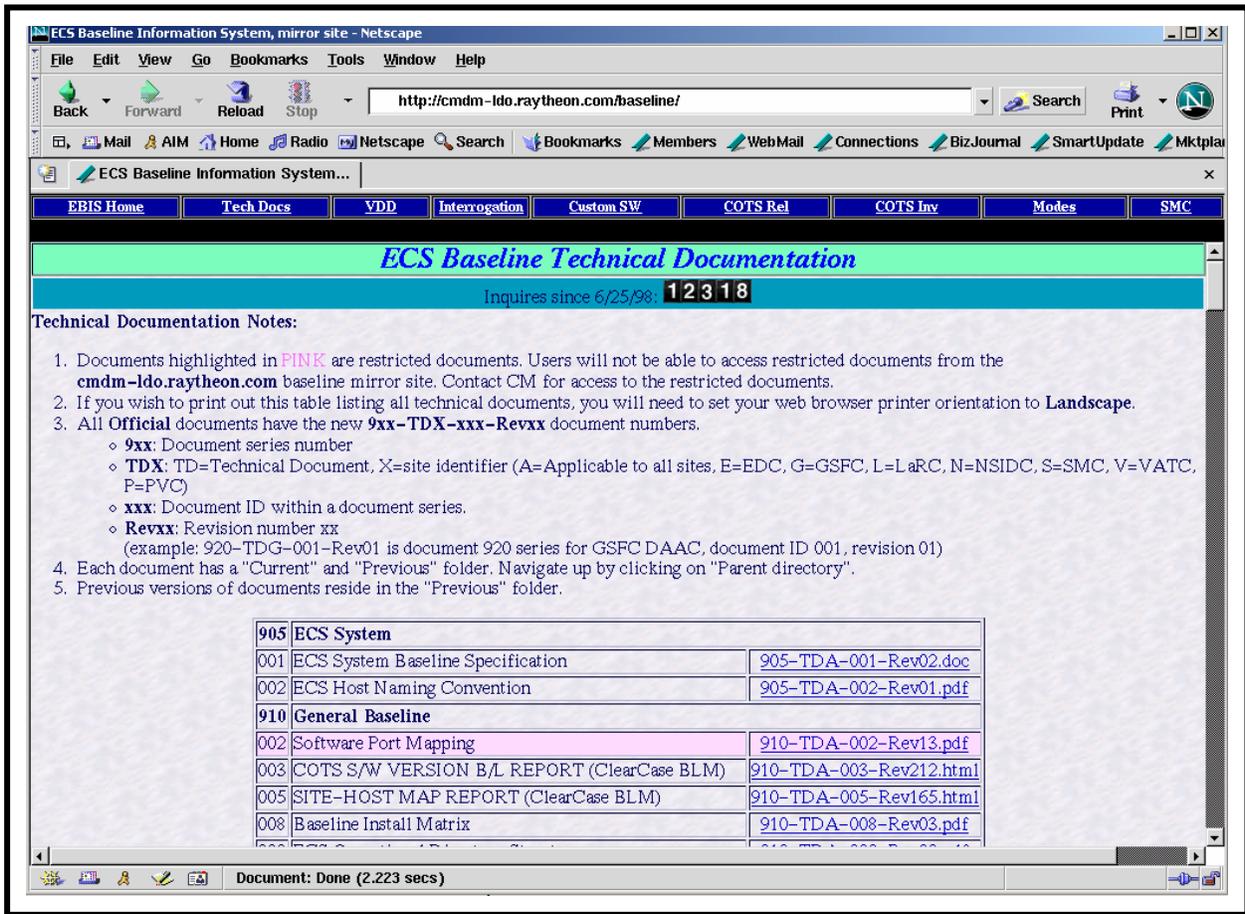


Figure 9. EBIS List of Technical Documents

Inventory/Logistical Management (ILM)

The ILM system is used to enter and maintain property records for all items in the ECS inventory. This includes not only equipment items tagged with physical serial tags, but also non-physical items which, although they cannot be physically tagged, must be tracked as inventory items (e.g., software items). At each site, each item requiring serial tag control, whether an actual tag control or an assigned number provided by the system, must have an Equipment Identification Number (EIN). The illustration in Figure 10 shows the Remedy **Open** dialog, from which the operator can select an item to launch the ILM-EIN Entry form displayed in Figure 11.

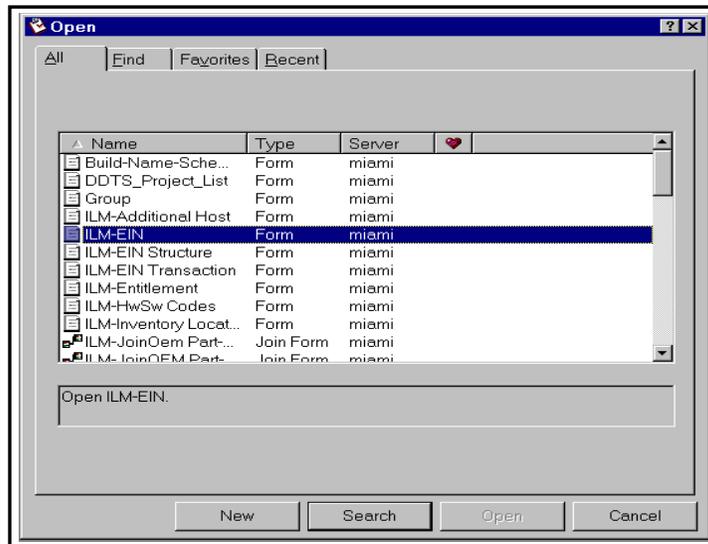


Figure 10. Remedy Open Window (Note: Not all choices may appear)

Figure 11. New ILM-EIN Entry Form

Once assigned an EIN, an item is tracked by ILM, with all movement and status recorded throughout its life. The ILM-EIN form illustrated in Figure 11 also allows the Property Administrator to create and modify EIN structures (i.e., Parent-Child relationships) by specifying a Parent EIN. The ILM system also provides reports for hard copy requirements. For some of the data fields on the ILM-EIN form, entries may be displayed from the database if appropriate data entries have been made and saved using other forms. For example, data on component parts are entered using the ILM-OEM Parts form illustrated in Figure 12.

The ILM tool provides for interaction among some of the forms. For example, a click on the **EIN Transaction** button at the bottom of the form illustrated in Figure 11 results in the display of the **ILM-EIN Transaction** form shown in Figure 13. Clicking on the **Select Components to Process** button on the **ILM-EIN Transaction** form brings up the **ILM-Process Component** form (Figure 14), which displays all the active components for the Parent EIN entered on the **ILM-EIN Transaction** form.

To understand the use of the ILM software, consider as an example the arrival at your site of a new RAID (Redundant Array of Inexpensive Disks) unit as an upgrade to the science processor. To update the ILM record for our example, use the following procedure.

The screenshot shows a web application window titled "Remedy User - [ILM-OEM Parts (New)]". The window has a menu bar with "File", "Edit", "View", "Tools", "Actions", "Window", and "Help". Below the menu bar is a toolbar with various icons. The main content area is titled "New ILM-OEM Parts" and contains a "Save" button. The form is titled "OEM Part Information" and is enclosed in a light green border. The form fields are as follows:

Part No	<input type="text"/>				
MFR	<input type="text"/>	Hw-Sw Code	<input type="text"/>		
Description	<input type="text"/>				
Mod-Ver	<input type="text"/>				
Create Date	<input type="text"/>	Submitter	<input type="text" value="ttran"/>	Last Modified By	<input type="text"/>

The status bar at the bottom of the window shows "Ready" and the user's name "ttran" and "miami".

Figure 12. ILM-OEM Parts Form

Remedy User - [ILM-EIN Transaction (New)]

File Edit View Tools Actions Window Help

New ILM-EIN Transaction Save

Parent EIN Effective Date 9/30/03 TransactionType

Parent Information

ECS Name System Serial No

Part No Description

MFR Location Building Room

Install/Move/Ship/RTS Relocate Archive

Return (Parent-Component) Ship (Parent-Component)

New ECS Name New Location

New Building New Room

Execute Transaction Select Components To Process

Ready ttran miami

Figure 13. ILM-EIN Transaction Form

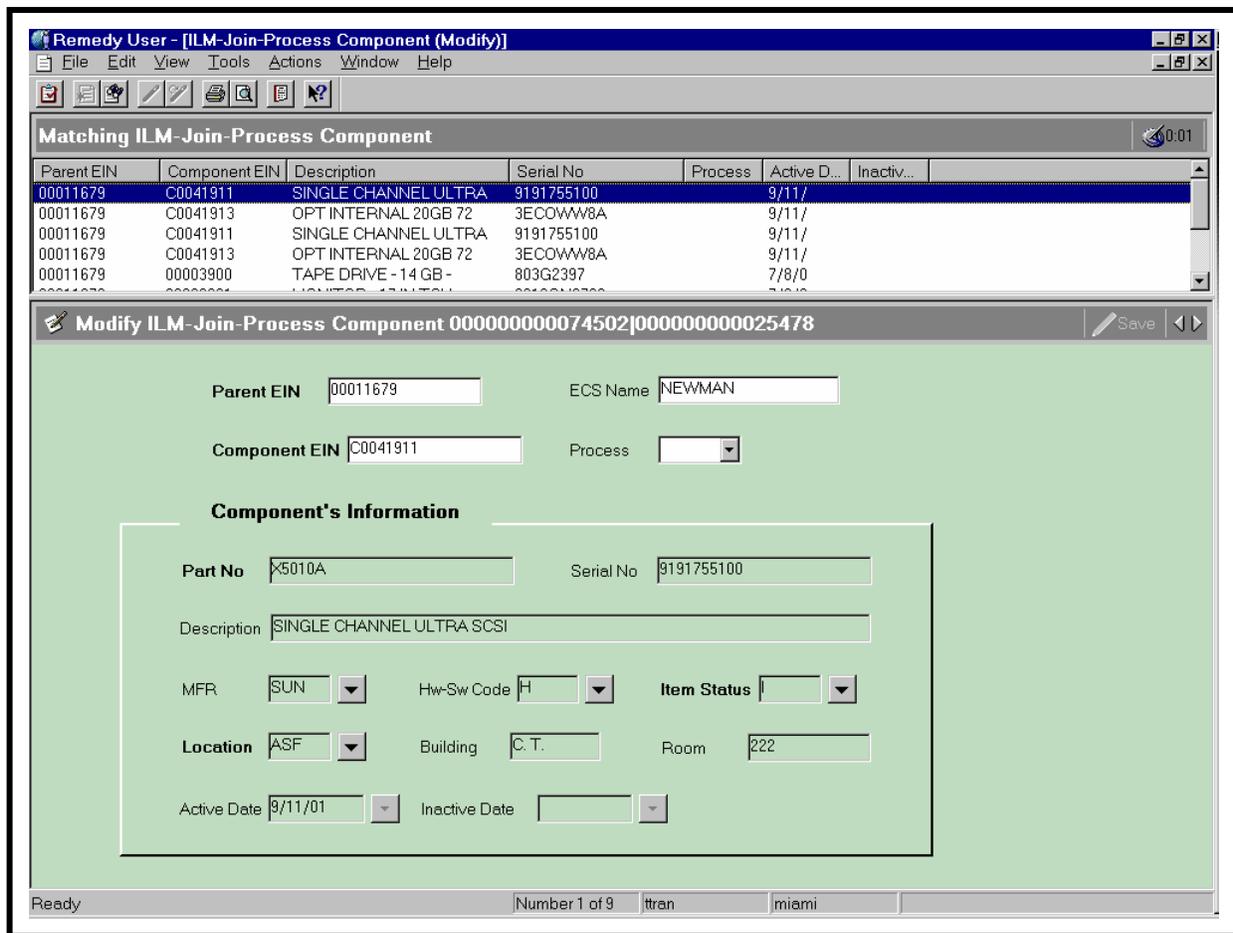


Figure 14. ILM-Process Component Form

Update the Inventory/Logistical Management Record using the ILM Tool

- 1 Execute the aruser.exe application in the Windows environment (e.g., double click on the **aruser.exe** listing in a Windows Explorer window, or click on the **Start** button in the Windows taskbar and then click on the **Run . . .** option to open the **Run** dialog, from which you then enter the path for the **aruser.exe** application. A typical path is **c:\Program Files\Remedy\aruser.exe**, which may be entered or selected by clicking on the **Browse** button and navigating to the path. When the path is displayed in the **Open:** field of the **Run** dialog, click on the **OK** button.).
 - A Remedy Action Request System logo window is displayed briefly, followed by a **Login – Remedy User** dialog box with entry fields for ID and password.
 - **Note:** The Remedy User application is also available in the UNIX environment on the MSS host (e.g., **e0mss21**, **g0mss21**, **l0mss21**, **n0mss21**). It is accessible in the

- path (e.g., `/usr/ecs/<MODE>/COTS/remedy/bin`) containing the Remedy command files. The command **aruser &** is used to launch the application.
- 2 Type your Remedy user ID in the entry field for ID and type your password in the entry field for password.
 - The typed user ID is displayed in its field and asterisks are displayed in the password entry field.
 - 3 Click on the **Apply** button.
 - The login dialog is dismissed and a Remedy Action Request System logo window is displayed briefly, followed by a Remedy initial screen from which a number of ECS application forms may be launched.
 - 4 Follow menu path **File→Open** or click on the leftmost button near the top of the window.
 - The **Open** dialog box is displayed, showing choices including **ILM-EIN**.
 - 5 Click on **ILM-EIN** to highlight it and then click on the **New** button.
 - The **New ILM-EIN** form is displayed.
 - 6 Click in the **EIN** field.
 - The cursor is displayed in the field.
 - 7 The **EIN** field is for the Equipment Identification Number from the silver identification tag attached to a hardware item (in our example, a RAID unit). For this exercise, type **0000TTTT** or a number supplied by the instructor as the EIN.
 - If the item were an item with no physical tag number (e.g., a software item), you could skip entering an EIN and let the system generate a number at the time the record is saved.
 - The typed **EIN** is displayed in the entry field.
 - 8 Click in the **Serial No** field.
 - The cursor is displayed in the field.
 - 9 For this exercise, type **S99999**.
 - The **Serial Number** is displayed in the entry field.
 - 10 Click in the **Part No** field.
 - The cursor is displayed in the field.
 - 11 Type the part number for the item.
 - The typed entry is displayed in the field.

- 12 If data on the part has been previously entered using the **ILM-OEM Parts** form, go to Step 22; otherwise continue with Step 13.
- 13 To add data on a new part, click on the **Add New Part** button for access to the **ILM-OEM Parts** form.
 - The **ILM-OEM Parts** form is displayed, with the **Part No** field showing the part number that was entered in Step 11.
- 14 Click on the pull-down arrow at the end of the **MFR** field and select the code for the manufacturer of the part.
 - The selected code is displayed in the field.
- 15 Click on the pull-down arrow at the end of the **Hw-Sw Code** field and select the code for the class of maintenance costs associated with the item.
 - The selected code is displayed in the field.
- 16 Click in the **Description** field.
 - The cursor is displayed in the field.
- 17 Type a brief manufacturer's or vendor's description of the part (up to 60 characters).
 - The typed entry is displayed in the field.
- 18 Click in the **Mod-Ver** field.
 - The cursor is displayed in the field.
- 19 Type the model or version of the item (up to 24 characters).
 - The typed entry is displayed in the field.
- 20 Click on the **Save** button near the upper right corner of the window (or follow menu path **Actions→Save**) to save the information on the part to the database.
 - The system supplies entries for the **Submitter**, **Create Date**, and date **Last Modified**.
 - The data on the part are save to the database.
- 21 Follow menu path **File→Close** or click on the Close (**x**) button in the upper right corner of the **ILM-OEM Parts** form.
 - The **ILM-OEM Parts** form and window is closed.
 - On the **New ILM-EIN** form, data on the part are displayed in the **Description**, **MFR**, **Hw-Sw Code**, and **Mod-Ver** fields.
- 22 Click on the **EIN Transaction** button at the bottom of the GUI.
 - The **ILM-EIN Transaction** form is displayed.

- 23 Click in the **Parent EIN** field.
- The cursor is displayed in the field.
- 24 Type the EIN of the Parent item and then press the **Return/Enter** key.
- The typed entry is displayed in the field and associated values from the database are displayed in the **ECS Name, System Serial No, Part No, MFR, Description, Location, Building, and Room** fields.
- 25 Click on the pull-down arrow at the end of the **Transaction Type** field and select the type of transaction being recorded (for our example in this exercise, select **Installation**).
- The selected entry is displayed in the **Transaction Type** field.
- 26 If the default current date displayed in the **Effective Date** field is to be the date on which the change is effective, go to Step 29; otherwise continue with Step 27.
- 27 If it is desired to specify for the change an effective date other than the default current date, click at the end of the **Effective Date** field.
- The cursor is displayed in the field.
- 28 Clear the displayed date information by backspacing, or drag the cursor to highlight the displayed date, then type the desired date (using format mm/dd/yy) to specify the date on which the change is to be effective.
- An alternative method to enter the information is to click on the pull-down button at the right of the field and use the displayed calendar tool to select the desired date information.
 - The entered information is displayed in the **Effective Date** field.
- 29 Click on the pull-down arrow at the end of the **Install (P)arent-(C)omponent** field and select **C** to designate that it is a component that is being installed.
- The selected choice is displayed in the field.
- 30 Click on the **Select Components to Process** button.
- The GUI displays the **ILM-Process Component** form. Above the form is a table listing the components of the Parent EIN, showing for each its component EIN, description, serial number, etc.
- 31 In the list, locate the component to be installed, scrolling down the list if necessary, and double click on the row corresponding to the item.
- The **ILM-Process Component** form is populated with the data concerning the component to be installed.
- 32 Click on the pull-down arrow at the end of the **Process** field of the **ILM-Process Component** form and select Y (for Yes).
- The selected entry is displayed in the field.

- 33** Click on the **Save** button near the upper right corner of the form (or follow menu path **Actions→Save**) to save the component processing data to the database.
- The line item data are saved to the database.
 - The **ILM-Process Component** form permits the operator to select another component EIN from a list at the top of the form and to process that component in the same way by repeating Steps 31 and 32.
 - The **ILM-Process Component** form may be closed when the component processing is complete.
- 34** At the bottom of the **ILM-EIN Transaction** form click on the **Execute Transaction** button.
- The database is updated for the specified component EIN being installed, setting the records to reflect the following:
 - **ECS Name = New ECS Name.**
 - **Location = New Location.**
 - **Building = New Building.**
 - **Room = New Room.**
 - **Item Status = I.**
 - **Installation Date = Effective Date.**
 - **Audit Date = Effective Date.**
 - Remedy also writes an “INS” record in the transaction log to capture details of the event, including date/time, initiating operator, and changes to ECS Name and Location values.
- 35** To exit Remedy, follow menu path **File→Exit**.
- A confirmation dialog is displayed, permitting confirmation to close the application.
-

Practical Exercise

Introduction

This exercise is designed to practice key elements of the Configuration Management procedures. Perform the tasks identified in the exercise.

Equipment and Materials

One system workstation.

Release 7.11 Operations Tools Manual for the EMD Project, 609-EMD-001.

Release 7.11 Mission Operation Procedures for the EMD Project, 611-EMD-001.

Custom Software Problem

This exercise involves a problem with custom software developed for and maintained by the EMD Project.

A science user trying to use one of the ECS toolkits experiences an inability to get the desired results when using the toolkit with another ECS application. The science user reports the problem to the site's User Services Desk. The User Services Desk records the information and opens a Trouble Ticket (TT) in the TTS. The TT is routed to the site Sustaining Engineer(s) for diagnosis. The Sustaining Engineer verifies that the toolkit's interface to the other ECS application does not provide the desired results and identifies two sources of error: a) the user is attempting a procedure that has not typically been supported at this site and that requires a display hardware upgrade, and b) there are source statements in the software that are in error. The engineer estimates that it will take one person-month to correct and test the application.

1. Generate a CCR for the display hardware upgrade from a Wyse Model WY-150 monochrome display monitor to a Silicon Graphics Model GDM-20D11 Color Graphic Display.
2. Generate a CCR for the software change.
3. Generate a CCR to document the hardware and software changes.
4. Prepare distribution lists for review of the proposed changes.
5. Log in the new software file using the Baseline Manager.
6. Use the Configuration Registry GUI to review the configuration parameters associated with the software.
7. Perform the required Change Control Accounting for the software and hardware changes.
8. Assume delivery of the new display monitor and create updates to the Inventory/Logistical Management records using the ILM tool.

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Slide Presentation

Slide Presentation Description

The following slide presentation represents the slides used by the instructor during the conduct of this lesson.

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