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EOS Core System (ECS) Project Contract No. NAS5-60000

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Document No.: 305-CD-038-002

Title: Release B System Monitoring and Coordination Center Design Specification for the ECS Project

Enclosed please find change pages for the subject document. Please replace the pages as follows:

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305-CD-038-002

EOSDIS Core System Project

Release B System Monitoring and Coordination Center Design Specification for the ECS Project

March 1996

Hughes Information Technology Systems
Upper Marlboro, Maryland

Release B System Monitoring and Coordination Center Design Specification for the ECS Project

March 1996

Prepared Under Contract NAS5-60000
CDRL Item #046

APPROVED BY

Rick Kochhar /s/	3/26/96
Rick Kochhar, Release B CCB Chairman EOSDIS Core System Project	Date

Hughes Information Technology Systems
Upper Marlboro, Maryland

305-CD-038-002

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Preface

This document is one of eighteen comprising the detailed design specifications of the SDPS and CSMS subsystem for Release B of the ECS project. A complete list of the design specification documents is given below. Of particular interest are documents number 305-CD-020, which provides an overview of the subsystems and 305-CD-039, the Data Dictionary, for those reviewing the object models in detail.

The SDPS and CSMS subsystem design specification documents for Release B of the ECS Project include:

305-CD-020	Release B Overview of the SDPS and CSMS Segment System Design Specification
305-CD-021	Release B SDPS Client Subsystem Design Specification
305-CD-022	Release B SDPS Interoperability Subsystem Design Specification
305-CD-023	Release B SDPS Data Management Subsystem Design Specification
305-CD-024	Release B SDPS Data Server Subsystem Design Specification
305-CD-025	Release B SDPS Ingest Subsystem Design Specification
305-CD-026	Release B SDPS Planning Subsystem Design Specification
305-CD-027	Release B SDPS Data Processing Subsystem Design Specification
305-CD-028	Release B CSMS Segment Communications Subsystem Design Specification
305-CD-029	Release B CSMS Segment Systems Management Subsystem Design Specification
305-CD-030	Release B GSFC Distributed Active Archive Center Design Specification
305-CD-031	Release B LaRC Distributed Active Archive Center Design Specification
305-CD-033	Release B EDC Distributed Active Archive Center Design Specification
305-CD-034	Release B ASF Data Center Distributed Active Archive Center Design Specification
305-CD-035	Release B NSIDC Distributed Active Archive Center Design Specification
305-CD-036	Release B JPL Distributed Active Archive Center Design Specification
305-CD-037	Release B ORNL Distributed Active Archive Center Design Specification
305-CD-038	Release B System Monitoring and Coordination Center Design Specification
305-CD-039	Release B Data Dictionary for Subsystem Design Specification

This document is a formal contract deliverable with an approval code of 2; as such it requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

Any questions should be addressed to:

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Abstract

The Release B System Monitoring and Coordination Center (SMC) Design Specification document describes the design of the ECS SMC, located at the Goddard Space Flight Center, in Greenbelt, Maryland. The purpose of this document is to describe the unique configuration of common ECS software and hardware elements that are configured to support the SMC mission. The SMC provides coordination/distribution of ECS policy, provides user registration and application toolkit information, and provides overall health, performance, fault, and security status of the ECS by exchanging system management summary data from the ECS DAACs and networks. Each of the ECS software and hardware components which comprise the SMC is fully documented in its own subsystem design specification document. Therefore, this document's focus is on the specific software and hardware components of the SMC as deployed in the Release B timeframe.

Keywords: SMC, MSS, CSS, EMC, GSFC, system, management, bulletin, board

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1. Introduction

1.1 Identification

This Release B SMC Design Specification for the ECS Project, Contract Data Requirement List (CDRL) Item 046, with requirements specified in Data Item Description (DID) 305/DV2, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract NAS5-60000.

1.2 Scope

Release B of ECS supports functional capabilities and services required to meet driving requirements and milestones including:

- Functionality/services required to support mission operations for the continuation of TRMM, as well as the initiation of LANDSAT 7, COLOR, ADEOS II, and EOS AM-1. This includes planning and scheduling, command and control, production data processing, data distribution and other ECS functions.
- Functionality/services required to support mission operations for the initiation of SAGE III (METEOR) and ACRIM Flight-Of-Opportunity (FOO). This includes production data processing, data distribution and other ECS functions.
- Provide information management, data distribution and a high level archive for the SAR data from the ERS-1/2, JERS-1 and RADARSAT spacecraft.
- Functionality/services required to support EOS ground system interface testing which includes end-to-end mission simulations, communication services for EBnet, network management services and other ECS services.
- Functionality/services required for V0 Interoperability.
- Functionality/services required for Science Software I&T Support for TRMM, LANDSAT 7, COLOR, ADEOS II, EOS AM-1, SAGE III (METEOR) and ACRIM FOO.

ECS will provide support to eight Distributed Active Archive Centers (DAACs). The DAACs are tasked with generating EOS standard data products and carrying out NASA's responsibilities for data archive, distribution and information management. The DAACs serve as the primary user interface to EOSDIS. These DAACs are located at: Goddard Space Flight Center (GSFC) Greenbelt, MD; Langley Research Center (LaRC) Hampton, VA; Oak Ridge National Laboratory (ORNL) Oak Ridge, TN; EROS Data Center (EDC) Sioux Falls, SD; National Snow and Ice Data Center (NSIDC) Boulder, CO; Jet Propulsion Laboratory (JPL) Pasadena, CA; the Consortium for International Earth Science Information Network (CIESIN) in University Center, MI; and the Alaska SAR Facility (ASF) at the University of Alaska Fairbanks.

This document is part of a series of documents comprising the Science and Communications Development Office design specification for the Communications and System Management segment (CSMS) and the Science and Data Processing Subsystem (SDPS) for Release B. The series of documents include an overview, a design specification document for each subsystem, and a design implementation document for each DAAC involved in the release, as well as one for the System Monitoring and Control (SMC) center.

This document specifically focuses on the SMC configuration and capabilities at Release B. It is released in support of the Release B Critical Design Review (CDR). This document reflects the February 14, 1996 Technical Baseline, maintained by the ECS Configuration Control Board in accordance with ECS Technical Direction No. 11 dated December 6, 1994.

1.3 Purpose

The purpose of this document is to show the elements of the Release B ECS science data processing and communications design and implementation that will support the SMC in meeting it's objectives. The Release B Overview of SDPS and CSMS provides an overview of the ECS subsystems and should be used by the reader in order to get a basic understanding of ECS design components. The Release Plan Content Description document (222-TP-003-008) provides a detailed mapping of functional capabilities and services that will be available for each release. The majority of the capabilities at the SMC are satisfied by the design and implementation of the Communications and Systems Management Segment (CSMS) subsystems, however, some science data processing subsystem functionality will be provided to support resource planning and coordination.

1.4 Status and Schedule

This submittal of DID 305/DV2 meets the milestone specified in the Contract Data Requirements List (CDRL) for Release B Critical Design Review (CDR) of NASA Contract NAS5-60000. The submittal will be reviewed during the Release B CDR and changes to the design which resulted from that review will be reflected in subsequent updates.

1.5 Document Organization

This document is organized to describe the implementation of the SMC at Release as follows:

Section 1 provides information regarding the identification, scope, purpose, status and schedule, and organization of this document.

Section 2 provides a listing of the related documents which were used as source information for this document.

Section 3 provides a description of the SMC implementation. It includes a description of the SMC external interfaces, software implementation, including identification of Commercial-Off-the-Shelf (COTS) products, hardware and networks configuration and operational activities.

- Subsection 3.1 establishes the context for the technical discussions with an overview of the specific SMC mission and operations. It identifies the key ECS related mission and operations activities that are supported at Release B**.**
- Subsection 3.2 addresses the SMC external interfaces. Major interfaces in the Release B timeframe include EBnet and eight of the ECS DAACs including LaRC, GSFC, EDC, ASF, JPL, ORNL, and NSIDC.
- Subsection 3.4 describes the ECS Hardware Configuration Items (HWCIs) used in the SMC design. This section identifies the specific HWCI components and quantities provided with the SMC at Release B. It includes the Local Area Network (LAN) configuration and the rationale for the specific hardware configuration.
- Subsection 3.5 provides a software to hardware configuration mapping.

Section 4 gives a description of what can be expected in the next version of this document which is planned for each subsequent Release of ECS.

The section, Abbreviations and Acronyms, contains an alphabetized list of the definitions for abbreviations and acronyms used in this document.

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2. Related Documentation

2.1 Parent Documents

The parent documents are the documents from which the scope and content of this Release B Design Specification is derived.

194-207-SE1-001	System Design Specification for the ECS Project
305-CD-002-002	Science Data Processing Segment (SDPS) Design Specification for the ECS Project
305-CD-003-002	Communications and System Management Segment (CSMS) Design Specification for the ECS Project
305-CD-019-001	Release A System Monitoring and Coordination Center Design Specification for the ECS Project
305-CD-020-002	Release B Overview of the SDPS and CSMS System Design Specification for the ECS Project
305-CD-026-002	Release B SDPS Planning Subsystem Design Specification for the ECS Project
305-CD-028-002	Release B CSMS Communications Subsystem Design Specification for the ECS Project
305-CD-029-002	Release B CSMS Systems Management Subsystem Design Specification for the ECS Project
305-CD-039-002	Release B Data Dictionary for Subsystem Design Specification for the ECS Project

2.2 Applicable Documents

The following documents are referenced within this Specification, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this document.

206-CD-001-002	Version 0 Analysis Report for the ECS Project
209-CD-001-003	Interface Control Document Between EOSDIS Core System (ECS) and the NASA Science Internet
209-CD-008-004	Interface Control Document Between EOSDIS Core System (ECS) and the Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC)

209-CD-009-002	Interface Control Document Between EOSDIS Core System (ECS) and the Marshall Space Flight Center (MSFC) Distributed Active Archive Center (DAAC)
209-CD-010-002	Interface Control Document Between EOSDIS Core System (ECS) and the Langley Research Center (LaRC) Distributed Active Archive Center (DAAC)
209-CD-011-004	Interface Control Document Between EOSDIS Core System (ECS) and the Version 0 System
209-CD-021-002	Interface Control Document Between EOSDIS Core System (ECS) and the ASF Distributed Active Archive Center (DAAC)
209-CD-022-002	Interface Control Document Between EOSDIS Core System(ECS) and the ORNL Distributed Active Archive Center (DAAC)
304-CD-002-002	Science Data Processing Segment (SDPS) Requirements Specification for the ECS Project
304-CD-003-002	Communications and System Management Segment (CSMS) Requirements Specification for the ECS Project
305-CD-021-002	Release B SDPS Client Subsystem Design Specification for the ECS Project
305-CD-022-002	Release B SDPS Interoperability Subsystem Design Specification for the ECS Project
305-CD-023-002	Release B SDPS Data Management Subsystem Design Specification for the ECS Project
305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-027-002	Release B SDPS Data Processing Subsystem Design for the ECS Project
305-CD-030-002	Release B GSFC DAAC Design Specification for the ECS Project
305-CD-031-002	Release B LaRC DAAC Design Specification for the ECS Project
305-CD-032-001	Release B MSFC DAAC Design Specification for the ECS Project
305-CD-033-002	Release B EROS Data Center DAAC Design Specification for the ECS Project
305-CD-034-002	Release B ASF DAAC Design Specification for the ECS Project

305-CD-035-002	Release B NSIDC DAAC Design Specification for the ECS Project
305-CD-036-002	Release B JPL DAAC Design Specification for the ECS Project
305-CD-037-002	Release B ORNL DAAC Design Specification for the ECS Project
313-CD-006-002	Release B CSMS/SDPS Internal Interface Control Document for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project: Part 1-- ECS Overview
604-CD-002-003	Operations Concept for the ECS Project: Part 2B -- ECS Release B
210-TP-001-006	Technical Baseline for ECS Project
222-TP-003-008	Release Plan Content Description for the ECS Project
423-41-03	Goddard Space Flight Center, EOSDIS Core System (ECS) Contract Data Requirements Document

2.3 Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify and clarify the information presented in this document. While not binding on the content of this design specification, these and many additional ECS documents are available via the EDHS (ECS Data Handling System) . The EDHS can be accessed via the World Wide Web (WWW) at the following Universal Reference Location: http://edhs1.gsfc.nasa.gov/. Please note that Internet links cannot be guaranteed for accuracy or currency.

302-CD-002-001	SDPS/CSMS Release A and FOS Release A and B Facilities Plan for the ECS Project
101-303-DV1-001	Individual Facility Requirements for the ECS Project
333-CD-003-002	SDP Toolkit Users Guide for the ECS Project
601-CD-001-004	Maintenance and Operations Management Plan for the ECS Project
608-CD-001-002	ECS Operations Plan for Release B
101-620-OP2-001	List of Recommended Maintenance Equipment for the ECS Project
828-RD-001-002	Government Furnished Property for the ECS Project
430-TP-001-001	SDP Toolkit Implementation with Pathfinder SSM/I Precipitation Rate Algorithm, Technical Paper
423-16-01	Goddard Space Flight Center, Data Production Software and Science Computing Facility (SCF) Standards and Guidelines for the ECS Project
423-16-02	Goddard Space Flight Center, PGS Toolkit Requirements Specification for the ECS Project

423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System
540-022	Goddard Space Flight Center, Earth Observing System (EOS) Communications (Ecom) System Design Specification
560-EDOS-0211.0001	Goddard Space Flight Center, Interface Requirements Document Between EDOS and the EOS Ground System (EGS)

3. SMC Configuration

3.1 Introduction

3.1.1 SMC Overview

The System Monitoring and Coordination Center (SMC) is a part of NASA's Earth Observing System Data and Information System (EOSDIS) Core System (ECS). EOSDIS, when fully deployed will consist of eight Distributed Active Archive Centers (DAACs). The SMC's role is to coordinate policy issues amongst the DAACs, provide user registration information, toolkit information and monitor the overall health of the ECS. As the recipient of performance data, processing status and scheduling data, the SMC staff supports schedule adjudication, cross-DAAC schedule coordination and DAAC resource planning activities.

The SMC is configured with both SDPS and CSMS components in order to satisfy its mission and operations requirements. Figures 3.1.1-1 and 3.1.1-2 identify all the ECS SDPS and CSMS subsystems, respectively. The bulk of this document focuses on the selected elements of the ECS design that are used to achieve the Release B objectives of the SMC. Additional background material can be found in the Release A CDR version of the SMC design specification, 305-CD-019-001.

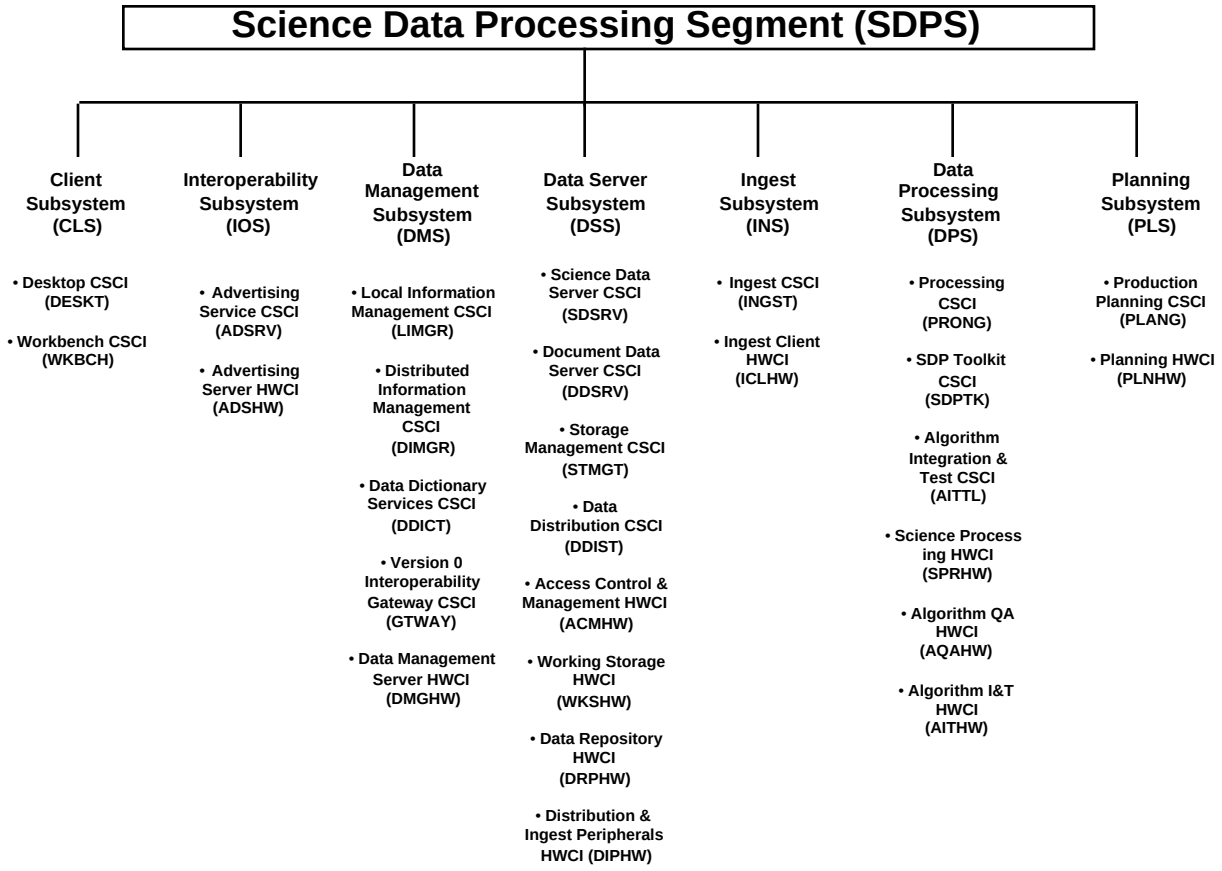


Figure 3.1.1-1. SDPS Subsystems and Components

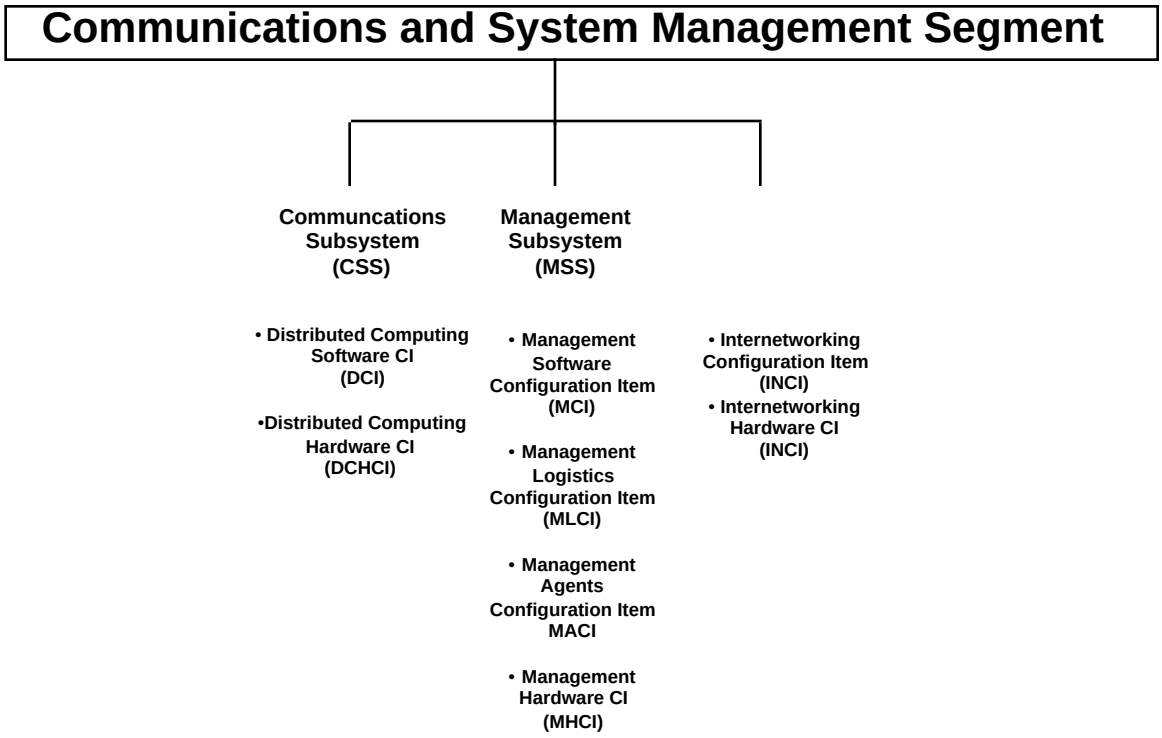


Figure 3.1.1-2. CSMS Subsystems and Components

3.1.2 SMC Mission and Operations Activities

ECS subsystems provide mission and operations functionality for Release B. These include provisions for enterprise management, enterprise communications, bulletin board services and resource planning. In addition, ECS subsystems provide the capability for the SMC operations staff to perform a number of roles which are essential to meeting the goals of the SMC. Table 3.1.2-1 identifies the key operational roles at the SMC and the ECS subsystem which supports the performance of a particular role/function. Detailed descriptions of these activities are captured in the ECS Operations Concept for the ECS Project: Part 2B - ECS Release B (604-CD-002-003) document. The Release B SDPS/CSMS Operations Scenarios document (605-CD-002-001) provides additional detailed scenarios for these activities.

The Release B activities will also be affected by the transition of Release A SMC to Release B. This will involve installing and testing Release B custom software, COTS software and hardware in a currently operational environment. Reference the Transition to Release B Technical Paper (240-TP-010-001) for a more detailed discussion.

Table 3.1.2-1. SMC Operations Support Functions

SMC Operational Roles	ECS Capability
User Registration	Communications Subsystem
System Performance Analysis	Management Subsystem
Security Management Analysis	Management Subsystem
Fault Management Analysis	Management Subsystem
Accountability, Accounting & Billing	Management Subsystem
Configuration Management	Management Subsystem
ECS Policy Dissemination	Management Subsystem Communication Subsystem
Testing, training, property management, integrated logistics support, library administration	Management Subsystem Communication Subsystem Office Support
Resource Scheduling Management	Planning Subsystem

3.2 SMC External Interfaces

The SMC will interface with multiple external organizations and to each ECS DAAC. The ECS subsystem-specific DID 305 design documents address the interfaces generically in a series of tables supported by textual explanations. For details, the reader is referred to those documents in addition to the various Interface Control Documents (ICDs). Figure 3.2-1 schematically illustrates the interfaces between the SMC and its external entities (sinks and sources of data). The figure enumerates data flows which are elaborated upon in Table 3.2-1.

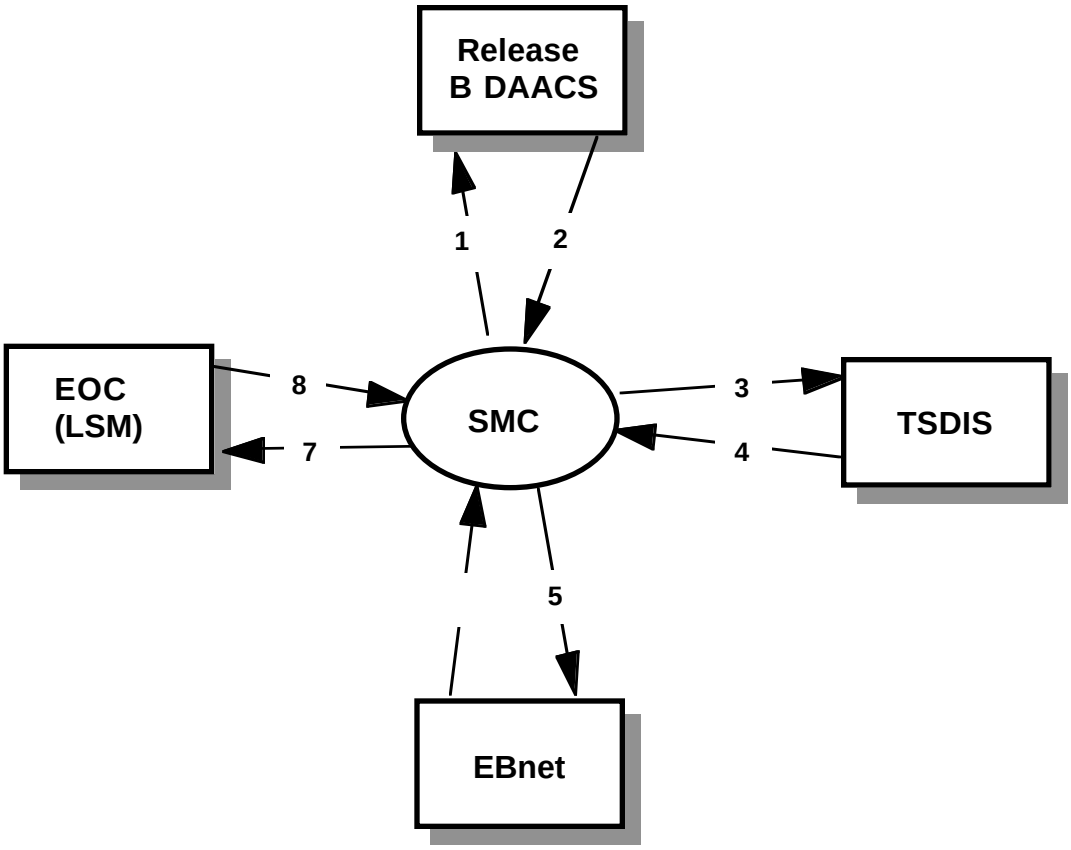


Figure 3.2-1. SMC External Interfaces

The following further describes the external entities, including those identified to support interface testing:

- Release B DAACs - SMC will interface with the GSFC, LaRC, EDC, ASF, JPL, ORNL, and NSIDC DAACs. Policy information, originating from the ESDIS project office, system and network performance and management summary data, and user registration data will be exchanged between the SMC and the Local System Management (LSM) element at each DAAC. This information is identified in Table 3.2-1.
- EOSDIS Backbone Network (EBnet) - The EBnet is the primary interface between the SMC, DAACs, EDOS, other ECS assets, and non-ECS elements. The SMC interface with the EBnet is to monitor and exchange status information between the EBnet and ECS.
- TSDIS - The SMC interface with TSDIS is to monitor the status of the TSDIS. This is an operational interface via e-mail.
- EOC - The SMC interface with EOC, at Release B is via the LSM at the EOS Operations Center (EOC). This interface is used to monitor and exchange status, performance summary and management information between the EOC and the SMC.

Table 3.2-1. SMC External Interfaces

Flow No.	Source	Destination	Data Types	Data Volume	Frequency
1	SMC	Rel B DAACs (MSS)	Policies	low	as required
1	SMC	Rel B DAACs (MSS)	Conflict Resolution	low	as required
1	SMC	Rel B DAACs (MSS)	Procedures	low	as required
1	SMC	Rel B DAACs (MSS)	Directives	low	as required
2	Rel B DAACs (MSS)	SMC	Conflict Resolution Request	low	as required
2	Rel B DAACs (MSS)	SMC	Status	low	as required
2	Rel B DAACs (MSS)	SMC	Performance	low	as required
3	SMC	TSDIS	Status Request	low	as required (via e-mail)
4	TSDIS	SMC	Status	low	as required (via e-mail)
5	SMC	EBnet	Status Request	low	as required
6	EBnet	SMC	Status, fault and performance	low	as required
7	SMC	EOC (LSM)	Status Request	low	as required
7	SMC	EOC (LSM)	Directives	low	as required
8	EOC (LSM)	SMC	Status	low	as required
8	EOC (LSM)	SMC	Performance	low	as required

3.3 Computer Software Component Analysis

3.3.1 Software Subsystem Overview

The 10 ECS software subsystems are described in detail in the ECS Subsystem-specific DID305 documents. This section provides a brief overview description of each of the subsystems.

Client Subsystem (CLS): This software consists of graphic user interface (GUI) programs, tools for viewing and/or manipulating the various kinds of ECS data (e.g., images, documents, tables) and libraries representing the client application program interface (API) of ECS services. The client subsystem components will be available to users for installation on their workstations and will also be deployed on workstations within the DAAC in support of normal operations, including User Services support.

Interoperability Subsystem (IOS): The interoperability subsystem is an advertising service. It maintains a database of information about the services and data offered by ECS, and allows users to search through this database to locate services and data that may be of interest to them. The advertising service will be implemented as a Web server application with a DBMS back-end.

Data Management Subsystem (DMS): This subsystem includes functions which provide uniform access to descriptions of the data and the data elements offered by the ECS repositories and provide a bi-directional gateway between ECS and Version 0. This subsystem also includes distributed search and retrieval functions and corresponding site interfaces.

Data Server Subsystem (DSS): The subsystem provides the physical storage access and management functions for the ECS earth science data repositories. Other subsystems can access it directly or via the data management subsystem (if they need assistance with searches across several of these repositories). The subsystem also includes the capabilities needed to distribute bulk data via electronic file transfer or physical media. Other components include, for example, administrative software to manage the subsystem resources and perform data administration functions (e.g., to maintain the database schema); and data distribution software, e.g., for media handling and format conversions. The main components of the subsystem are the following:

- database management system - uses an off-the-shelf DBMS to manage its earth science data and implement spatial searching, as well as for the more traditional types of data (e.g., system administrative and operational data). It will use a document management system to provide storage and information retrieval for guide documents, scientific articles, and other types of document data.

- file storage management systems - used to provide archival and staging storage for large volumes of data. Provides hierarchical storage support and device/media independence to the remainder of DSS and ECS.

- data type libraries - they will implement functionality of earth science and related data that is unique and not available off-the-shelf (e.g., spatial search algorithms and translations among coordinate systems). The libraries will interface with the data storage facilities, i.e. the database and file storage management systems.

Ingest Subsystem (INS): The subsystem deals with the initial reception of all data received at an ECS facility and triggers subsequent archiving and processing of the data. Given the variety of possible data formats and structures, each external interface, and each ad-hoc ingest task may have unique aspects. Therefore, the ingest subsystem is organized into a collection of software components (e.g., ingest management software, translation tools, media handling software) from which those required in a specific situation can be readily configured. The resultant configuration is called an ingest client. Ingest clients can operate on a continuous basis to serve a routine external interface or they may exist only for the duration of a specific ad-hoc ingest task.

Data Processing Subsystem (DPS): The main components of the data processing subsystem - the science software - will be provided by the science teams. The data processing subsystem will provide the necessary hardware resources, as well as software for queuing, dispatching and managing the execution of the science software in an environment which will eventually be highly distributed and consist of heterogeneous computing platforms. The DPS also interacts with the DSS to cause the staging and de-staging of data resources in synchronization with processing requirements.

Planning Subsystem (PLS): This subsystem provides the functions needed to pre-plan routine data processing, schedule on-demand processing, and dispatch and manage processing requests. The subsystem provides access to the data production schedules at each site, and provides management functions for handling deviations from the schedule to operations and science users.

System Management Subsystem (MSS): The Management Subsystem (MSS) provides enterprise management (network, system and application management) for all ECS resources: commercial hardware (including computers, peripherals, and network routing devices), commercial software, and custom applications. Enterprise management reduces overall development and equipment costs, improves operational robustness, and promotes compatibility with evolving industry and government standards. Consistent with current trends in industry, the MSS thus manages both ECS's network resources per EBnet requirements and ECS's host/application resources per SMC requirements. Additionally MSS also supports many requirements allocated to SDPS and FOS for management data collection and analysis/distribution.

The MSS allocates services to both the system-wide and local levels. With few exceptions, the management services will be fully decentralized and no single point of failure exists which would preclude user access. In principle, every service is distributed unless there is an overriding reason for it to be centralized. MSS has two key specializations: Enterprise Monitoring and Coordination Services, and Local System Management Services.

Communications Subsystem (CSS): The CSS services include Object Services, Distributed Object Framework (DOF) and Common Facility Services. Support in this subsystem area is provided for peer-to-peer, advanced distributed, messaging, management, and event-handling communications facilities. These services typically appear on communicating end-systems across an internetwork and are not layered, but hierarchical in nature. Additionally, services to support communicating entities are provided, including directory, security, time, and other ancillary services. The services of the Communications Subsystem are functionally dependent on the services of the Internetworking Subsystem. The services of the common facility, object and DOF are the fundamental set of interfaces for all management and user access (i.e., pull) domain services.

Internetworking Subsystem (ISS): The Internetworking Subsystem provides for the transfer of data transparently within the DAACs, SMC and EOC, and for providing interfaces between these components and external networks. ECS interfaces with external systems and DAAC-to-DAAC communications are provided by the EOSDIS Backbone Network (EBnet). EBnet's primary function is to transfer data between DAACs, including both product data and inter-DAAC queries and metadata responses. Other networks, such as NSI, will provide wide-area services to ECS. In addition, "Campus" networks, which form the existing networking infrastructure at the ECS locations, will provide connectivity to EOSDIS components such as SCFs and ISTs.

3.3.2 Software Subsystem Analysis Summary

The software subsystem analysis summary addresses the CSCIs that are included in the SMC configuration. In general, the CSCIs developed for the LSM at each DAAC, provide all the functionality necessary to satisfy the SMC mission at Release B. When differences occur between the version of software at the DAAC and that at the SMC, they will be due more to things like database content and schema constructs rather than to application software. The following descriptions serve to highlight specific differences in the SMC implementation of the software subsystems.

- Communications Subsystem (CSS) - The CSS provides a number of services in support of the distributed computing architecture designed for the ECS. The SMC uses these services for communication with the DAACs and external systems. The ECS also provides a bulletin board service that supplies users with registration and toolkit information. This bulletin board service is incorporated into the SMC design as a security measure to preclude unauthorized access to ECS resources.

- Management Subsystem (MSS) - The MSS is composed of a variety of management applications, providing services such as fault management, performance management, security management and accountability management of ECS networks, hosts, and applications. Two tiers of "view" (domain of management service interface) are provided by the applications in this subsystem. The SMC has both a local management view (of itself) and an enterprise-wide view, of all DAACs.

- Internetworking Subsystem (ISS) - The Internetworking Subsystem provides for the transfer of data transparently within the DAACs, SMC and EOC, and for providing interfaces between these components and external networks. ECS interfaces with external systems and DAAC to DAAC communications are provided by the EOSDIS Backbone Network (EBnet). EBnet's primary function is to transfer data between DAACs, including both product data and inter-DAAC queries and metadata responses. Other networks, such as NSI, will provide wide-area services to ECS. In addition, "Campus" networks, which form the existing networking infrastructure at the ECS locations, will provide connectivity to EOSDIS components such as SCFs and ISTs.

- Planning Subsystem (PLS) - Only a subset of the Planning functionality will be configured at the SMC. This will specifically support schedule coordination and adjudication. It is expected that the actual development code and COTS packages required at the SMC will not be unique, however, it is likely that configuration and database information will be specific.

Table 3.3.2-1 lists the ECS subsystems and associated CSCIs and CSCs. For each CSC, there is an indication of the type of component. As defined in the DID 305 subsystem-specific documents, type indicates whether the component is custom developed (DEV), off the shelf (OTS), a CSC reused from another subsystem (reuse), a wrapper (WRP), or a combination of these types. The Use column indicates whether a generic (Gnrc) form of the CSC is implemented or specific (Spf) tailoring or use is required at a DAAC. The Notes column is included to comment about the characteristics of the system, data, and/or software that makes the CSC specific, as well as to provide any additional information about the generic CSCs. This column also identifies the OTS product, if currently know.

Table 3.3.2-1. SMC Components Analysis (1 of 4)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Client	DESKT	Desktop Manager	DEV	Gnrc	
Client	WKBCH	Comment/Survey Tool	OTS/ DEV	Gnrc	WWW Browser
Client	WKBCH	Data Acquisition Request Tool	DEV	Gnrc	
Client	WKBCH	Data Dictionary Tool	DEV	Gnrc	
Client	WKBCH	Document Search Tool	OTS	Reuse	CSS-provided
Client	WKBCH	Earth Science Search Tool	DEV	Gnrc	
Client	WKBCH	E-mailer Tool	OTS	Reuse	CSS-provided
Client	WKBCH	Hypertext Authoring Tool	OTS	Gnrc	MS Office / TBD public domain
Client	WKBCH	Hypertext Viewer	OTS	Gnrc	WWW Browser
Client	WKBCH	Logger/Reviewer Tool	DEV	Gnrc	
Client	WKBCH	News Reader Tool	OTS	Reuse	CSS-provided
Client	WKBCH	Product Request Tool	DEV	Gnrc	
Client	WKBCH	Session Management Tool	DEV	Gnrc	
Client	WKBCH	User Preferences Tool	DEV	Gnrc	
Client	WKBCH	User Registration Tool	DEV	Gnrc	
Client	WKBCH	Visualization Tool	DEV	Gnrc	
Communication	DCCI	Bulletin Board	OTS	Reuse	CSS-provided
Communication	DCCI	Directory/Naming Services	OTS/ DEV	Gnrc	OODCE

Table 3.3.2-1. SMC Components Analysis (2 of 4)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Communication	DCCI	Distributed File System (DFS)	OTS	Gnrc	DCE
Communication	DCCI	DOF Services	OTS	Gnrc	OODCE
Communication	DCCI	Electronic Mail Services	OTS/ DEV	Gnrc	native operating system
Communication	DCCI	Event Logger Services	OTS/ DEV	Gnrc	DCE
Communication	DCCI	File Access Services	OTS/ DEV	Gnrc	ftp, kftp, DCE
Communication	DCCI	Life Cycle Services	OTS/ DEV	Gnrc	OODCE
Communication	DCCI	Message Passing Services	OTS/ DEV	Gnrc	Developed with OODCE
Communication	DCCI	Security Services	OTS/ DEV	Gnrc	OODCE
Communication	DCCI	Thread Services	OTS	Gnrc	OODCE
Communication	DCCI	Time Services	OTS/ DEV	Gnrc	OODCE
Communication	DCCI	Virtual Terminal Services	OTS	Gnrc	native operating system
Internetworking	INCI	Datalink/Physical	OTS	Gnrc	firmware, vendor-supplied with hardware
Management	MACI	Application MIB	DEV	Gnrc	
Management	MACI	ECS Subagent	DEV	Gnrc	
Management	MACI	Encapsulator for non-Peer Agent	OTS/ DEV	Gnrc	OptiMate
Management	MACI	Extensible SNMP Master Agent	OTS/ DEV	Gnrc	Peer Network's agent, along with its toolkit for Dev
Management	MACI	Instrumentation Class Library	DEV	Gnrc	
Management	MACI	Management Agent Services	OTS/ DEV	Gnrc	Peer and Tivoli/Sentry
Management	MACI	Proxy Agent	DEV	Gnrc	
Management	MACI	SNMP Manager's Deputy	DEV	Gnrc	
Management	MCI	Accountability	DEV	Gnrc	
Management	MCI	Application Management	DEV	Gnrc	
Management	MCI	Automatic Actions	DEV	Gnrc	
Management	MCI	Billing and Accounting Management	OTS/ DEV	Gnrc	ITS selection in progress

Table 3.3.2-1. SMC Components Analysis (3 of 4)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Management	MCI	DCE Cell Management	OTS	Gnrc	HP Account Manager Toolr
Management	MCI	Diagnostic Tests	OTS	Gnrc	vendor-supplied with hardware
Management	MCI	Fault Management	OTS/ DEV	Gnrc	Tivoli and HP OpenView
Management	MCI	Management Data Access	DEV	Gnrc	
Management	MCI	Management Data Access User Interface	DEV	Gnrc	
Management	MCI	Management Framework	OTS	Gnrc	HP OpenView Network Node Manager
Management	MCI	Management Proxy	DEV	Gnrc	
Management	MCI	Mode Management	DEV	Gnrc	
Management	MCI	Network Manager	OTS	Gnrc	HP OpenView Network Node Manager
Management	MCI	Performance Management	OTS/ DEV	Gnrc	RFP released
Management	MCI	Performance Management Proxy	DEV	Gnrc	
Management	MCI	Performance Test	OTS	Gnrc	vendor-supplied with hardware
Management	MCI	Physical Configuration Management	OTS	Gnrc	Mountain View
Management	MCI	Physical Configuration Proxy Agent	DEV	Gnrc	
Management	MCI	Report Generation	OTS	Gnrc	No decision yet, evaluation in progress
Management	MCI	Report Generation and Distribution	DEV	Gnrc	
Management	MCI	Report Generation Manager	DEV	Gnrc	
Management	MCI	Resource Class Category	DEV	Gnrc	
Management	MCI	Security Databases	OTS	Gnrc	Operating System Password Files, DCE Registry Database, Router Configuration Files, TCP Wrappers configuration files, Operating System Access Control Lists, DCE Access Control Lists
Management	MCI	Security Management	DEV	Gnrc	

Table 3.3.2-1. SMC Components Analysis (4 of 4)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Management	MCI	Security Management Proxy	DEV	Gnrc	
Management	MCI	Security Tests	OTS	Gnrc	CRACK, COPS, SATAN, TRIPWIRE
Management	MCI	Trouble Ticketing Management Service	OTS	Gnrc	Remedy Action Request System
Management	MCI	Trouble Ticketing Proxy Agent	DEV	Gnrc	
Management	MCI	Trouble Ticketing Service Requester	DEV	Gnrc	
Management	MCI	Trouble Ticketing User Interface	DEV	Gnrc	
Management	MCI	User Contact Tool	OTS/ DEV	Gnrc	Remedy
Management	MCI	User Profile Server	DEV	Gnrc	
Management	MLCI	Baseline Manager	OTS/ DEV	Gnrc	XRP II
Management	MLCI	Configuration Management	OTS	Gnrc	ClearCase
Management	MLCI	Inventory/Logistics/ Maintence (ILM) Manager	OTS/ DEV	Gnrc	Vendor evaluation in progress
Management	MLCI	Policies and Procedures Management	DEV	Gnrc	
Management	MLCI	Software Change Manager	OTS/ DEV	Gnrc	ClearCase
Management	MLCI	Software Distribution Management Structure	OTS/ DEV	Gnrc	ClearCase and Tivoli
Management	MLCI	Software Request Manager	OTS/ DEV	Gnrc	DDTS
Management	MLCI	Training Management	DEV	Gnrc	
Planning	PLANG	Production Planning Workbench	DEV	Gnrc	

3.4 DAAC Hardware and Network Design

This section provides an overview of the hardware configuration currently envisioned to support the Release B mission of the SMC. Included below are details with respect to the Release B network architecture presented in Section 3.4.1 and the hardware design, presented in Section 3.4.2.

3.4.1 SMC Network Architecture

The SMC network architecture remains unchanged from Release A. As illustrated in Figure 3.4.1-1, it consists of two FDDI LANs. The Enterprise Communications Server and the Enterprise Management Server connect directly to one of the FDDI rings, and the Management Workstations and printers are attached to Ethernet networks bridged to the FDDI ring via an Ethernet-to-FDDI hub. Since the Bulletin Board Server (BBS) is accessible by the general public, it is attached to a separate FDDI ring to facilitate increased security and to segregate BBS traffic from the rest of the SMC. The two SMC FDDIs connect to the ECS GSFC DAAC router, which provides the SMC interface both to EBnet (for communication with DAACs) and NSI (for communication with the general Internet). The router provides all required filtering and routing controls; refer to Section 5.5.4 in the Overview document for a more detailed description of the SMC network security architecture.

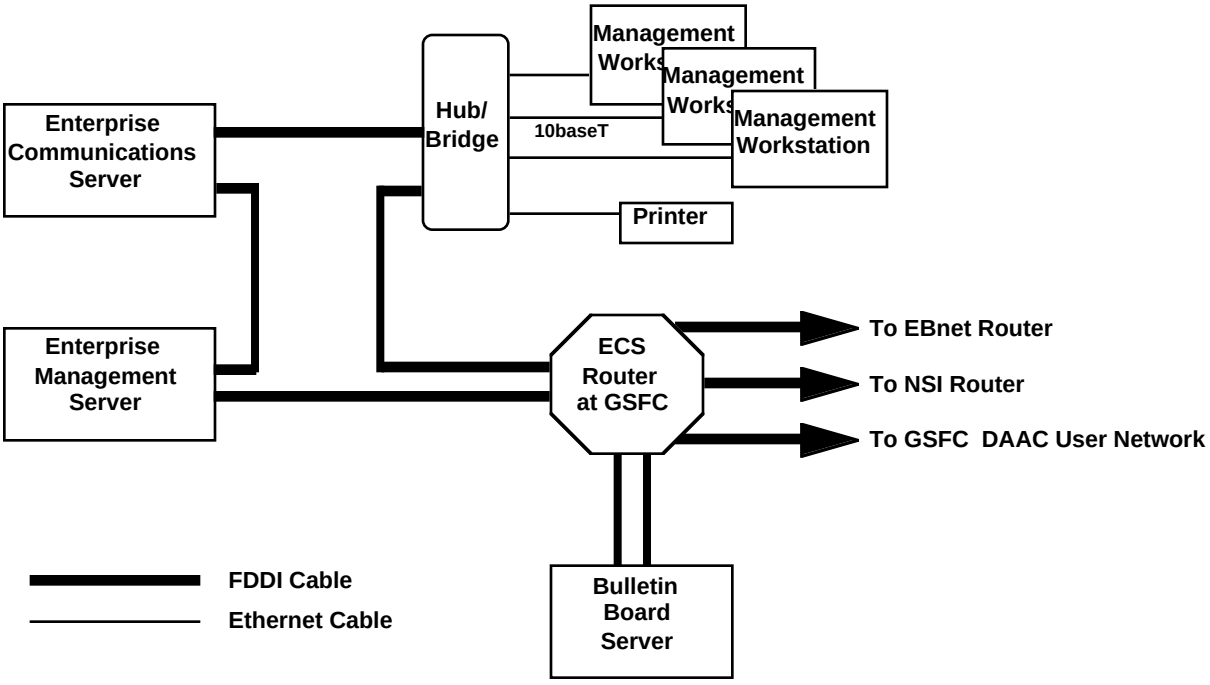


Figure 3.4.1-1. SMC Network Architecture

Because the SMC has been assigned requirements dictating very high availability, the FDDI LANs will be implemented via physically wired rings as opposed to concentrators. Physical rings eliminate concentrator hardware from the network and create a less complex topology,

thereby increasing availability. The use of physical rings is feasible in this case due to the very small number of hosts on the FDDI network (two hosts on one ring and one host on the other). Of course, the workstations and printers will be attached to the Ethernet-to-FDDI hub, which will in turn be part of the physically wired FDDI ring.

The quantities of networking hardware components for the SMC are presented in Table 3.4.1-1. These are the same quantities present during Release A: ECS is providing no additional network equipment to the SMC in Release B.

Table 3.4.1-1. Networking Hardware for SMC LAN

Networking Component	Quantity	Comments
FDDI Cables	6	Multimode fiber cables with MIC connectors
FDDI-to-Ethernet Hub	1	Connects printers and workstations
Ethernet Cables	6	10baseT connection to printers and workstations
Router/FDDI Switch	1	This is the GSFC DAAC User Network router

3.4.1.1 Sizing/Performance Rationale

Although the total network traffic appearing on the networks to which SMC servers are attached is fairly low (e.g., less than 5 Mbps peak), an FDDI network was chosen for RMA considerations. A major advantage in using FDDI is its inherent redundancy: If any portion of the FDDI ring is severed or damaged, the wiring will automatically reconfigure itself to "heal" around the failure, enabling full and uninterrupted connectivity to continue. FDDI also provides sparing advantages both for the SMC hosts (in terms of the availability of FDDI replacement hardware) and for the Router (in terms of it being implemented via the same hardware as is chosen for the DAAC FDDI switches).

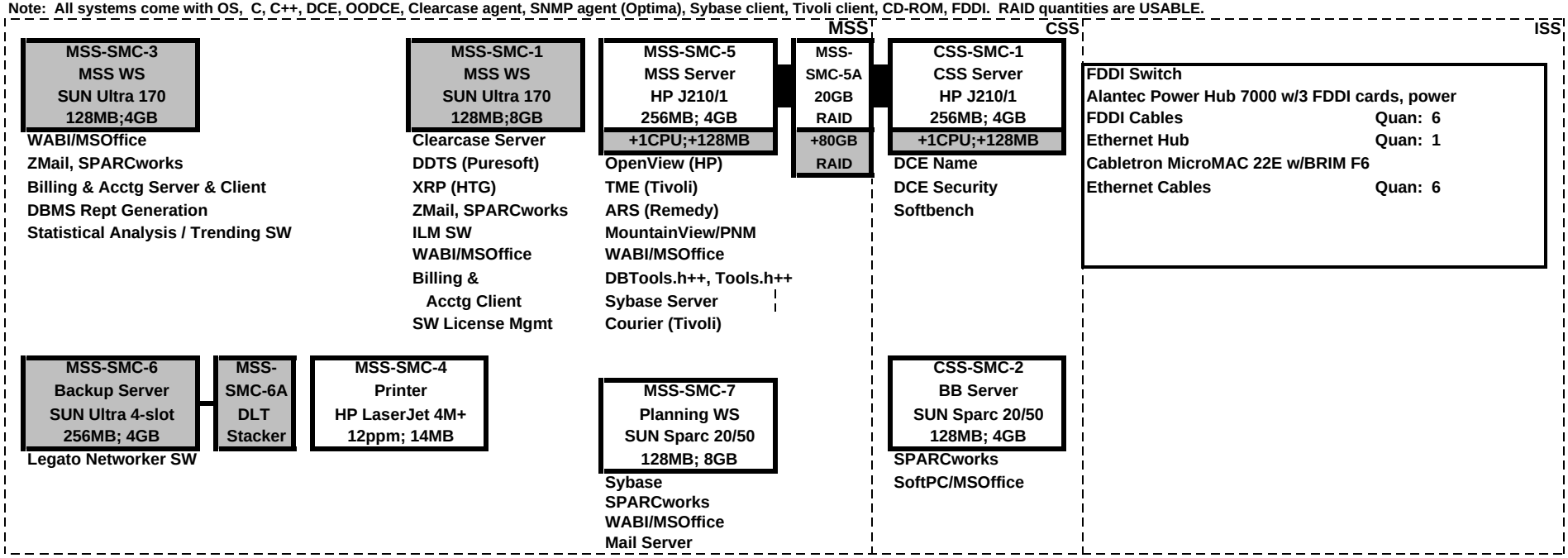
3.4.2 SMC Hardware Configuration

The SMC hardware configuration, as illustrated in Figure 3.4.2-1, *SMC Hardware Configuration Diagram*, is by and large identical to the MSS and CSS subsystem designs for the LSM at each DAAC, with the exception of the bulletin board server which resides only at the SMC. The remainder of this section provides the detailed hardware design and rationale for the MSS and CSS subsystems for Release B. These configurations represent the candidate hardware selections which most closely satisfy the processing, storage capacities and communications bandwidth requirements described in the following sections. In some cases the selected configuration appears to significantly exceed the requirements to due to the sizing increments provided by the selected vendor, when in reality, our analysis and selection process has provided cost effective solutions to each problem.

SMC at Rel B

Added for Release B

Note: All systems come with OS, C, C++, DCE, OODCE, Clearcase agent, SNMP agent (Optima), Sybase client, Tivoli client, CD-ROM, FDDI. RAID quantities are USABLE.



3.4.2.1 Client Subsystem

There is no dedicated hardware support for the Client Subsystem. The Client software configurations are supported by ECS provided workstations utilizing Client software in support of operations users at the SMC.

3.4.2.2 Data Server Subsystem

No hardware support for the Data Server Subsystem is required at the SMC.

3.4.2.3 Data Management Subsystem

No hardware support for the Data Management Subsystem is required at the SMC.

3.4.2.4 Ingest Subsytem

The SMC facility does not ingest data, therefore no hardware support is required at the SMC.

3.4.2.5 Interoperability Subsystem

No hardware support for the Interoperability Subsystem is required at the SMC.

3.4.2.6 Production Planning Subsystem

There is no dedicated hardware support for the Client Subsytem. The Planning software utilized at the SMC is supported by the Management Subsystem hardware.

3.4.2.7 Data Processing Subsystem

No hardware support for the Data Processing Subsystem is required at the SMC.

3.4.2.8 MSS and CSS Subsystems

The MSS and CSS Subsystem hardware have been sized and configured in a redundant configuration in order to provide for high availability of communications infrastructure and management services. The sizing rationale, therefore, applies to both MSS and CSS servers and will be presented in a single subsection.

The MSS Subsystem consists of a single hardware configuration item (MSS-MHWCI), which provides the servers, workstations, and printers needed for all local system management functions. The MSS-MHWCI provides processing and storage for the following MSS software components:

- Management Software Configuration Item (MCI) - provides system monitoring and control (via HP Openview), the database management system (Sybase), trouble ticketing (Remedy), fault and performance management (Tivoli), physical configuration management (Accugraph), security management, accountability management, billing and accounting system, mode management service, performance trending capability, report

generation and distribution, and management data access (custom code / scripts used to import log file data to the relational data base management system)

- Management Logistic Configuration Item (MLCI) - Site and SMC maintenance and operations staffs will rely on configuration management to provide software change control (Clearcase), change request management (DDTS), baseline management (XRP), inventory/logistics/maintenance (ILM) management, training management, policy and procedure management, software distribution management (Tivoli), and software license management.
- Management Agent Configuration Item (MACI) - Agents are processes used to monitor and/or control managed objects distributed across heterogeneous platforms. Current COTS technology for network management uses network protocols such as simple network management protocol (SNMP to provide a way for the manager, the managed objects, and their agents to communicate. SNMP defines specific messages, referred to as commands, responses, and notifications.

The CSS Subsystem consists of a single hardware CI (CSS-DCHWCI), which provides the server for all CSS functionality. CSS contains a single CI, the Distributed Communications CI, which provides the following services:

- Common Facility Services - includes electronic mail, file access, bulletin board, virtual terminal, and event logger services
- Object Services - includes security, naming, message passing, event, thread, time and life cycle services
- Distributed Object Framework - includes OODCE framework functionality.

3.4.2.8.1 Rationale

The MSS/CSS processing complement for the SMC was designed and sized for both the TRMM and AM-1 missions. The sizing of MSS/CSS subsystem hardware is based on the February 1996 version of the technical baseline. Storage requirements have been rounded upward.

Processing Requirements Processing requirements for the MSS and CSS subsystem at the SMC are driven by the following types of transactions:

- HP Openview data collection from managed objects and ad hoc queries (server)
- Conversion / import of HP Openview and log file data to MSS Sybase DBMS (server)
- DBMS usage for report generation / ad hoc queries (server)
- Fault & performance management notification (server)
- Trouble ticketing (server)
- Order request tracking (server)
- Billing & accounting (workstation)
- Mode management (server)

- Usage for configuration, baseline, training, license, inventory, change request, software distribution, inventory/logistics/maintenance and associated report generation (workstation)
- DCE logical server transactions (directory, security, time).

Server Sizing At Release B, ad-hoc queries will be performed and statistical analysis collected from the Sybase database. Ad-hoc reports will be generated that include the following type of information; user accesses, trend analysis, fault occurrences, resource utilization, data production jobs and security events. Benchmarks are being run on a prototype Sybase database to evaluate performance. The prototype database was developed to do real-time benchmarking queries of designated working attributes that are expected to be of reporting interest (i.e. performance).

DCE has been installed in the EDF and used in the Engineering Packages (EPs). Running on an HP 715, rated at 77 MIPS, the DCE server functions used 8% of the CPU, or approximately 6 MIPS. An analysis was performed to determine how much additional load would be placed on the DCE server at Release B.

The load imposed on the DCE server is a function of the number of directory, security and time look-ups from client applications. A client application maintains its own cache containing the most recently accessed directory and security information, and will only access the server when a user is not found in its own cache. Many client applications will only access other clients in the DAAC, and so will never exceed their cache. CIDM and the Data Server APC, however, will be directly accessed by external user clients and so will need to access directory and security information for each user access. Given that a directory and security lookup typically requires less than 0.5 seconds, it is unlikely that there will be more than 1-2 simultaneous hits on the DCE server. We estimate that 1 additional MIP processor capacity will be sufficient for the level of DCE accesses required.

ECS already has experience with many of the COTS products to be loaded on the MSS server from previous work in Evaluation Packages (EPs) and EDF installations. Based on this experience, a profile of the MSS/CSS server that is operating under nominal load (e.g., HP Openview map is displayed, but no collections are in process) has been developed.

ECS already has experience with many of the COTS products to be loaded on the MSS server from previous work in Evaluation Prototypes (EPs) and EDF installations. Based on this experience, a profile of the MSS/CSS server that is operating under nominal load (e.g., HP Openview map is displayed, but no collections are in process) has been developed. To this, processing requirements have been added for specific types of transactions.

In the EDF, an HP 9000/735/125, rated at 160 MIPS, was loaded with HP Openview, DCE client, Sybase server, X-server, and operating system. Tests were run to examine the impact of various types of HP Openview functions on CPU utilization. HP Openview was configured to discover approximately 500 nodes within EDF and then displayed them as a node map. Minimal status polling was performed at 15 minute intervals. A variety of HP Openview on-line reports were generated to show such items as packet throughput and CPU utilization. During the testing, processes resident on the server were monitored. CPU utilization remained extremely low (i.e., less than 3%) except during operator queries and initialization. At system start-up, initialization

of the various daemons used by HP Openview generated a load of approximately 50%. After start-up, functions that involved initialization of x-windows screens (e.g., generation of the node map or display of a performance graph) generated loads of 25-40% for a brief (less than 15 seconds) period of time. Multiple SNMP queries on a router increased CPU usage to approximately 20 percent, with the primary driver appearing to be the x-windows server. Simultaneous queries of two routers (to two different x-window screens) consumed a total of 50-60% of the CPU. Based on this benchmark, we assume that a basic configuration of a server, including HP Openview, Sybase, DCE client, and the operating system will require approximately 72 MIPS, and will provide adequate resources for routine HP Openview operations at the SMC.

In the EDF "Mini DAAC" facility, Tivoli performance was evaluated on an HP 9000 J210/1 rated at 176 MIPS and with 256 MB of RAM. The Tivoli COTS package will be used primarily for performance management, fault management and software distribution (most likely through Tivoli Courier). Performance will be monitored, statistics collected, and faults detected via Tivoli GUI screens. Tests were run to determine Tivoli GUI screen CPU utilization. The benchmark was performed with one user and the following configuration; the Tivoli application, the platform operating system, xwindows, and the performance tool (glance plus). CPU utilization was minimal as expected with no applications running (.5% of the system CPU) and approximately 56 processes active.

Following initialization of the Tivoli application, CPU utilization remained low (<2%), with the Tivoli Management Enterprise (TME) desktop enabled and 61 processes active. CPU loading became more prevalent when an administration GUI was selected from the TME desktop. Peak utilization was recorded at 9% of the system CPU for a period of 10 seconds and 73 processes active. Max peak CPU utilization (approximately 11%) and IO throughput (13.5 MB/s) was recorded when enabling the policy region desktop. In steady state, CPU utilization measured approximately 3% of the system CPU. Opening multiple GUIs did not increase demands on CPU utilization (remained <11%) but linearly required more memory. The Tivoli vendor for this reason recommends 96 MB of RAM dedicated. Total CPU utilization allocation for Tivoli based on benchmark results is estimated at 11% of the system CPU or 20 MIPS. The targeted platform at each DAAC site will be upgraded from the platform used for benchmark calculations. Recognizing the emphasis by Tivoli for memory and moderate processing needs, additional processing and memory capabilities were added to the MSS management server in Release B to provide adequate resources in support of the Tivoli product.

Remedy was evaluated on the HP 9000/735/125 for CPU utilization. The application required very little CPU allocation (<1%). A more significant load was present when performing browse or ticket assignment functions (approximately 6%). Submittal and processing of a trouble ticket required less than 1% of the CPU capacity.

For billing & accounting, there are expected to be approximately 17,000 total daily user accounts. Each account will be logged and on demand available for information tracking.

The server requirements, as dictated by the rationale given above, is synopsized in Table 3.4.2.8.1-1.

Table 3.4.2.8.1-1. CSS/MSS Server Configuration - Requirements Estimate

Server Load Sources	Estimated R-B MIPS
Basic configuration (includes HP Openview and DCE client)*	72
Sybase Server and Client*	50
Tivoli *	20
Remedy	11
MSS Agent*	3
DCE server (including additional processing for peak directory and security transactions)*	7
Word Processor	1
Spreadsheet	1
Other Common Services (Mail, file transfer, etc.)*	5
Total * These items were considered to be potentially active at the same time.	168

Workstation Sizing There will be two MSS workstations at the SMC. Workstation # 1 will primarily contain the MLCI software. This includes software change management (clearcase), change request management (DDTS), baseline control management (XRP), software license manager and inventory/logistics/maintenance (ILM) management. Policy & procedures management and training management will be configured on workstation # 2. Each MSS Workstation will contain the Sybase client, DCE client, Tivoli client, MSS agent, and operator tools.

The DDTS tool was evaluated for performance in the EDF facility on a Sun Sparc 20/50 rated at approximately 130 MIPS and 64 MB of RAM (DAAC targeted platform will be an upgrade version). DDTS is the change request manager and maintains and tracks potential changes (via configuration change requests) to the ECS System. Configuration change requests (CCRs) will be created, logged into the DDTS database and tracked by a CM specialist. Tests were performed to determine CPU utilization for implementation of these tasks. The benchmark was performed with one user, the DDTS application configured with the platform operating system, xwindows and the performance tool (proctool). Following initialization of the DDTS application, CPU utilization as expected was very low, <1%. For each instance that a CCR was either submitted, modified or logged, the CPU utilization remained below 3% and memory utilization less than 8%. Table 3.4.2.8.1-2 shows that processing utilizations increased significantly when queries were made to the DDTS database.

Table 3.4.2.8.1-2. DDTS Benchmark Results

Benchmark Test	# Records	CPU Utilization (% of system CPU)	Memory Utilization (% of system memory)	IO Throughput (KB/s)
CCR submittal/creation	-	1.4 %	6.6 %	4
CCR registration	-	2.3 %	7.1 %	4
EP4 database query	128	9.7 %	7.2 %	11.3
EP6 database query	279	13.5 %	7.3 %	11.7
EP4 + EP6 database query	407	16.5 %	7.5 %	11.8
DDTS (inclusive) database query	1232	30.8 %	7.5 %	12.2

CPU utilizations ranged from 10% of the system CPU to approximately 30%. The number of records in the development environment is expected to be substantially higher than at the DAAC sites. For this reason, a conservative estimate of a maximum of 400 records is used to result in a CPU utilization allocation of approximately 21 MIPS. Memory utilization and IO throughput were moderate and appeared constant for each test performed.

Processing requirements for baseline management COTS (XRP), was estimated from vendor specifications. For a 30 user system, the XRP vendor specifies a processing requirement of 100 MIPS. Each DAAC site is assigned to have 2 XRP users and therefore will require approximately 7 MIPS.

Vendor specifications suggest an allocation of 35 MIPS for the Clearcase Virgin Object Base (VOB) Server. The VOB server is the most compute intensive of the Clearcase server applications due to its required database processing. In the EDF, Clearcase was installed on a SPARCstation 10, equipped with 120 MB RAM, rated at 109 MIPS, and with an ethernet interface. The SPARCstation 10 was initially used for Tool kit development, as well as CM of the Evaluation Packages. With moderate numbers of users, the SPARCstation 10 provided good performance. At peak use (15-20 simultaneous users viewing items, manipulating the contents of the database, and executing directly out of Clearcase), performance was adversely affected. Usage at the DAAC is not anticipated to require more than 5 simultaneous users, frequency of use is anticipated to be much lower, and applications will not be executed from the Clearcase tool. Additional benchmarks will be run as ECS code and science algorithms become available to help determine the precise Clearcase processing requirements at the DAAC. EDF experience suggests that a workstation configuration in the SPARCstation 20 range should be adequate to support Clearcase, other MLCI COTS, DCE and billing & accounting and tivoli clients.

On MSS Workstation #2, the COTS products expected to exert the larger processing loads are billing and accounting (B&A) and performance trending. Other primary load contributions come from training management, policy and procedures, and the DBMS report generator.

Major B&A processing loads will occur during nightly batch imports from each DAAC site to the sybase server which is not resident to MSS Workstation #2. Processing of B&A transactions such as accounts received, purchase orders placed and products delivered are expected to exert a moderate load on the MSS Workstation due to the expected number of user requests for data as provided by user modeling.

Selection for the performance trending statistical analysis package is in progress. Statistical and historical performance data will be analyzed to assure optimum usage of system resources. A determined number of performance attributes will be analyzed by the statistical tool. Performance trending and other resident COTS packages such as training manager, policy and procedure manager and DBMS report generator are expected to require a small to moderate load on the MSS Workstation.

Tables 3.4.2.8.1-3 and 3.4.2.8.1-4 show configuration requirements for the MSS workstations. They reflect a best estimate of load to be imposed on each MSS workstation. It assumes that most functions run concurrently. Operator functions can be spread across workstations in such a way as to balance processing loads.

Table 3.4.2.8.1-3. MSS Workstation #1 Configuration - Requirements

Workstation Load Sources	Estimated MIPS
Basic configuration (includes Clearcase and Operating System)*	50
Software License Management*	5
DDTS*	21
XRP*	7
Tivoli Client*	5
Sybase Client*	10
Word Processor	1
Spreadsheet	2
Graphics	1
Inventory/Logistics/Maintenance Management	15
MSS Agent*	2
DCE Client*	5
B&A Client*	5
Other Common Services (Mail, file transfer, etc.)	5
Total * These items are considered to be potentially active at the same time	125

Table 3.4.2.8.1-4. MSS Workstation #2 Configuration - Requirements

Workstation Load Sources	Estimated MIPS
Basic configuration (includes Billing & Accounting and Operating System)*	50
Training Management*	5
Performance Trending*	15
DBMS Report Generation*	10
Policy & Procedures*	5
Tivoli Client*	5
Sybase Client*	10
Clearcase Client*	10
Word Processor	1
Spreadsheet	2
Graphics	1
MSS Agent*	2
DCE Client*	5
B&A Client*	5
Other Common Services (Mail, file transfer, etc.)	5
Total * These items are considered to be potentially active at the same time	122

Bulletin Board Sizing—The processing requirements for the bulletin board server, which will be primarily used as an HTML server for general ECS users, are driven by the number of simultaneous user accesses. Based on existing bulletin boards, news servers, and web servers in use by ECS, ESDIS, and V0, a workstation will adequately provide for bulletin board requirements. At GSFC, the ESDIS bulletin board (maintained by the V0 network engineer) was initially maintained on a SUN SPARCstation 10 with 48 MB RAM and 1 GB disk space. Over a 4 day period, an average of 1,950 accesses a day were recorded, with minimal impact on the bulletin board server, which provides support for anonymous ftp, gopher, and web accesses to EOS-related information. Based on this, a SUN SPARCstation20 with 128 MB RAM and 4 GB disk should be adequate, through Release B. Additional storage can be added if required.

Storage Requirements Major datastores for the MSS and CSS subsystems include: HP Openview files, application log files (including request order tracking, billing & accounting and mode management), the Management DBMS, and Clearcase-managed data for software change management.

Other datastores include DCE directory, security data, mail, trouble ticketing, Tivoli, DDTS, baseline control management data (XRP), ILM, billing & accounting client, training management, policy & procedures, and DBMS report generation.

The size of the data storage for HP Openview has been estimated from the determination of the frequency of transmission of the necessary information of all the appropriate attributes of the managed objects during one hour period. It was assumed that fourteen days worth of HP Openview data are stored.

A description of how application log file volume was estimated is in the previous section (Processing Requirements). Log file volume is provided in Table 3.4.2.8.1-1 based on an assumption of fourteen days storage prior to archiving in the data server archive.

The SMC will, in general, receive summary data from each of the sites, and will not store the entire DBMS for a particular site. However, in specific instances, the SMC may wish to perform detailed analyses that involve cross-corelation from sites. The storage requirement for the Management DBMS was based on a worst case assumption that the SMC stores one month's data from each of the Release B sites. The summary data includes billing & accounting, order request tracking and mode management activities.

Storage requirements for Clearcase are based on the assumption that Clearcase will store two copies of all source code (including ECS application source and algorithms) and two copies of all executables. This will enable recovery of the previous version of any application if required. In addition, Clearcase will store test data and configuration files.

Tivoli sizing estimates are based on the number of performance attributes that will be monitored as specified by MSS developers in the Release B CSMS System Management Subsystem Design Specification, (305-CD-029-001, Section 6.6). These include system, application, process, and disk performance metrics. The monitoring frequency is dependent on the performance attribute. A worst case polling frequency of once per minute for all attributes was used in sizing calculations. The size of a typical fault/performance notification was estimated at 256 bytes.

Approximately 400 trouble tickets per day are estimated to be assigned, or approximately 17 per hour. The size of a trouble ticket is approximately 256 characters. Trouble ticket frequency and size are worst case.

To determine DDTS sizing requirements, the frequency non-conformance reports (NCRs) are generated on a daily basis was identified with the report size. A NCR was evaluated due to its similarity to a configuration change request (CCR). The number of CCRs generated at the DAAC sites are not considered to be more then necessary in a developmental environment.

There are expected to be approximately 16 periodic reports that will be produced on a daily, weekly, monthly and annual basis per DAAC site. Reporting areas include data production, fault identification, user accesses, resource utilization, user services activity and trouble ticketing. The size of an average report is estimated to be 15 KB. The aggregate number of reports generated is approximately 1 per hour per DAAC site.

The cumulative datastores of XRP, ILM, billing & accounting client, training management, and policy & procedures was estimated based on vendor provided information and experience in the development facility.

Disk space requirements of the MSS management server COTS applications are listed in Table 3.4.2.8.1-5. These applications will be stored in RAID and available for download to local disk. The RAID device interface is Fast/Wide SCSI which offers application access times comparable with local disk.

Table 3.4.2.8.1-5. COTS Product Disk Requirements

COTS Product	Disk Requirement (MB)
HPOV	2,000
Tivoli	100
Trouble Ticket (Remedy)	50
Sybase Server	1,000
Clearcase	2,000
DCE Server	200
Accugraph	50
TOTAL	5,400

The storage requirement for the Sybase DBMS is estimated to be 85 GB, Clearcase 3.9 GB, Tivoli 114 MB, Remedy 2 MB, DDTS 7 MB, DBMS Report Generator 5 MB, and 145 MB for all other datastores combined. Storage requirements for DCE directory and security stores are based on the number of predicted users as provided by user modeling. The total storage requirement for CSS is estimated to be 496 MB for Release B as specified in Table 3.4.2.8.1-6.

Additional RAID storage is allocated for safegurad of HP Openview functions and storage of billing and accounting transaction logs. Other real time functions (i.e. Tivoli and Remedy) will be replicated to the CSS server. A copy of all management data will be stored in RAID on a daily basis and safestored into a DLT tape drive via the management backup server. As required, the management data will then be stored into ECS data server archive.

The total storage requirement for Release B is estimated to be between 95 and 98 GB as specified in Table 3.4.2.8.1-7.

Table 3.4.2.8.1-6. SMC CSS Release B Storage Requirement

CSS Data Store	# of Users	Size of Record (# Bytes)	14-Day Storage Requirements (MB)
DCE Directory	17,000	1,000	238
DCE Security	17,000	1,000	238
Mail	348	4,000	20
Total Storage Requirement			496

Table 3.4.2.8.1-7. SMC MSS Release B Storage Requirements

Datastore	Freq. of Events/Hr	Size in Bytes/ Transaction	Size in Bytes Transmitted/Hr	Storage Requirements (MB)
HP Openview Datastore	13,884	4	55,536	19
Sybase DBMS				84,423
Clearcase				4,000
Tivoli	1320	256	337,920	114
Remedy	17	256	4,352	2
DDTS	8	2400	19,200	7
DBMS Report Generator	9	15,000	135,000	91
Other Datastores (ILM, XRP, B&A client, training, policy & procedures)				145
Application Disk Space Requirements				5,400
Total Storage Requirement				88,801

Processor Selection—Choice of the MSS/CSS Server platform was based on Release B processing requirements, COTS to be hosted on the platform, and price/performance data provided by EDS. HP is the preferred vendor, since HP Openview and OODCE will be principal COTS products on these platforms, and HP is one of the principal developers of DCE and OODCE. Workstations throughout the DAACs and SMCs are Sun SPARCs, with specific configurations varying by subsystem and DAAC.

3.4.2.8.2 Configuration

The SMC will contain two primary servers for its configuration, cross-strapped to RAID disk to enable warm backup. MSS and CSS applications will run on separate processors but in case of contingency, either system will be capable of running both subsystems. Two workstations will be provided for management operations and data analysis. A bulletin board server will provide support for general user access to ECS-related data and registration activities. A planning workstation will be provided primarily for schedule coordination between DAAC sites. The SMC will receive product generation schedules from each DAAC site and perform analysis and recommend adjustments for cross DAAC schedule dependencies. A management backup server will be provided for daily safestore of all management data. The selected storage device will be a DLT tape drive which offers improved performance/capacity over a traditional helical scan drive.

In addition, two PCs will be provided and loaded with a billing and accounting client to support the billing and accounting activity. Specific billing & accounting functions that will be performed at the SMC include maintaining of the general ledger and financial reporting.

The following configuration will be provided for the SMC LSM for Release B, which includes the MSS MHWCI and the CSS DCHWCI.

- MSS Local Management Server and CSS Communications Server: 2 HP 9000 J210/2 processors, 384 MB of RAM and 4 GB of storage.
- RAID Storage: 144 GB total storage
- Workstations:
  - 1 Sun SPARC Ultra 170, 128 MB of RAM and 8 GB of storage (This workstation will house configuration management software)
  - 1 Sun SPARC Ultra 170, 128 MB of RAM and 4 GB of storage
- Planning Workstation
  - 1 Sun SPARC 20/50, 64 MB of RAM and 4 GB of storage
- Bulletin Board Server
  - 1 Sun SPARC 20/50, 128 MB of RAM and 4 GB of storage
- Management Data Backup Server
  - 1 Sun Ultra 4-slot with 128 MB of RAM and 4 GB of storage

- PCs
  - 2 Intel 486/DX, 66 MHz, 16 MB of RAM and 200 MB of local storage
- Printer
  - 1 HP Laser Jet 4M+ Printer, 12 ppm/14 MB

The HP 9000 J210 is a high performance processor specifically designed for compute intensive and graphic applications.

3.5 Software/Hardware Mapping

Table 3.5-1 provides a mapping of SMC Release B software components to hardware.

Table 3.5-1. SMC Software to Hardware Mapping (1 of 4)

HWCI /units	Subsystem	CSCI	CSC
CSS/BB Server	CSS	DCCI	Bulletin Board Services
CSS/CSS Server	CSS	DCCI	Directory/Naming Services
CSS/CSS Server	CSS	DCCI	DOF Services
all workstations and hosts	CSS	DCCI	Electronic Mail Services
all workstations and hosts	CSS	DCCI	Event Logger Services
all workstations and hosts	CSS	DCCI	File Access Services
all workstations and hosts	CSS	DCCI	Life Cycle Services
all workstations and hosts	CSS	DCCI	Message Passing Services
none	CSS	DCCI	Multicast
CSS/CSS Server	CSS	DCCI	Security Services
all workstations and hosts	CSS	DCCI	Thread Services
all workstations and hosts	CSS	DCCI	Time Services
CSS/CSS Server	CSS	DCCI	Virtual Terminal Services
MSS/MSS workstations or MSS/MSS Local System Management server	ISS	INCI	Datalink/Physical
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MACI	Application MIB
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MACI	DCE Proxy Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MACI	ECS Subagent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MACI	Encapsulator for non-Peer Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MACI	Extensible SNMP Master Agent

Table 3.5-1. SMC Software to Hardware Mapping (2 of 4)

HWCI /units	Subsystem	CSCI	CSC
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MACI	Instrumentation Class Library
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MACI	SNMP Manager's Deputy
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Accountability Manager
MSS/MSS Local System Management server or CSS/CSS Server	MSS	MCI	Accountability Proxy Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Application Management
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Automatic Actions
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	BAAC Configuration (Billing And Account.)
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	BAAC Manager QO
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	BAAC Proxy Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	DCE Cell Management
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Diagnostic Tests
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Management Data Access Services
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Management Data Access User Interface
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Management DBMS
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Management DBMS Proxy Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Management Framework
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Management Proxy
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Mode Management
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Network Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Performance Management Proxy
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Performance Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Performance Test

Table 3.5-1. SMC Software to Hardware Mapping (3 of 4)

HWCI /units	Subsystem	CSCI	CSC
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Performance Trending
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Physical Configuration Manager
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Physical Configuration Proxy Agent
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Report Generation and Distribution
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Report Generation Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Report Generation Proxy Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Report Generation User Interface
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Report Generator
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Resource Class Category
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Security Databases
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Security Management Proxy Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Security Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Security Tests
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Transaction Generator
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Trouble Ticketing Management Services
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Trouble Ticketing Proxy Agent
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	Trouble Ticketing Service Requester
MSS/MSS Local System Management server CSS/CSS Server	MSS	MCI	Trouble Ticketing User Interface
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MCI	User Profile Server
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Baseline Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Change Request Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Inventory Manager

Table 3.5-1. SMC Software to Hardware Mapping (4 of 4)

HWCI /units	Subsystem	CSCI	CSC
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	License Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Logistics Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Maintenance Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Policies and Procedures Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Software Change Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Software Distribution Manager
MSS/MSS workstations or MSS/MSS Local System Management server	MSS	MLCI	Training Manager
MSS/MSS workstations MSS/MSS Local System Management server	Planning	PLANG	Production Planning Workbench

4. Future Releases

This document has described the design of ECS subsystems for the SMC at Release B of ECS. Two other releases are currently being planned. The next release, Release C is scheduled for deployment in December 1999. There will be a number of evolutionary enhancements associated with Releases C and D including the introduction of Common Object Request Broker Architecture (CORBA) to the communications infrastructure. This and other evolutionary enhancements are identified in the Release Plan Content Description document. As the system design progresses the precise nature of the impact on the SMC will be better understood.

An updated version of this document will be generated for Release C and will reflect the design corresponding to that release. In particular, items which will be reflected include:

CORBA

Evolutionary Enhancements for Information Management, Archive, Science Processing, Mission Operations, Networks and System Management functions.

Two-way Interoperability with ADCs

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Abbreviations and Acronyms

ACMHW	Access Control and Management HWCI
ACRIM	Active Cavity Radiometer Irradiance Monitor
ADC	Affiliated Data Center
ADEOS	Advanced Earth Observing System (Japan)
ADS	Archive data sets
ADSHW	Advertising Service HWCI
ADSRV	Advertising Service CSCI
AITHW	Algorithm Integration & Test HWCI
AITTL	Algorithm Integration and Test Tools (CSCI)
AM	Ante meridian
ANSI	American National Standards Institute
APC	Access/Process Coordinators
API	Application Programming Interface
APID	Application Process Identifier
AQAHW	Algorithm QA HWCI
ASAP	As soon as possible
ASCII	American Standard Code for Information Interchange
ASF	Alaska SAR Facility (DAAC)
ATM	Asynchronous Transfer Mode
BBS	Bulletin Board Server
CCB	Configuration Change Board
CCR	Configuration Change Request
CCSDS	Consultative Committee for Space Data Systems
CD ROM	Compact disk read only memory
CDR	Critical Design Review
CDRL	Contract Data Requirements List

CERES	Clouds and Earth's Radiant Energy System
CI	Configuration Item
CIESIN	Consortium for International Earth Science Information Network
CLS	Client Subsystem
CM	Configuration Management
CORBA	Common Object Broker Architecture
COTS	Commercial off-the-shelf
CPU	Central processing unit
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSDT	Computer Science Data Types
CSMS	Communications and Systems Management Segment
CSS	Communication Subsystem (CSMS)
DAA	DAN Acknowledge
DAAC	Distributed Active Archive Center
DADS	Data Archive and Distribution System
DAN	Data Availability Notice
DAO	Data Assimilation Office
DAR	Data Acquisition Request
DAS	Data Availability Schedule
DBA	Database administrator
DBMS	Database Management System
DCE	Distributed Computing Environment (OSF)
DCN	Document Change Notice
DDA	Data Delivery Acknowledgment
DDICT	Data Dictionary CSCI
DDIST	Data Distribution CSCI
DDN	Data Delivery Notice
DDSRV	Document Data Server CSCI

DDTS	Distributed Defect Tracking System
DESKT	Desktop CI
DEV	Developed code
DID	Data Item Description
DID	Data Item Description
DIM	Distributed Information Manager
DIMGR	Distributed Information Management CSCI
DIPHW	Distribution & Ingest Peripheral Management HWCI
DLT	Digital Linear Tape
DMGHW	Data Management HWCI
DMS	Data Management Subsystem
DMS	Data Management System
DOF	Distributed Object Framework
DP	Data Processing
DPR	December Progress Review
DPREP	Science Data Pre-Processing CSCI
DPS	Data Processing Subsystem
DR	Data Repository
DRPHW	Data Repository HWCI
DS	Data Server
DSM	Distribution Storage Management
DSS	Data Server Subsystem
DT	Data Type
EBnet	EOSDIS Backbone Network
Ecom	EOSDIS Communications System
ECS	EOSDIS Core System
EDC	EROS Data Center (DAAC)
EDF	ECS Development Facility
EDHS	Electronic Data Handling System

EDOS	EOS Data and Operations System
EGS	EOS Ground System
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
EP	Early Prototype
EP	Evaluation Package
ERS	Earth Resources Satellite
ESDIS	Earth Science Data and Information System
ESDT	Earth Science Data Types
F&PRS	Functional and Performance Requirements Specification
FC	Fiber Channel
FDDI	Fiber distributed data interface
FDF	Flight Dynamics Facility
FOO	Flight-Of-Opportunity
FOS	Flight Operations Segment
FSMS	File and Storage Management System
FTP	File transfer protocol
GB	Gigabyte
GDAO	GSFC Data Assimilation Office
GFLOPS	Giga (billions) Floating Point Operations per Second
GOES	Geostationary Operational Environmental Satellite
GRIB	Gridded Binary
GSFC	Goddard Space Flight Center
GTWAY	Version 0 Interoperability Gateway CSCI
GUI	Graphic user interface
HDF	Hierarchical Data Format
HiPPI	High Performance Parallel Interface
HMI	Human machine interface

HTML	Hypertext Markup Language
http	hypertext transfer protocol
HWCI	Hardware Configuration Item
I&T	Integration and Test
I/O	Input/Output
IAS	Image Assessment System
ICD	Interface Control Document
ICLHW	Ingest Client HWCI
IDL	Interface Definition Language
IEEE	Institute of Electrical and Electronics Engineers
IERS	International Earth Rotation Service
IGS	International Ground Station
IOS	Interoperability Subsystem
IP	International Partner
IR-1	Interim Release 1
IRD	Interface Requirements Document
IS	Ingest Subsystem
ISS	Internetworking Subsystem
IST	Instrument Support Terminal (ECS)
JERS	Japanese Earth Remote-Sensing Satellite
JPL	Jet Propulsion Laboratories
kftp	Kerberos File Transfer Protocol
L0	Level 0
LaRC	Langley Research Center
LIM	Local Information Manager
LIMGR	Local Information Management CSCI
LIS	Lightning Imaging Sensor
LSM	Local System Management
MB	Megabyte

Mbps	Megabits per second
MBps	Megabytes per second
MD	Maryland
MFLOP	Millions of Floating Point Operations per Second
MIPS	Millions of Instructions per Second
MOC	Mission Operations Center
MODIS	Moderate-Resolution Imaging Spectrometer
MPP	Massively Parallel Processor
MRF	Medium Range Forecast
MSFC	Marshall Space Flight Center
MSS	Management Subsystem (CSMS)
MTBF	Mean time between failures
MTTR	Mean time to restore
NCR	Notice of Change Request
NESDIS	National Environmental Satellite Data and Information Service
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration
NSI	NASA Science Internet
NSIDC	National Snow and Ice Data Center (DAAC)
O/A	Orbit/Attitude
ODC	Other Data Center
ODL	Object Description Language
ORNL	Oak Ridge National Laboratory (DAAC)
OSM	Open Storage Manager
OTS	Off-the-shelf
PAM	Permanent Archive Manager
PCI	Peripheral Component Interface
PDPS	Planning and Data Processing System
PDR	Preliminary Design Review

PDS	Production Data Set
PDS	Production Data Specialist
PGE	Product Generation Executive
PGS	Product Generation System
PLNHW	Planning HWCI
PLS	Planning Subsystem
POSIX	Portable Operating System for UNIX
PRONG	Processing CSCI
Q	Quarter
Q/A	Quality Assurance
QA	Quality Assurance
QAC	Quality and Accounting Capsule
RADARSAT	Radar Satellite (Canada)
RAID	Redundant Array of Inexpensive Disks
RAM	Random Access Memory
REL	Release
RID	Review Item Discrepancy
RMA	Reliability, Maintainability, Availability
RTF	Rich Text Format
S/C	Spacecraft
SAA	Satellite Active Archives (NOAA)
SCF	Science Computing Facility
SCSI II	Small Computer System Interface
SDF	Software Development File
SDP	Science Data Processing
SDPF	Sensor Data Processing Facility (GSFC)
SDPS	Science Data Processing Segment
SDPS/W	Science Data Processing Software
SDPTK	SDP Toolkit CSCI

SDSRV	Science Data Server CSCI
SFDU	Standard Format Data Unit
SMC	System Monitoring and Coordination Center
SMP	Symmetric Multi-Processor
SNMP	Simple Network Management Protocal
SPRHW	Science Processing HWCI
SSM/I	Special Sensor for Microwave/Imager
STMGT	Storage Management CSCI
TBD	To be determined
TBR	To be resolved
TCP	Transmission Control Protocol/Internet Protocol
TDRSS	Tracking and Data Relay Satellite System
TONS	TDRSS Onboard Navigation System
TP	Technical Paper
TRMM	Tropical Rainfall Measuring Mission
TSDIS	TRMM Science Data and Information System
UR	Universal Reference
USNO	United States Naval Observatory
V0	Version 0
VC	Virtual Channel
VCDU-ID	Virtual Channel ID
W/S	Workstation
WAIS	Wide Area Information Servers
WAN	Wide Area Network
WKBCH	Workbench CI
WKSHC	Working Storage HWCI
WORM	Write Once Read Many
WS	Working Storage
WWW	World Wide Web