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

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Document No.: 305-CD-034-002

Title: Release B ASF DAAC Design Specification for the ECS Project

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305-CD-034-002

EOSDIS Core System Project

Release B ASF DAAC Design Specification for the ECS Project

March 1996

Hughes Information Technology Systems
Upper Marlboro, Maryland

Release B ASF DAAC Design Specification for the ECS Project

March 1996

Prepared Under Contract NAS5-60000
CDRL Item #046

APPROVED BY

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Hughes Information Technology Systems
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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 *Alaska SAR Facility* (ASF) Distributed Active Archive Center (DAAC) Design Specification describes the ECS subsystems at the ASF ECS DAAC. ECS Subsystem-Specific Design Specifications provide detailed design descriptions of the subsystems. This document shows the specific implementation of that design at the ASF ECS DAAC, including the identification of the specific software, hardware and network configuration for the ASF ECS DAAC.

Keywords: ASF, DAAC, ASF DAAC, DAAC Configuration, DAAC design

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1. Introduction

1.1 Identification

This Release B ASF DAAC 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.

Several of the driving requirements and milestones were initially supported by Release A but are expanded upon for Release B. For example, infrastructure Data Flow, End-to-End Testing and Simulation Readiness Testing were supported early-on by Release A, and are fully supported by Release B during the final phases of testing. Likewise, V0 interoperability is supported by Release A for GSFC, LaRC and EDC DAACs and is expanded to the remaining DAACs in Release B. This concept is carried forward to deliveries subsequent to Release B as well.

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 (SCDO) 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 Coordination (SMC) center.

This document specifically focuses on the ASF DAAC ECS configuration and capabilities at Release B. It is released, and reviewed at the formal 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 ASF ECS DAAC in meeting its objectives. The Release B Overview of SDPS and CSMS (305-CD-020-002) 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. While some DAAC configurations vary depending on the mission/capability requirements for ECS at their DAAC, the ASF DAAC at full ECS capability will include all of the ECS science data processing and communications subsystems except for the processing and planning subsystems.

1.4 Status and Schedule

This submittal of DID 305/DV2 meets the milestone specified in the Contract Data Requirements List (CDRL) for Critical Design Review (pre-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 design of ECS at the ASF DAAC as follows:

Section 1 provides information regarding the identification, scope, 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 ECS design at the ASF DAAC. It includes a description of the DAAC external interfaces, ECS software implementation, including identification of Off the Shelf (OTS) products, hardware configuration and operational activities.

- Subsection 3.1 establishes the context for the technical discussions with an overview of the specific ASF ECS DAAC mission and ASF Release B operations. It identifies the key ECS related mission and operations activities that are supported via the ECS functionality at the DAAC.
- Subsection 3.2 addresses the external interfaces of the ECS subsystems as implemented at ASF ECS DAAC.
- Subsection 3.3 provides a software component analysis. There are 10 ECS data processing and communications subsystems that contain Hardware Configuration Items (HWCIs) and Computer Software Configuration Items (CSCIs). This section addresses the CSCIs and their corresponding lower level Computer Software Components (CSCs). The CSCs are described in detail in their respective subsystem design specification documents. In this section, the CSCs are captured in a single table, broken down by Subsystem/CSCI. The table lists the CSCIs and the associated CSCs. Notes are provided to expand upon generic explanations from the body of the Subsystem Design Specifications to describe what makes the particular CSC specific to the DAAC. In addition, when a CSC is identified as Off-the-shelf (OTS), the candidate product is identified where known.
- Subsection 3.4 provides a DAAC specific discussion of the ECS data processing and communications Hardware Configuration Items (HWCIs). This section identifies the HWCI components and indicates the specific components and quantities that are resident at the DAAC. 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 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 ASF DAAC Design Specification is derived.

194-207-SE1-001	System Design Specification for the ECS Project
209-CD-021-002	Interface Control Document (ICD) Between the EOSDIS Core System (ECS) and the Alaska SAR (Synthetic Aperture Radar) Facility (ASF) Distributed Active Archive Center (DAAC) for the ECS Project
305-CD-020-002	Release B SDPS/CSMS Design Specification Overview for the ECS Project
305-CD-021-002	Release B SDPS Client Subsystem Design Specification
305-CD-022-002	Release B SDPS Interoperability Subsystem Design Specification
305-CD-023-002	Release B SDPS Data Management Subsystem Design Specification
305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification
305-CD-026-002	Release B SDPS Planning Subsystem Design Specification
305-CD-027-002	Release B SDPS Data Processing Subsystem Design 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
305-CD-038-002	Release B System Monitoring and Coordination Center (SMC) Design Specification for the ECS Project
305-CD-039-002	Release B Data Dictionary for the ECS Project Subsystem Design Specification

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.

205-CD-002-002	Science User's Guide and Operations Procedure Handbook for the ECS Project, Part 4: Software Developer's Guide to Preparation, Delivery, Integration and Test with ECS
206-CD-001-002	Version 0 Analysis Report for the ECS Projectand the Version 0 System
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
304-CD-002-002	Science and Data Processing Segment (SDPS) Requirements Specification for the ECS Project
307-CD-004-001 / 329-CD-004-001	Release B Science Data Processing Segment (SDPS) Release and Development Plan for the ECS Project
307-CD-005-001 / 329-CD-005-001	Release B Communications and System Management Segment (CSMS) Release and Development Plan for the ECS Project
311-CD-002-004	Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project
311-CD-003-004	Communications and System Management Segment (CSMS) Database Design and Database Schema Specifications for the ECS Project, Revision 1
313-CD-006-002	Release A CSMS/SDPS Internal Interface Control Document for the ECS Project
402-CD-003-001	Release B System and Segment Integration and Test Plan for the ECS
319-CD-006-001	Project
601-CD-001-004	Maintenance and Operations Management Plan for the ECS Project
604-CD-002-003	Operations Concept for the ECS Project: Part 2B -- Release B
605-CD-002-001	Release B SDPS/CSMS Operations Scenarios
608-CD-001-002	ECS Operations Plan for Release B
705-CD-005-002	ECS Release B SDPS/CSMS Incremental Design Review
160-TP-004-001	User Pull Analysis Notebook for the ECS Project
222-TP-003-008	Release Plan Content Description for the ECS Project
222-TP-005-001	Release B IDR Engineering Plan for the ECS Project
222-TP-010-001	Release B IDR Design Development Plan for the ECS Project
222-WP-002-001	Release B Interface Requirements Analysis, White Paper
420-TP-001-005	Proposed ECS Core Metadata Standard, Version 2.0
420-TP-010-002	Transition to Release B Technical Paper

430-TP-001-001	SDP Toolkit Implementation With Pathfinder SSM/I Precipitation Rate Algorithm
510-TP-003-001	Release B (EOS-AM1/Landsat-7) SDPS/CSMS IDR Review Guide for the ECS Project
423-41-03	Goddard Space Flight Center, EOSDIS Core System (ECS) Contract Data Requirements Document

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3. ASF DAAC Configuration

3.1 Introduction

3.1.1 ASF DAAC Overview

The ASF Distributed Active Archive Center (ASF DAAC) is one of the eight DAACs that are part of the NASA Earth Observing System Data and Information System (EOSDIS). These DAACs are organized to support specific scientific disciplines.

The vision of the ASF DAAC is to advance polar research and earth sciences by supporting scientific and operational applications of remote sensing data to better understand the earth as a system. There are seven components of the ASF Mission Statement. They are to:

1) Acquire, process, distribute and archive remote sensing data in support of research, operational applications and education.

2) Participate in programs for scientific validation and applications of the remote sensing data acquired at the facility.

3) Support users with acquisition planning, data processing tools, field program data, and resident expertise.

4) Implement systems or functions that generate higher level geophysical data products.

5) Preserve and provide access to geophysical data and maps.

6) Design and develop systems to accommodate evolving requirements, changing technology and future sensors.

7) Contribute to education at the university, primary, secondary and community levels through student involvement, lectures, curriculum development, electronic information exchange and tours.

The ASF currently has 13 SAR data sets with data from the ERS-1 and JERS-1 spacecraft. In late 1995, the ASF began to acquire, distribute, store and process SAR data from the ERS-2 platform. Also, this year, the ASF will begin to acquire, distribute, store and process SAR data from the RADARSAT satellite. When these milestones have been reached, the number of ASF SAR datasets will grow to at least 57.

Currently a development effort is underway by the Jet Propulsion Lab (JPL) to upgrade the ASF ground processing systems for the RADARSAT data products. Called the RADARSAT Upgrade, it will provide the ASF with a new ground system that will be used to support ERS-1/2 and JERS-1 as well as RADARSAT. The RADARSAT Upgrade is being delivered to the ASF incrementally, with the last delivery scheduled for January 1998.

This Release B Design Specification establishes the ASF DAAC ECS configuration and capabilities at Release B. These capabilities are selected from two ECS design segments referred to as the Science Data Processing Segment (SDPS) and the Communications and Systems Management Segment (CSMS). More specifically, this document addresses how the ASF's Release B version of SDPS will provide the hardware, software, and operations to:

- o provide information management, data distribution and a high level archive for the SAR data from the ERS-1/2, JERS-1 and RADARSAT spacecraft at the ASF,
- o provide the Earth science community with access to data held by the ECS and the data products resulting from research using these data;
- o support migration of V0 data and to promote exchange of data and research results within the science community and across the multi-agency/multi-national data collection systems and archives; and

Likewise, this document addresses how the ASF Release B version of CSMS will provide the hardware, software, and operations to:

- o provide full functionality and performance to EBnet links among the Distributed Active Archive Centers (DAACs) and Goddard Space Flight Center (GSFC) mission operations and monitoring centers and National Oceanic Atmospheric Administration (NOAA) to support exchange and archive of mission-related science products, and ancillary data sets required by SDPS; and
- o support status exchange between various sites, and the DAACs for both operational and test efforts.
- o to provide full functionality and performance for all System Management functions.

Figures 3.1.1-1 and 3.1.1-2 illustrate the ECS SDPS and CSMS subsystems and their components for Release B. The bulk of this document focuses on the selected elements of the ECS design that are use to achieve Release B objectives at the DAAC. Section 2.1 of this document identifies CDR Design Specifications which provide detailed information on each subsystem.

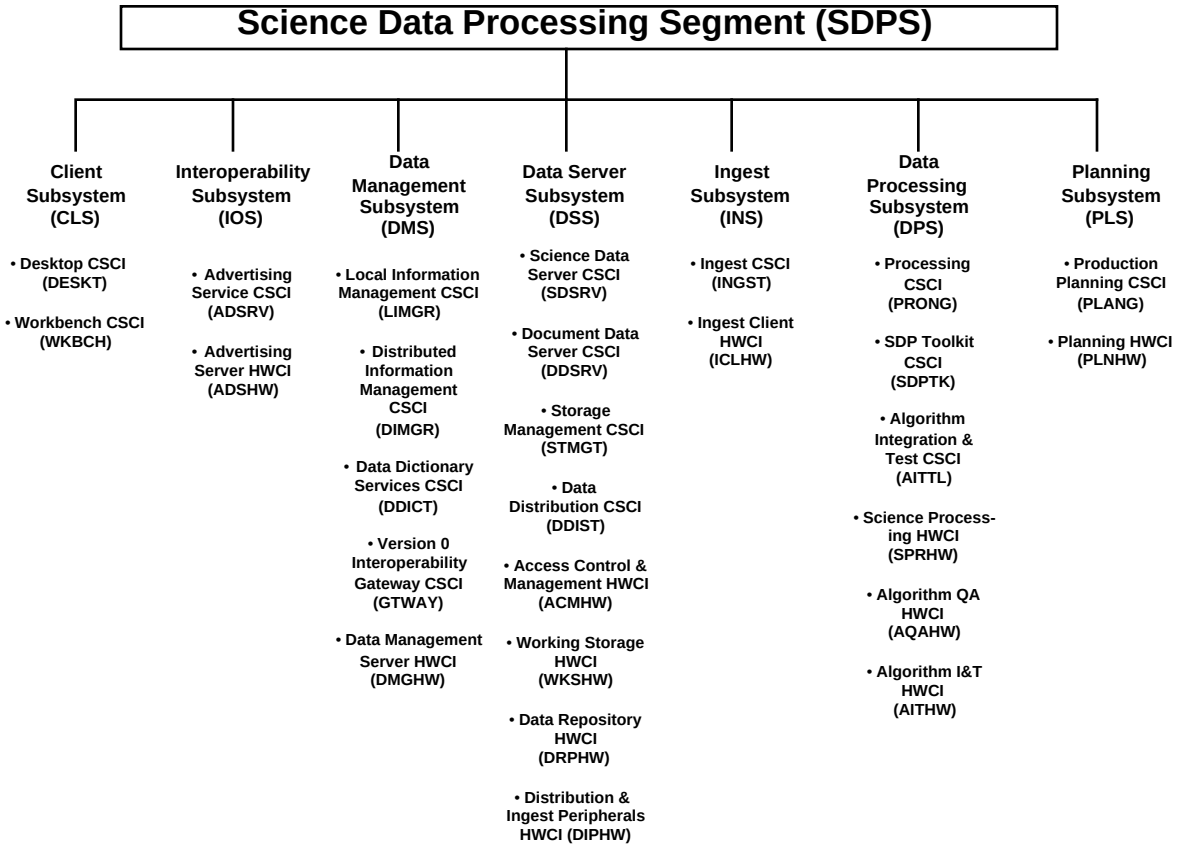

Figure 3.1.1-1. SDPS Subsystems and Configuration Items

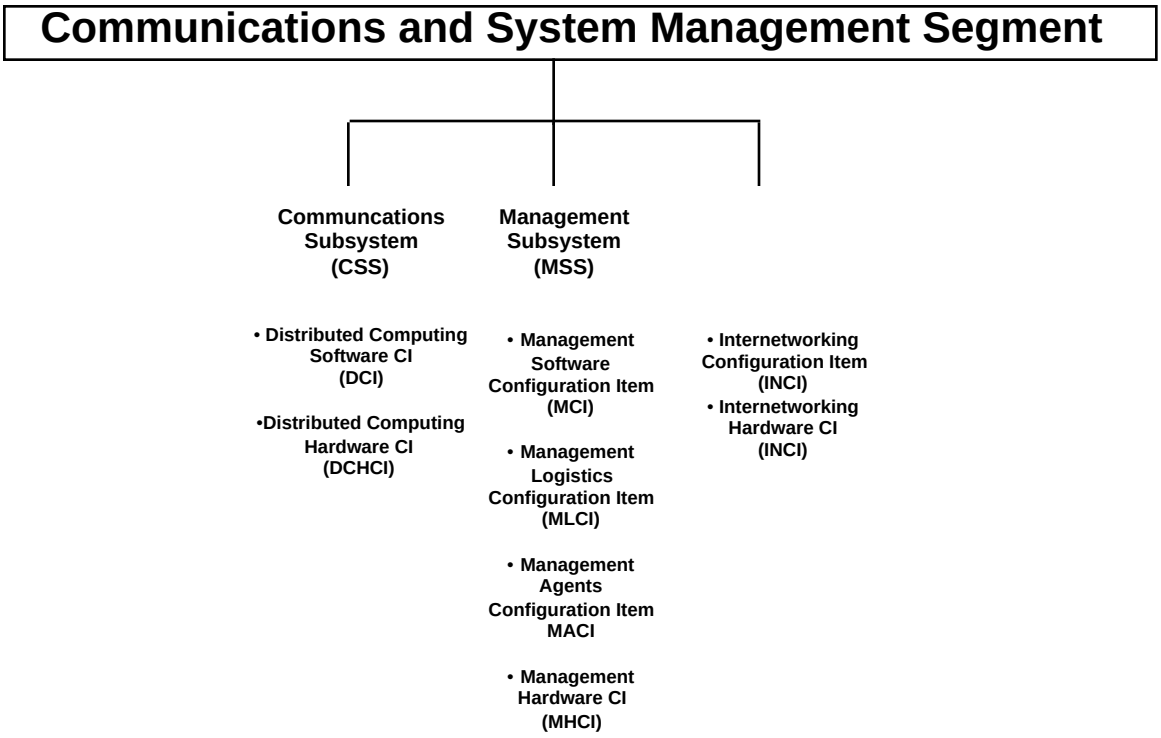

Figure 3.1.1-2. CSMS Subsystems and Components

3.1.2 DAAC-Specific Mission and Operations Activities

The ASF-specific objectives of Release B are to provide the following:

- ERS-1/2, JERS-1 and RADARSAT Support for SAR Data;
- Independent Verification and Validation (IV&V) Support;
- V0/ADC Interoperability;
- V0 Interoperability;
- Version 0 Data Migration;
- DAAC Site Activation.

These objectives are discussed below in more detail.

ERS-1/2, JERS-1 and RADARSAT Support: ECS provides information management (including a catalog of all SAR data holdings), data distribution and a high level archive for the SAR data from the ERS-1/2, JERS-1 and RADARSAT international missions. DAAC-unique components of the ASF will be providing flight operations, processing

and planning capabilities for these spacecraft. A significant challenge for both ECS and ASF will be the ability to integrate these two evolving systems together into a unified whole.

Independent Verification and Validation (IV&V) Support: Prior to the Release Readiness Review (RRR), the IV&V contractor can witness and/or monitor release acceptance testing and document non-conformances. Upon successful completion of the RRR, the IV&V contractor verifies that the ECS release operates correctly within the EOS Ground System (EGS). The ECS contractor, specifically the Independent Acceptance Test Organization (IATO), supports the IV&V contractor in this effort for a period of one month following RRR at the operational sites. The IATO coordinates personnel, facilities, and equipment support in the resolution of ECS non-conformances identified during IV&V testing. ECS contractor Maintenance and Operations personnel also support IV&V activities at operational centers, as necessary.

V0/ADC Interoperability: Two-way interoperability involves two different capabilities. First, outgoing interoperability allows users to log into the ECS and access ECS services, including the ability to access non-ECS data products from a site external to ECS directly from the ECS user interface. Second, incoming interoperability allows users, who are logged into a non-ECS site, to access ECS data products directly from the non-ECS user interface, using non-ECS IMS services.

Two-way Version 0 interoperability prior to the transition from Version 0 to Version 1 ECS is required to ease the transition process. One-way interoperability with ADCs (ECS to ADCs) is also required early to ease the Version 0 transition. Two-way interoperability with ADCs is not required for Release B.

Building from Version 0: ECS will deploy an infrastructure that exceeds that of the V0 system and which will provide the foundation from which to add future enhancements.

Version 0 (V0) Data Migration: Version 0 (V0) data migration includes the ability to transition V0 data sets from V0 to V1; and provide support, data management, search, and access capabilities for these data sets. High priority data sets were defined to be candidate data sets for V0 transition. ASF data migration takes place during Release B operations.

DAAC Site Activation: The EOSDIS DAACs have the mission of processing, archiving and distributing earth science data. While ECS will be helping the DAACs perform these functions in the Release B time frame, many DAACs, like the ASF, are currently performing these functions now.

The ECS contractor will schedule a series of site coordination trips to all DAACs. The objective of these trips is to ensure that the ECS contractor and the DAAC managers are in agreement with all operational issues. When ECS starts to deliver it's systems to the sites, ECS works with the host organizations to ensure that hardware and software installation and segment and system testing all occur in a pre-planned manner that is sensitive to the mission of the host organization. Coordination topics include facility requirements, locations of ECS equipment and personnel, installation and test periods, etc.

Issues of when ECS training is performed, and to whom training is provided are critical because of the potential impact on ECS operations and user support. Training on COTS hardware and software, and application software, regardless of the development track, is an absolute necessity. If the site's user services are unable to handle issues about an ECS product, additional demands on developers' time will be made to isolate, remedy, or suggest work-arounds to the issues.

The facility access dates must be at least 2 months prior to the scheduled initial installation date to provide time for site verification inspection, completion Government facility preparations, and receiving of COTS HW and SW. Installations of HW and SW take between 2 and 6 weeks depending on whether the site is an initial installation (requiring LAN installation) and the quantity and complexity of the configurations to be installed.

After installation, staffing and training of the maintenance and operations staff is accomplished. M&O training occurs in conjunction with the 3-month system integration and acceptance testing.

Another key objective is the ECS transition to Release B. The transition aspects of how this Release B site interoperates with that sites that are transitioning from A must be addressed. Reference the Transition to Release B Technical Paper (240-TP-010-001) for a more detailed discussion.

ECS subsystems provide mission and operations functionality for Release B. Key ECS related mission and operations activities supported by the ASF ECS DAAC include information management (including a catalog of all ASF SAR data holdings), data distribution and a high level data archive.

In addition to automated support, ECS subsystems provide the capability for the ECS operations staff to perform a number of roles in support of these activities. These operational roles for the ASF are identified in Table 3.1.2-1. The table identifies the corresponding SDPS or CSMS subsystem that enables the DAAC ECS operations staff to perform 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.

Table 3.1.2-2. ASF Operations Support Functions

ECS DAAC Operational Roles	Capability
User Services - Support user with data expertise - Generate and maintain data interface	Data Management Subsystem
Data Ingest - Monitor electronic - Handle media	Ingest Subsystem
Archive Management	Data Server Subsystem
Resource Planning	Systems Management Subsystem
Data Distribution - Monitor electronic - Handle media/film	Data Server Subsystem
Resource Management	Ingest, Distribution & Data Server Subsystems in coordination with Systems Management Subsystem
Database Maintenance	Data Management Subsystem Data Server Subsystem Application specific (1)
System and Performance Analysis	Systems Management Subsystem
Security	Systems Management Subsystem
Accounting and Billing	Systems Management Subsystem
Sustaining Engineering	Office Support Systems Management Subsystem Communication Subsystem
S/W and H/W Maintenance	Office Support Systems Management Subsystem Communication Subsystem
Configuration Management (chg control)	Systems Management Subsystem
Testing, training, property management, integrated logistics support, library administration	Office Support Systems Management Subsystem Communication Subsystem

Notes:

(1) Included to ensure that the number of small DBMSs throughout the system are not explicitly excluded

3.2 ASF External Interfaces

Since ECS is not providing the complete suite of ECS components to the ASF, the ECS portion of the ASF DAAC will have many external interfaces. The external interfaces between ECS and ASF are complicated due to differences in design philosophies and implementations between the two systems. ECS requirements state that ECS is to provide API's to the ASF for it to use in interfacing to the ECS system. The ASF system (including the ongoing RADARSAT

development upgrades) has no requirements to interface to the ECS-provided APIs. This disconnect is a known problem and had been referred to the customer for resolution. In the meantime, ECS is defining its side of the interfaces, including the API's, in the Interface Control Document (ICD) between ECS and the ASF (209-CD-021-002). This section of the ASF-specific Design Document is therefore TBD until additional information about the ASF/ECS interface is known.

3.3 Computer Software Component Analysis

The ECS software subsystems are described in detail in the ECS Subsystem-specific DID 305 documents. This section provides a brief overview description of each of the subsystems, then as part of the analysis, addresses the CSCIs for each subsystem, focusing upon those CSCIs that are specific to the ASF ECS DAAC. For the most part, the software is the same for all ECS DAACs. However, the content of databases and schema constructions may differ. In addition, the purchase of different OTS packages for the DAACs may be required.

3.3.1 Software Subsystem Overview

The ECS software subsystems applicable to the ASF are described in detail in the ECS Subsystem-specific DID305 documents. This section provides a brief overview description of these 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 functions which 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): This 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:

- o database management system - uses an off-the-shelf DBMS (Illustra) 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.
- o 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.
- o 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): This subsystem deals with the initial reception of all data received at an ECS facility and triggers subsequent archiving 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 ASF ECS DAAC does not include an ECS Data Processing subsystem. Processing will be done by DAAC-Unique components of the ASF.

Planning Subsystem (PLS): The ASF ECS DAAC does not include an ECS Planning subsystem. Planning functions will be done by DAAC-Unique components of the ASF.

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 to ensure that no single point of failure exists which would preclude user access to the system. 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 across an inter network and are not layered, but are hierarchical in nature. Additionally, services to support communicating entities are provided, included 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 where applicable.

3.3.2 Software Subsystem Analysis Summary

The subsystems that comprise SDPS and CSMS have already been described in detail in companion CDR documents and have been summarized above. This section addresses the CSCIs from each subsystem and identifies their ASF ECS DAAC specifics. Generally, the software is the same for all ECS DAACs. The content of databases and schema constructions may differ. In the case of OTS packages, the possibility arises for the purchase of different versions for different DAAC hardware, but even this will be extremely minimal for Release B. In this section, each of the subsystems will be addressed in a somewhat general manner to point out whether or not there are any ASF DAAC specific portions.

- Client Subsystem - The client software will not have any ASF ECS DAAC specific portions except for the possibility of different versions of OTS packages due to different types of hardware. Since the services offered by the client are required by operations, user services, and systems administrators, the ASF ECS DAAC will have clients installed on several different ECS furnished workstations. In addition the ASF V0 DAAC may desire the client on some of their existing workstations to provide additional user access.

- Data Server - At the ASF, the data servers will store non-signal data products (L1, L2, L3, Browse and Quicklook) as well as non-signal and signal Metadata. They will also distribute this data along with ancillary data to the ASF processors.

The software components of the Data Server Subsystem are largely the same for all Data Servers, at all DAACs. The two basic areas in which the Data Server Subsystem software will vary from DAAC to DAAC are configuration and special components.

Data Server software is designed to be highly configurable in order to allow a wide variety of DAAC unique policy implementations. These unique configurations will enable the data server software installations to vary behavior and meet DAAC specific needs. Examples of configuration parameters include number of concurrent connections, number of requests per client, inactivity time-out period and allocation of software components to hardware.

Another facet of the Data Server Subsystem software that supports the specific DAAC capabilities is in which actual components are installed at the ECS portion of the DAAC. These opportunities for DAAC specificity are driven by the types of distribution available to the DAACs data server clients and in the types of data (and their data type services) available. There will be portions of the Data Server software specific to the ASF DAAC that are used to add special distribution devices (e.g. - 3490 Tape) where necessary.

However, the primary portion of the Data Server Subsystem software that will be specific to the ASF DAAC will be the data types supported at the DAAC. These software components are a portion of the Science Data Server (SDSRV) CSCI. The SDSRV is designed to allow complete flexibility in the data types (specifically, Earth Science Examples of services offered by ESDTs include Insert, Acquire, Browse and Spatial Subset. These data types are organized by separate CSCs, generally one per source instrument - i.e. ERS-1 SAR, ERS-2 SAR, JERS-1 SAR and RADARSAT SAR. Additional information about the ASF instruments can be found in the ECS Technical Baseline.

- Data Management - None of the data management software will be unique to the ASF ECS DAAC. The V0 Gateway (GTWAY) will interface with the data servers at each site. Local and cross-DAAC searches on V0 DAACs' data holdings are provided via capabilities resulting from integrating the components from the V0 System IMS into ECS.

- Ingest - The software portions for ingest at the ASF ECS DAAC may differ from those of other ECS DAACs because of dataset dependencies and differences related to non-homogeneous computer hardware across the three Release B DAACS. Data ingestion procedures must match the peculiarities of the ingested data sets. Several types of ingest clients are described in the Data Server Subsystem companion document. The Ingest Subsystem at the ASF ingests all L0 Metadata and all Ancillary data. Higher level data products and Metadata are 'ingested' by the Data Server Subsystem.

- Interoperability - There are no ASF ECS DAAC specific portions of the Interoperability Subsystem .

- Production Planning - The ASF does not get this ECS subsystem. Instead, ASF planning functions are performed by ASF DAAC-Unique components.

- Data Processing - The ASF DAAC does not get this ECS Subsystem. Instead, ASF data processing functions are performed by ASF DAAC-Unique components.
- Communications Subsystem - There are no ASF ECS DAAC specific portions of this subsystem.
- Systems Management - This subsystem is composed of a variety of management applications, providing services such as fault, performance, security and accountability management for ECS networks, hosts, and applications. Two tiers of "view" (domain of management service interface) provided by the applications in this subsystem. Only the local management view is provided at the ASF ECS DAAC. The MSS capabilities will be available to the non-ECS portions of the ASF through an ECS-provided API.
- Internetworking Subsystem - There are no ASF ECS DAAC specific portions of this subsystem.

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) that encapsulates OTS, or a combination of these types. The USE column indicates whether a generic-for-all-DAACs (Gnrc) form of the CSC is implemented or specific (Spfc) 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. The OTS products are also listed in this column if they are known.

Table 3.3.2-1. ASF Components Analysis (1 of 8)

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	

Table 3.3.2-1. ASF Components Analysis (2 of 8)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
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
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
Data Management	DDICT	Client Library	DEV	Gnrc	
Data Management	DDICT	Configuration/Setup	DEV	Gnrc	
Data Management	DDICT	DBMS Server	OTS	Gnrc	Sybase DBMS
Data Management	DDICT	Maintenance Tool	DEV	Gnrc	
Data Management	DDICT	Persistent Data	DEV	Gnrc	
Data Management	DDICT	Request Processing	DEV	Gnrc	
Data Management	DDICT	Server	DEV	Gnrc	
Data Management	DIMGR	Configuration/Setup	DEV	Gnrc	
Data Management	DIMGR	Server	DEV	Gnrc	
Data Management	GTWAY	Configuration/Setup	DEV	Gnrc	
Data Management	GTWAY	Server	DEV	Gnrc	

Table 3.3.2-1. ASF Components Analysis (3 of 8)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Data Management	GTWAY	V0 Back End	OTS	Gnrc	From V0
Data Management	GTWAY	V0 Client Interface	DEV	Gnrc	
Data Management	GTWAY	V0 External Interface	DEV	Gnrc	
Data Management	GTWAY	V0 Front End	OTS	Gnrc	From V0
Data Management	LIMGR	Client Library	DEV	Gnrc	
Data Management	LIMGR	Configuration/Setup	DEV	Gnrc	
Data Management	LIMGR	Database Interface	OTS	Gnrc	RogueWave DBTools
Data Management	LIMGR	External Interface	DEV	Gnrc	
Data Management	LIMGR	Mapping Layer	DEV	Gnrc	
Data Management	LIMGR	Request Processing	DEV	Gnrc	
Data Management	LIMGR	Server	DEV	Gnrc	
Data Server	DDIST	Distribution Client Interface	DEV	Gnrc	
Data Server	DDIST	Distribution Products	DEV	Gnrc	
Data Server	DDIST	Distribution Request Management	DEV	Gnrc	
Data Server	DDSRV	DDSRV	DEV/ OTS	Gnrc	RogueWave class libraries
Data Server	DDSRV	DDSRV Client	DEV/ OTS	Gnrc	OODCE; RogueWave class libraries
Data Server	DDSRV	DDSRV CSDT	DEV/ OTS	Gnrc	RogueWave class libraries
Data Server	DDSRV	DDSRV ESDT	DEV/ OTS/ Reuse	Gnrc	Reuse from SDSRV; RogueWave class libraries
Data Server	DDSRV	DDSRV Search Engine	DEV/ OTS	Gnrc	Topic and Netscape server
Data Server	DDSRV	DDSRV Server	DEV	Gnrc	Topic API; RogueWave class libraries
Data Server	DDSRV	Gateway	DEV/ OTS	Gnrc	Netscape libraries
Data Server	SDSRV	Administration and Operations	DEV	Gnrc	RogueWave class libraries
Data Server	SDSRV	Client	DEV/ OTS	Gnrc	OODCE; RogueWave class libraries
Data Server	SDSRV	Configuration and Startup	DEV	Gnrc	RogueWave class libraries
Data Server	SDSRV	CSDT	DEV/ OTS	Gnrc	HDF-EOS

Table 3.3.2-1. ASF Components Analysis (4 of 8)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Data Server	SDSRV	DB Wrappers	DEV/ OTS	Gnrc	Illustra DBMS server and API
Data Server	SDSRV	Descriptors	DEV	Gnrc	RogueWave class libraries
Data Server	SDSRV	General ESDT	DEV	Gnrc	RogueWave class libraries
Data Server	SDSRV	Global	DEV/ OTS	Gnrc	RogueWave class libraries
Data Server	SDSRV	GUI	DEV/ OTS	Gnrc	RogueWave class libraries; X≠ 11/Motif
Data Server	SDSRV	Metadata	DEV/ Wrpr	Gnrc	Illustra DBMS API
Data Server	SDSRV	Non-Product Science ESDT	DEV	Gnrc	RogueWave class libraries
Data Server	SDSRV	Non-Science ESDT	DEV	Gnrc	RogueWave class libraries
Data Server	SDSRV	ERS-1 SAR	DEV	Spfc	ESDTs - ERS-1 SAR
Data Server	SDSRV	ERS-2 SAR	DEV	Spfc	ESDTs - ERS-2 SAR
Data Server	SDSRV	JERS-1 SAR	DEV	Spfc	ESDTs - JERS-1 SAR
Data Server	SDSRV	RADARSAT SAR	DEV	Spfc	ESDTs - RADARSAT SAR
Data Server	SDSRV	Server	DEV/ OTS	Gnrc	RogueWave class libraries
Data Server	SDSRV	Subscriptions	DEV/ OTS	Gnrc	RogueWave class libraries
Data Server	STMGT	Data Storage	DEV/ OTS	Gnrc	AMASS File Storage Management System
Data Server	STMGT	File	DEV	Gnrc	
Data Server	STMGT	Peripherals	DEV	Gnrc	This CSC encapsulates the CSS≠ supplied API which supports the OTS FTP product.
Data Server	STMGT	Resource Management	DEV	Gnrc	
Data Server	STMGT	Service Clients	DEV/ OTS	Gnrc	CSC encapsulates the AMASS OTS product (Data Server subsystem, STMGT CSCI, Data Storage CSC) . Also Rogue Wave class libraries.
Ingest	INGST	Client	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Configuration/ Startup	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	CSDT	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI

Table 3.3.2-1. ASF Components Analysis (5 of 8)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Ingest	INGST	Data Storage	Reuse	Gnrc	Reused from Data Server subsystem, STMGT CSCI
Ingest	INGST	DB Wrappers	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Descriptors	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Distribution Client Interface	Reuse	Gnrc	Reused from Data Server subsystem, DDIST CSCI
Ingest	INGST	Distribution Products	Reuse	Gnrc	Reused from Data Server subsystem, DDIST CSCI
Ingest	INGST	Distribution Request Management	Reuse	Gnrc	Reused from Data Server subsystem, DDIST CSCI
Ingest	INGST	File	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	General ESDT	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Global	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	GUI	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Ingest Administration Data	DEV	Gnrc	
Ingest	INGST	Ingest Data Preprocessing	DEV	Spfc	Specific based on uniqueness of ingested data and preprocessing requirements.
Ingest	INGST	Ingest Data Transfer	DEV	Gnrc	
Ingest	INGST	Ingest DBMS	OTS	Gnrc	Sybase DBMS
Ingest	INGST	Ingest Request Processing	DEV	Gnrc	
Ingest	INGST	Ingest Session Manager	DEV	Gnrc	
Ingest	INGST	Metadata	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Non-Product Science ESDTs	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Non-Science ESDTs	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	ERS-1 SAR	Reuse	Spcf	ESDTs- ERS-1 SAR; Reused from Data Server subsystem, SDSRV CSCI

Table 3.3.2-1. ASF Components Analysis (6 of 8)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Ingest	INGST	ERS-2 SAR	Reuse	Spcf	ESDTs- ERS-2 SAR; Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	JERS-1 SAR	Reuse	Spcf	ESDTs- JERS-1 SAR; Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	RADARSAT SAR	Reuse	Spcf	ESDTs- JRADARSAT SAR; Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Operator Ingest Interfaces	DEV	Gnrc	
Ingest	INGST	Polling Ingest Client Interface	DEV	Gnrc	
Ingest	INGST	Resource Management	Reuse	Gnrc	Reused from Data Server subsystem, STMGT CSCI
Ingest	INGST	Server	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Service Clients	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	Subscriptions	Reuse	Gnrc	Reused from Data Server subsystem, SDSRV CSCI
Ingest	INGST	User Network Ingest Interface	DEV	Gnrc	
Ingest	INGST	Viewing Tools	Reuse	Gnrc	Reused from Client subsystem, WKBCH CSCI, Data Visualization (EOSView) CSC
Interoperability	ADSRV	AdvNavigationServer	OTS	Gnrc	HTTP server
Interoperability	ADSRV	Client Library	DEV	Gnrc	
Interoperability	ADSRV	Core Library	DEV	Gnrc	
Interoperability	ADSRV	HTML Framework	DEV	Gnrc	
Interoperability	ADSRV	HTML Interfaces	DEV	Gnrc	
Interoperability	ADSRV	Installer	DEV	Gnrc	
Interoperability	ADSRV	Persistent Object Framework	DEV	Gnrc	
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

Table 3.3.2-1. ASF Components Analysis (7 of 8)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
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
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

Table 3.3.2-1. ASF Components Analysis (8 of 8)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
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	
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	

3.4 DAAC Hardware and Network Design

This section describes the ECS hardware and local area network design supporting the Release B ECS mission at the ASF DAAC. Section 3.4.1 contains an overview diagram from the "networks" point of view, and detailed descriptions of the Release B LANs. Section 3.4.2 contains a hardware overview diagram of all of the ECS subsystems at ASF, followed by detailed descriptions and rationale for each subsystem.

3.4.1 ASF DAAC LAN Configuration

The ASF DAAC LAN topology is illustrated in Figure 3.4.1-1. The topology consists of a User FDDI Network and a Production FDDI Network (a HiPPI Network is not required due to the moderate data flows between Data Server and the ASF processing system). (Note that even though ECS does not perform production at ASF, ECS still handle production flows stemming from processing requirements for the ASF production system.) The creation of separate User and Processing networks allows processing flows to be unaffected by user pull demands. Each is discussed in detail below.

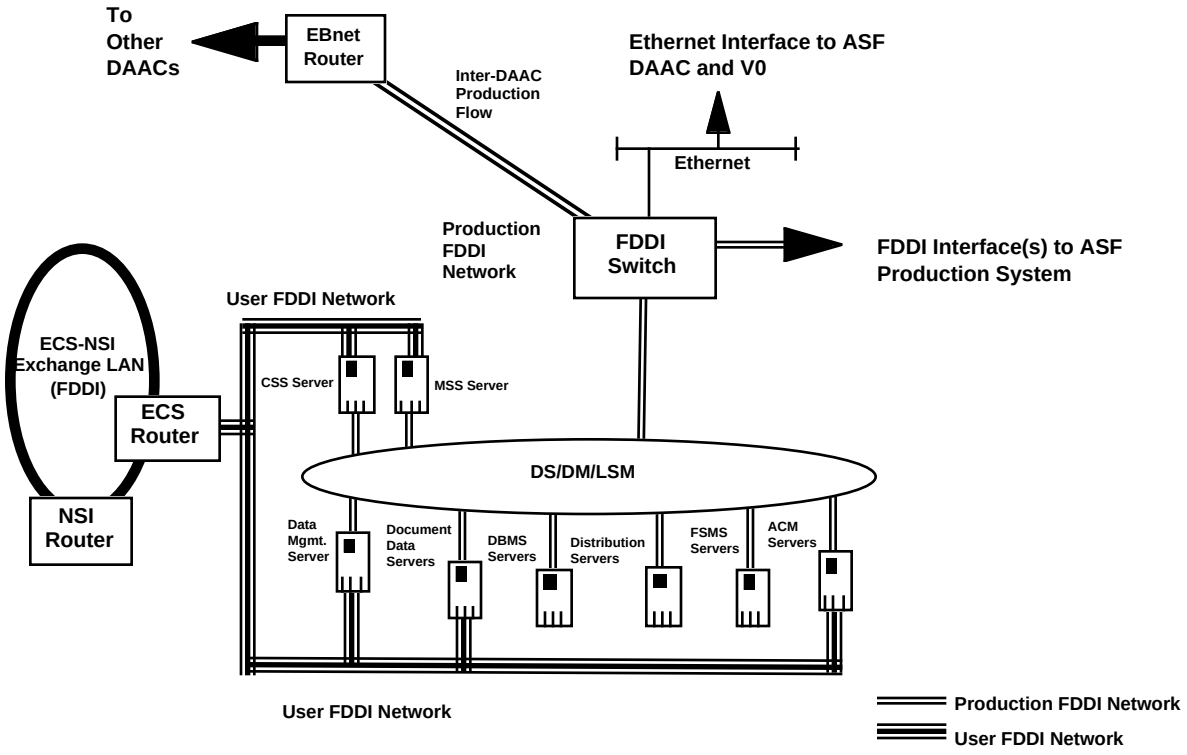

Figure 3.4.1-1. ASF DAAC LAN Topology

The Production Network consists of multiple FDDI rings supporting the DAAC subsystems and connections to the ASF production system, as well as to other ECS DAACs via EBnet. The separation and aggregation of hosts and subsystems onto FDDI rings is driven mostly by data flow requirements. Some Data Server hosts are contained on dedicated FDDI rings in order to provide adequate bandwidth for processing flow requirements (see Table 3.4.1.1-1 below). The DM, LSM, and some Data Server hosts are contained on a single ring because their flows are expected to be fairly small given that user traffic will be processed on the separate User Network (see discussion below). Another ring provides access to the EBnet router to handle the DAAC-to-DAAC flows. The FDDI Switch is the central device connecting the FDDI rings together, and it provides the necessary routing and filtering control. Note that, for clarity, workstations and printers are not shown.

The ECS Production Network has two interfaces to the ASF DAAC to provide connectivity to ASF production hosts. The main connection with ASF is via an FDDI interface to the ASF FDDI ring. There is also a second Ethernet interface to communicate with other ASF hosts and V0.

The User Network is an FDDI-based LAN connecting the users (via NSI) to DAAC hosts responsible for providing user access. It has the main advantage of separating user and production flows. This allows DAAC processing data flows to be unaffected by user demand, so that even unanticipated user pull will not hinder the production network. Basically, the User Network provides access to Data Manager hosts and to a subset of Data Server hosts that interact directly with users; users will not have access to any other ECS hosts. The CSS and MSS servers are connected to the User Network but will not allow direct user access. These connections are required for communications with outside networks for such things as name lookups and receipt of Internet mail, as well as communication with and monitoring of the DAAC's interfaces to the user community (such as NSI).

The User Network will connect to NSI through an ECS router which will provide the necessary routing and filtering controls. This router is connected to ASF's FDDI-based ECS-NSI Exchange LAN. NSI will be the sole Internet provider for ECS at ASF.

Individual FDDI rings for the Production and User Network will be implemented with FDDI concentrators to provide ease of wiring and central points of management. All Processing Network DAAC hosts will have FDDI interfaces and will be attached directly to the FDDI rings. Workstations will have single-attached FDDI cards, whereas high-performance servers and processors on the Production Network will have dual-attached FDDI cards to provide redundancy. Dual-attached hosts will be dual-homed to two separate FDDI concentrators to provide an additional level of redundancy in the event of a hub failure. Interfaces of User Network hosts will be single-attached, except for the Data Management Server, which will be dual-attached. Printers, which will be the only Ethernet devices in the ASF ECS DAAC, will be connected to the Production Network through the FDDI Switch.

Quantities of networking hardware components for the ASF DAAC during Release B are presented in Table 3.4.1-1.

Table 3.4.1-1. Rel. B Networking Hardware for ASF DAAC LAN

Networking Component	Quantity	Comments
FDDI Concentrator	5	Bay Networks 2914-04 concentrator with 12 M & 1 A/B port
FDDI Cables	53	Multimode fiber cables with MIC connectors
Ethernet Cables	2	10baseT connection to printers
FDDI Switch/Router	1	Interconnects Production Network
FDDI Router	1	Interconnects User Network to ECS-NSI Exchange LAN

3.4.1.1 Sizing/Performance Rationale

The data flow estimates used as input to the design process for the ASF DAAC LAN topology are contained in Table 3.4.1.1-1. The table, based on static analysis of the February 1996 AHWGP baseline (results for epoch k (3Q99)) and the February 1996 User Pull Baseline (results for the greater of July 1999 and January 2000), is arranged according to the source and sink of the flow. It provides both raw 24-hour average data flows which are the output of ECS models, as well as weighted flows containing all overhead and contingency factors. The "Factors Applied" column shows which of the factors (listed beneath the table) were applied to each data flow.

Table 3.4.1.1-1. Estimated Release B Data Flows for the ASF DAAC

Major Data Flow Description *	Raw Volume (in Mbps)	Factors Applied	Weighted Volume (in Mbps)
FSMS Server to/from ASF Processing	10.9	1,2,3,4,5,6	36.7
FSMS Server to Distribution Server	4.1	2,3,4,5	11.9
ACM Server to/from other DAACs	<< 0.1	1,2,3,4,5,6	<< 0.1
User Pull	3.4	2,3,4,5	9.6

* Other flows such as session establishments amongst the subsystem hosts and subsystems to and from MSS are trace amounts and are not included in the table.

Overhead Factors:

(1) SSI&T Factor: 1.2. This factor not applied to User flows. Accounts for capacity for integration and test flows.

(2) TCP/IP/FDDI Protocol Overhead: 1.25. Accounts for overhead associated with FDDI, IP, TCP, and other protocols (such as DCE).

(3) FDDI Maximum Circuit Utilization Factor: 1.25. Accounts for amount of 100 Mbps bandwidth that is actually usable for sustained data rates.

(4) Average-to-peak Conversion Factor: 1.5. This provides elasticity in the network by converting the 24 hour averages provided by the model into peaks.

(5) Scheduling Contingency: 1.2. This reflects the ability for the network to recover within 24 hours from a 4 hour down-time (24/20=1.2).

(6) Operational Hours Factor: 1.0 at ASF . Accounts for percentage of day/week operations are performed. This factor is applied only to production flows, not to user flows.

3.4.2 DAAC Hardware Configuration

The ECS DAAC hardware suite at ASF hosts the Data Server, Data Management, Ingest, Interoperability, Management and Communications subsystems. The hardware and COTS software selected for the ASF configuration is illustrated in Figure 3.4.2-1, ASF ECS DAAC Hardware Configuration Diagram. 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.

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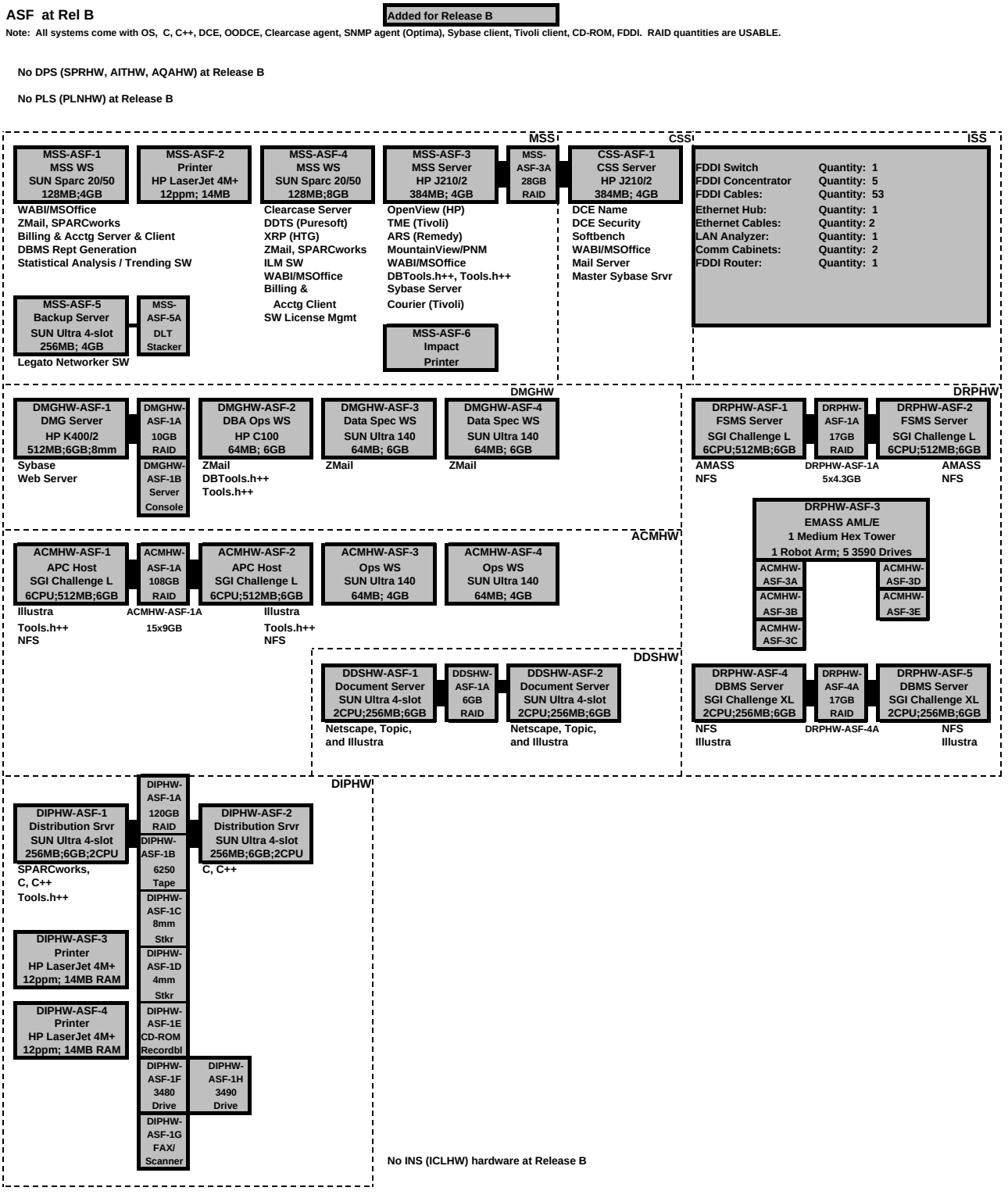
Figure 3.4.2-1. ASF ECS DAAC Hardware Configuration Diagram



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3.4.2.1 Client Subsystem

There is no dedicated hardware support (HWCI) for the Client Subsystem. The Client software configurations are supported by: (1) non-ECS provided hardware platforms, in the case of Client software utilized by the user community, or (2) ECS provided workstations utilizing Client software in support of operations users (network management, DAAC operations, etc.).

3.4.2.2 Data Server Subsystem

During the Release B time frame at the ASF DAAC, a Data Server configuration is supplied to support the following data storage and access services: ERS-1, ERS-2, JERS-1, and RADARSAT data. The configuration discussed in the subsections that follow provide a design of the configuration and sizing of the Data Server hardware for Release B. The configuration and sizing are based on the February 1996 technical baseline for ASF. The reader is encouraged to refer to the Data Server specific volume of DID 305 for more details on the operational and engineering concepts that form the basis for the DSS Release B design and a more detailed discussion of the design drivers.

The Data Server configuration has made some assumptions in regards to disk, robotics, tape drives, and general I/O. The Data Server Subsystem configuration at ASF is supported by five hardware CIs and is sized for the mission support as described above for a period of one calendar year beyond AM-1 launch date plus V0 data migration for the same time period:

- *Access Control & Management (ACMHW HWCI)* -- The access hardware allows for client access (both the client subsystem and direct "push/pull" user access) to the Data Server subsystem, provides tools and capabilities for system administration, and is broken down into two components; Administration Stations (AS) which consist typically of operations support workstations, and Access/Process Coordinators (APCs) which consist of server class machines with host attached disk pools.
- *Working Storage (WKSHW HWCI)* -- Working Storage (WS) hardware of the Data Server supplies a pool of storage used for temporary file and buffer storage within the data Server architecture. All data in WS regardless of storage duration is still considered temporary in nature and not part of the permanent archive.
- *Distribution and Ingest Peripheral Management (DIPHW HWCI)* -- The hardware of the Distribution and Ingest Peripheral Management supports the hard media distribution methods for data dissemination from the system, as well as hard media ingest of data into the system. The hardware provided by this HWCI includes a variety of media and media drives, jukeboxes/stackers as necessary, and server hosts and disk storage for network distribution.
- *Data Repository (DRPHW HWCI)* -- Data Repositories (DRs) are the hardware components that store and maintain data permanently. This consists of DBMS repositories and archive tape library based repositories. This HWCI provides the disk, server, archive robotics, media and archive tape drives required to support the permanent storage repositories. The ASF "30 day rolling storage" buffer is supported by the deep archive robotics and tape.

- *Document Data Server (DDSHW HWCI)* -- This HWCI provides the disk and server required to support the Document Data Server portion of the DSS.

3.4.2.2.1 Rationale

The following subsystem-wide assumptions were applied in sizing the Data Server hardware components. Data Server Subsystem is sized for ERS-1, ERS-2, JERS-1, and RADARSAT data support for a period of one calendar year beyond AM-1 launch date. Static analysis was used to size the permanent data repository components, such as the number of robotic arms, tape drives, and working storage staging disk. The ECS technical baseline for February 1996 was used in static analysis. User modeling data was used in estimating the user access rates to the system where appropriate, however DSS sizing is still being driven by the ECS Project direction to size for a daily distribution volume at ASF equal to one time the daily production volume for the 30-day temporary products plus two times the site's total permanent daily data production volume.

ACMHW Analysis was undertaken primarily for the sizing of the APC server hosts and their attached disk storage. The administration workstations are assumed to continue to be minimally configured workstations designed to perform various operations functions (e.g. DBMS administration, repository administration, etc.). Client desktop services as well as X protocol access to Data Server hosts is the driving sizing factor.

APC Server -- The APC server provides the session establishment point for the client, routes service requests to the other CSCIs and HWCIs, and functions as the electronic distribution channel for the DSS user pull and push loads. APC server host runs the following software processes and applications: ScienceDataServer Process, ScienceDataServer Administration Process, SubscriptionServer Process, Network ResourceManager Process, PullMonitor Process, CSS DCE client, CSS logging API, and an MSS agent. The anticipated internal I/O to be sustained by the processor averaged over 24 hours of operation is orders of magnitude smaller than the processor capability and is not a driving selection factor.

The following is the CPU allocation (CPU loading for peripheral support is based on SGI configuration guidelines):

0.5 CPU Monitoring/Managing Tasks (estimated)

\+ *2 CPUs Subsetting/Subsampling (engineering assumption)*

\+ *1 CPU Operating System and Applications (estimated)*

\+ *2.3 CPUs for client support (estimated for session threads)*

\+ *0.075 CPU for 1 Differential SCSI -II Interfaces (1 SCSI [local disk] at 5 MB/sec -7.5% of a CPU for each 5 MB/sec)*

\+ *0.003 CPUs for SCSI RAID controller support (1.5% of a CPU for each 5 MB/sec of controller I/O; 1 MB/sec * 0.015/5)*

+ *0.008 CPUs for FDDI I/O support (7.5% of a CPU for each*

*5 MB/sec of FDDI I/O: ~0.5 MB/sec / 5 MB/sec * 0.075)*

+ *0.008 CPUs in support of subscriptions.*

This requires a total of 5.9 equivalent CPUs. The SGI Challenge L server with 6 CPUs and 512 MB of RAM will be selected as the APC server. The server will be equipped with 6 GB of local disk, 1 differential SCSI-II controller for the local disk, 3 SCSI RAID Controllers (see *APC Host Storage* below), and 2 FDDI Interfaces. Failover will be provided by a second identically configured SGI Challenge L.

APC Host Disk -- The APC server host disk is sized for electronic ingest (almost exclusively from sources external to the DAAC), as well as electronic distribution (again, almost exclusively to the recipients external to the DAAC) since this host is designed to manage the requests to the Data Server as well as the service response. For Release B, the electronic distribution at ASF is half of the sum of "two times" the total Data Server ingested volume of the permanent data and "one times" the volume of the 30 day temporary products volume. This volume is made up of data that is "pushed" and "pulled" by the user. The distribution of this electronic data is assumed to occur over a 24-hour period. It is further assumed that on the average each granule placed on the distribution volumes are pulled/pushed to two separate users. (This assumption is based on the workings of subscriptions, (assuming that a granule that is subscribed to more than once), and the fact that "interesting" data will be requested more than once when inserted while some data may not be requested at all.) This assumption in effect reduces the physical staged data requirements by a factor of 2. 48 hours accumulation capacity of electronic distribution at ASF (50% of the total daily distribution volume), plus 20% allocation for potential electronic ingest with 15 minutes of latency, plus 1 GB allocation for storage of the client threads is sized. The total allocated disk capacity rounded to the next higher GB is therefore 76 GB.

WKSHW At the ASF DAAC this HWCI consists of server attached RAID for very short-term product storage. The server itself is a part of the DRPHW CI.

The RAID requirement for working storage is approximately 6 GB (rounded). This provides sufficient storage to support 15 minutes worth of data received from processing, as well as all other incoming and outgoing Working Storage data flows. Working storage RAID is designed to be a temporary staging area only, not a long-term repository, so 15 minutes worth of space provides adequate time to either write the data to tape or forward it to its destination.

DIPHW

The DIPHW configuration at ASF includes two peer server hosts and disk units to serve media based distribution, as well as for some types of Ingest as well, and a number of peripheral form factors.

This server is designed to support the media distribution load (as well as a small factor for ingest loads). It is designed to handle the I/0 for 1x (one times) distribution of the Data Server ingested volume per twenty-four hours of operation, servicing this load in a nominal 8 hr. total shift period. The same assumption is used here as was used in the APC disk sizing, namely that on the average each granule placed on the distribution volumes are written twice to two separate

users. 72 hours accumulation capacity, plus ten percent, for potential hard media ingest is sized. 72 hours are assumed because of the 5 days per week 8 hours per day operations mode, where data may be staged for up to three days before it is fully distributed on media. It is assumed that off-site backup takes place via hard media to be shipped to GSFC. For Release B, analogously to the electronic distribution, hard media distribution at ASF is half of the sum of the "two times" the total Data Server ingested volume of the permanent data and "one times" the volume of the 30 day temporary products volume. The total volume of the backup data is conservatively estimated to be at 2% of produced data. The ingest activity is assumed to be negligible, since the Ingest Subsystem is sized to handle the high volume electronic ingest loads. The DIPHW RAID disk is sized at 120 GB (rounded upward to the nearest GB).

Server -- This server is designed to support the media distribution load (as well as a small factor for ingest loads). It is designed to handle the I/0 for 1x (one times) distribution of the Data Server ingested volume per twenty-four hours of operation, servicing this load in a nominal 8 hr. total shift period. The platform is sized to handle the network transfer traffic to local disk from the FSMS Server Host source, as well as the media preparation and media ingest I/O. The software processes/applications mapped to this server are: DistributionServer process, ResourceManager Processes for CD-ROM, various tape, and printers, CSS DCE client, CSS logging API, and an MSS agent. Two server hosts are provided in order to comply with RMA requirements for the function of archiving and distributing data with the required availability of 0.98 and the mean down time not to exceed 2 hours.

The following processes and applications will run on the server: ResourceManager Process for the staging disk, StagedDataMonitor Process, CSS DCE client, CSS logging API, and an MSS agent.

The servers included in the DIPHW must, in aggregate, support 0.45 MB/s of distribution and 10 % (0.04 MB/s) of ingest via hard media over each 24 hour period during 7

week days. The distribution, however will only occur during the working 8 hours 5 days per week, raising the total outgoing media flow rate to 2 MB/sec.

The CPU allocation for each of the two servers is as follows:

0.5 CPU Monitoring/Managing Tasks (estimated)
\+ *1 CPU Operating System and Applications (estimated)*
\+ *0.2 CPU for at least 4 Differential SCSI -II Interfaces*
\+ *0.2 CPUs for Fiber Channel RAID controller support*
\+ *0.1 CPUs for FDDI I/O.*

This requires a total of 2 equivalent CPUs. The SUN Ultra with 6 GB of local disk and 256 MB of RAM is specified for these servers.

Peripheral Support -- The peripherals supported at the ASF site for Release B were selected based on Level Four requirements: S-DSS-30440, S-DSS-30470, S-DSS-30480 (reference SDPS Requirements Specification for the ECS Project, 304-CD-002-001). We have provided a single 6250 bpi tape drive. In the case of 6250, V0 operational experience has shown that its use as a heritage device is low enough to make the provision of a spare drive unnecessary. In the event of the drive failure the low workload will allow waiting for the drive repair or replacement without

a noticeable impact on operations. The HWCI complement may be easily scaled for both media types as well as capacity. The peripherals supplied here are included in the configuration to primarily support distribution functions. However, the Ingest Subsystem (Ingest Client) residingat ASF may utilize peripherals to perform some media based ingest, as necessary, based on media form received for storage. This applies only to peripherals not already configured into the Ingest complement for performance reasons.

The types of media form factors/formats selected for Release B include:

- 8mm Tape
- 6250 Tape (heritage)
- CD-ROM
- 3480/3490
- 4 mm Tape
- FAX/scanner

The aggregate bandwidth for each of the 8mm and 4mm tape devices will meet the entire required distribution and ingest bandwidth plus allowance for RMA. The rest of the devices will be furnished in quantities dictated by the RMA considerations. CD-ROM drive quantities will be sufficient to allow no less than 25% of the aggregate bandwidth.

This HWCI also provides the network laser printers for the DAAC DS operations.

DRPHW The DRPHW configuration at ASF includes both archive based as well as DBMS based physical repositories. They are sized as follows:

Archive Repository -- The archive component was sized through static analysis coupled with the key driving requirements with respect to distribution (e.g. the 2x distribution cap, the User Model service access predictions for epoch k), flow analysis, and data with respect to hardware and software COTS selections. February 1996 Technical baseline was used.

AMASS was chosen for the Release B archive FSMS. Enhancements to the product deemed necessary for Release B functionally and performance requirements (i.e., BER monitoring, better cache management, Release B archive drive support, etc.) are currently being negotiated with the vendor. For the FSMS Manager host server, the platform is selected on the basis of FSMS(AMASS)/platform COTS S/W compatibility. Memory and cache estimates are currently based on vendor recommendations, reference "AMASS Archival Management and Storage System, Installation on Silicon Graphics", EMASS Part Number 600149, AMASS Version 4.2.4, March 1995. Aside from the AMASS FSMS the following processes and applications will run on this server: ResourceManager Process for the staging disk, StagedDataMonitor Process, CSS DCE client, CSS logging API, and an MSS agent.

The CPU allocation for this server is as follows:

0.5 CPU Monitoring/Managing Tasks (estimated)
\+ *1 CPU Operating System and Applications (estimated)*
\+ *0.04 CPU FSMS Allocation (2.57*2 MB/sec total flow to and from the ATL * 0.8% of a CPU per MB of flow)*
\+ *0.31 CPU for 7 Differential SCSI -II (2 SCSI [disk] at 5 MB/sec - 7.5% of a CPU for each 5 MB/sec +4 SCSI [tape] at 5 MB/sec - 0.8 % CPU/ 1 MB/sec; 2 * 5 * 0.075/5 + 4*5*0.008/1)*
\+ *2.3 CPUs for client support (estimated for session threads)*
\+ *0.02 CPUs for SCSI RAID controller support (1.5% of a CPU for each 5 MB/sec of controller I/O; 2.57*2*0.015/5)*
\+ *0.08 CPUs for FDDI I/O support ({total data flow of 2.57*2 MB/s + control flow of 10%}/5 MB/sec * 0.075).*

This requires a total of 4.25 equivalent CPUs. An SGI Challenge L server with 6 CPUs will serve as the DRPHW server. 6 GB of local disk and 6.4 GB of RAIDed disk for the AMASS cache and thread support, and 512 MB of RAM is also required for the server. A 4 CPU SGI Challenge will serve as a backup.

ASF Configuration:

1 unit (AML/E) Calculated Robotics Utilization: 1 Robotic Arm + 1 Hex Tower (7'11" tall)

Calculated Tape Drive Resource Utilization: 5 of 3590 (NTP) drive units

At Epoch k the accumulated ASF data volume is projected to be approximately 1.2 TBs. In 2002 the volume will cumulate to approximately 2.5 TB. The total carrying capacity of the unit with 3590 media is 12 TB. ASF also will need to support their site specific "30 day rolling storage", sized at 2 TBs, using this same robotic unit. Therefore at the end of epoch k ASF will in fact have 3.2 TBs total storage accounted for, 2 TBs of which is allocated to the rolling buffer. Approximately 1.6 TB is estimated for the Browse data collection residing in the archive. The assumption is 1 MB of Browse data per granule. 3590 single tape capacity without compression and at 100% media utilization is 10 GB. Backup capacity of 0.2% and a spare tape capacity of 10% are added. The total calculated media support requirement for Release B and V0 operations is as follows (approximate):

(Release B ECS = 3,200 GB + 1,600 GB Browse) + 2% backup capacity + 10% spare media capacity = 5,376 GB --> 538 count of 3590 tapes required.

DBMS Repository -- The Data Base Management System (DBMS) Repository component was sized as follows based on static data size analysis as well as transaction based analysis. The transaction analysis is based on both "push" (production metadata update) and "pull" (user access

and distribution) loads. Transaction rate was modeled based on the user service request rates as described at PDR time in the User Pull Analysis Notebook, 160-TP-004-001, Question 47 and a cross section of query types derived from the DBMS Benchmark Report, 430-TP-003-001.

The DBMS Server Host was sized based on the transaction analysis mentioned above, as well as platform suitability analysis based on the DBMS COTS software selection for Release B Data Servers (Illustra). Platform suitability is based on the DBMS software manufacturer's compatibility recommendations, benchmark data, and project bench marking activities. Aside from the Data Base engine, the following processes will run on this host: CSS DCE client, CSS logging API, and an MSS agent.

DBMS Server Disk for Release B was sized based on the *core metadata* associated with the V0 data sets identified for migration within Release B together with metadata associated with other data sets identified for migration with the Release B timeframe. This timeframe is from 1997 through 1999. Refer to Table 3.4.2.2-3 for DBMS Repository Sizing beyond the Release B timeframe. The size of the metadata granule for V0 was assumed to be half (0.91 KB) that of the full ECS metadata granule of 1.82 KB. That assumption is based on the 50% mapping of V0 attributes to ECS core attributes across all products throughout the Release A duration.

The key assumptions associated with the DBMS repository sizing are as follows:

- The products lists have been derived from the DAAC instrument teams representatives, the ECS Technical Baseline and in coordination with Science Metadata sizing for the SDSRV DBMS DRPHW CI.
- The period of data capture for Release B is 1/1/1997 through 12/31/1999.
- All products are assumed to conform to the Proposed ECS Core Metadata Standard v2.0, 420-TP-001-005, Dec. 1994.
- The metadata sizing has been calculated from the Metadata Expected with each granule included in the table on Page 94 in the Proposed ECS Core Metadata Standard v2.0, 420-TP-001-005, Dec. 1994.
- The calculated size of 1.823 KB per granule has been obtained from this data source.
- An overhead factor of 2.36 for implementation in Illustra has been estimated based on the benchmarking activities as outlined in the DBMS Benchmark Report, 430-TP-003-001. This assumes a high level of query / insertion activity and a low level of update / deletion activity.
- An estimated overhead of 80 MB will be made for the Illustra product code. Note that this includes sizing for the Illustra database product, the 2-D Spatial Data Blade, and the 3-D Spatial Data Blade.
- All instruments on AM-1, RADARSAT, ERS-1, ERS-2 and JERS-1 were included in the product lists.
- Keyword metadata per document is derived from Release A, phase 2 DDSRV. Average size is 1727 bytes.

- Sizing for document metadata and storage is assumed during initial Release B operations because time phasing of document production is indeterminate.
- Sizing includes requirements for a RAID 5 overhead factor of 1.125.

Table 3.4.2.2-3. ASF DBMS Repository Sizing (GB)

DAAC	1997	1998	1999	2000	2001	2002	EOC
ASF	1.6	3.6	5.7	7.7	9.7	11.8	13.7

The calculated disk capacity for the ASF repository (static analysis) results in a computed requirement of 5.7 GB. Due to the operational experience with the user space requirements, at least 5 GB of disk space must be allocated for a high use data base functioning. Therefore, at least 5 GB beyond the calculated storage requirement will be allocated - 10.7 GB. (The closest available quantity of disk equal or exceeding 10.7 GB will be purchased.) Dual host configuration will allow for failover. Host type will be a SGI XL class machine.

DOCUMENT DATA SERVER Document handling is handled via a dedicated Data Server implementation, geared to the predicted document ingest and access volumes and the nature of the COTS S/W requirements imposed on the support hardware. The Document Data Server is provided as a simple server configuration with network access. The following assumptions were made in the preparation of the ASF Document Data Server configuration:

1. Documents and document metadata together have been considered as a basis for the sizing calculations.
2. Document related data includes: 5 guide document types, algorithm descriptions, production plans and reference papers. These from the DDSRV Detailed Design for ESDTs (DID 305).
3. Guide document sizes (5 guides) from Release A, phase 2 of DDSRV are sized at 1.5 MegaBytes each.
4. Production plans are assumed to be on per DAAC, sized at 1.0 MegaBytes each.
5. Reference papers are sized at 6.5 MegaBytes each; one per instrument per platform.
6. One ATBD is assumed per instrument.
7. Sizing includes requirements for a RAID 5 overhead factor of 1.125.
8. The figures are approximations, which will be refined over time. The Document Data Server architecture is scaleable.
9. The Document Data Server continues to exist as a separate server. As the design effort for Release B continues relative to the Sybase/Illustra selection, the Document Data Server could be collapsed into the DBMS Server. This would change the document storage sizing and cause it to be added into the DBMS Server sizing.

10. The entire document Data Server DBMS sizing is assumed to be available at the beginning of the Release B timeframe. This is to allow sufficient capacity to be available to handle both historical document conversion and new document requirements. This includes the maximum required by the end of Release B.

A 2 CPU SMP server was selected based upon operational experience with the EDF EDHS. A WAIS-like, full text indexer, an http server, and additional custom developed software will reside on this host. The following processes/applications run on this host: Document Data Server Process, WWW Server Process, Document Repository Process, Client Applications Process, CSS DCE client, CSS logging API, and an MSS agent.

The disk complement was sized to hold the document metadata for the data product collections associated with the V0 data sets identified for migration. Sizing for document metadata was based on available V0 guide document sizing, and the 2.0 Core metadata baseline. The calculated required disk capacity for all document collection alone is 2.4 GB.

3.4.2.2.2 Configuration

The specific sizing for the Release B ASF Data Servers, derived from the rationale described above, is synopsized below. Figures (EDS provided figures) provide the a preliminary design for the site's configuration. Additional details on specific component configurations and sizing are provided within the figures. For the ASF Science Data Server:

ACMHW

- Admin. Workstations: 2 ea. of SUN Ultra
- APC Hosts: two 6 CPU SGI Challenge Ls, configured with 76 GB, minimum, of Disk.

WKSHW

- 6 GB, minimum, of Disk.

DIPHW

- Staging Server Host: two SUN Ultra 4-slot, with access to 120 GB disk.
- Standard Release B Peripheral Set:

  8mm Tape drives and stackers,

  4mm Tape drives and stackers,

  6250 Drive,

  CD-ROM drive and jukebox,

  FAX,

  3480/3490 outboard drives

  printers.

DRPHW

- FSMS Server Host: 6 CPU SGI Challenge L, and a 4 CPU Challenge L backup machine which utilize WKSHW for primary disk
- 6 GB of additional RAID (pooled with Working Storage RAID)
- Archive Tape Library Robotics: 1 EMASS ABBA/E with a Hex Tower (7'11" height) storage unit (12 TB carrying capacity with 3590 (10 GB/cartridge), 1 robotic arm
- Tape Drives: 5 3590 (linear) drives
- Tape Media: 359 of 3590 tapes, each at 10 GB capacity (including 2% backup capacity and 10% spare tape capacity)
- DBMS Server: two of 2 CPU SGI Challenge XL, with 12 GB of shared disk

For the ASF Document Data Server....

- o WAIS/http Data Server 2 of 2 CPU SMP Server
- o Data Server Disk: 6 GB mirrored in two machines for Release-B

3.4.2.3 Data Management Subsystem

The Data Management Subsystem (DMS) consists of a single Hardware CI (HWCI) that will also support the Release B processing requirements of the Interoperability Subsystem (IOS) at the ASF DAAC site.

The DMS is responsible for supporting Advertising Service CI, Data Dictionary CI, Gateway CI, Local Information Manger CI and Distributed Information Manager CI processing activities generated directly from user "pull" search invocations. The DMGHW CI consists of three major components: 1) DBMS/Web Server, 2) Database Management Workstation, 3) Data Specialists and User Support Workstations.

The DBMS/Web server is the primary hardware component in the Data Management Subsystem. The server provides DBMS storage, input/output (I/O), and processing resources in support of the Advertising Service CI, Data Dictionary CI, Gateway CI, Local Information Manager CI and Distributed Information Manager CI in Release B.

The DMGHW CI configuration provided in Section 3.4.2.3.2 depicts the Release B hardware design. The Release B hardware design accommodates Release B platform design issues concerning scalability, RMA and evolvability. The hardware design is tailored to Release B ASF DAAC specific processing needs in support of Advertising Service CI, Data Dictionary CI, Gateway CI, Local Information Manger CI and Distributed Information Manager CI processing functions. The Release B ASF DMGHW CI is designed to support BOREAS, FIFE, OTTER, NPP and other mission datasets. Section 3.4.2.3.1 provides the rationale behind the recommended Release B hardware configuration and is subject to change as Data Management software CI (under investigation in the incremental development track) prototyping results become available.

3.4.2.3.1 Rationale

The performance drivers for sizing the DMGHW CI server for Release B are:

- User Characterization analysis of science and non-science user search invocations
- DBMS/CI transaction rate (performance) analysis
- DBMS/CI prototype/benchmark analysis
- Hardware Scalability / RMA / Evolvability Analysis

User Characterization Analysis: User Characterization data provides the projected number of science and non-science users, frequency of search invocations per time period, and the percentage of invocations for different types of searches to be supported in the Release B time frame. In Release B, it is expected that science users will primarily access the DM services (Gateway CI, Data Dictionary CI, Local Information Manager CI, Distributed Information Manager CI) while the bulk of the accesses to the Interoperability service (Advertising Service CI) will originate from within the non-science community.

It is assumed that non-science users will access the Advertising Service CI 86% of the time, and DM CIs 14% of the time as documented in "User Characterization and Requirements Analysis" (19400312TPW). The number of searches per hour being processed by the DM CIs in response to queries by science users is based on the ECS science user scenarios in which users are assumed to be accessing the system through the client. Because of the increasing popularity and ease of use of the WWW, it is also expected that science users will make use of the Advertising Service at a rate equal to 25% of DM searches. Data provided by the User Characterization Team apply to epoch m (first quarter of 2000) since the data are meant to represent maximum usage loading (this will occur at the end of Release B).

Tables 3.4.2.3-1 and 3.4.2.3-2 summarize the number of science user system accesses per day and the fraction of invocations per search type for DM services as documented by the User Characterization Team. Table 3.4.2.3-3 summarizes the total number of searches per hour for the busiest hour of the day.

Table 3.4.2.3-1. ASF User System Accesses per Day for Science Users (Epoch m)

DAAC	User System Accesses per Day
ASF	276

Table 3.4.2.3-2. ASF Science User Search Types for Gateway CI Service (Epoch m)

Search Type	Fraction of total invocations
Simple Search/1 site	.263
Simple Search/multi-site	.279
Match-up Search/1 site	.272
Match-up Search/multi-site	.185
Coincident Search/1 site	0.0
Coincident Search/multi-site	.000374

Table 3.4.2.3-3. ASF Searches per hour for Science Users (Epoch m)

DAAC	Searches per hour (busiest time of day)
ASF	9

The data for searches submitted by science users is categorized into six different types (simple/1, simple/multi, match-up/1, match-up/multi, coincidence/1, and coincidence/multi) for DM services; however, there are only three types of searches for the non-science user data. Each of the three search types that exist in the non-science user data was subdivided into one-site vs. multi-site by applying the proportions of one-site vs. multi-site that exist for science users to the non-science user data. For example, the relative proportions of simple search/1 site and simple search/multi-site for science users is 0.263 and 0.279, respectively. The number of simple searches submitted by non-science users was divided into one-site and multi-site using these same proportions. Only one search type (simple/1) pertains to the Advertising Service CI.

Tables 3.4.2.3-4 and 3.4.2.3-5 summarize the number of non-science user system accesses per day and the fraction of search invocations for DM services as documented by the User Characterization Team.

Table 3.4.2.3-4. ASF User System Accesses per Day for Non-Science Users (Epoch m)

DAAC	User System Accesses per Day
ASF	1092

Table 3.4.2.3-5. ASF Non-Science User Search Types for Gateway CI Service (Epoch m)

Search Type	Fraction of total invocations
Simple Search/1 site	.31
Simple Search/multi-site	.29
Match-up Search/1 site	.09
Match-up Search/multi-site	.06
Coincident Search/1 site	0.0
Coincident Search/multi-site	.25

DBMS Transaction Rate Analysis: In order to size the DBMS server it is necessary to estimate the size of the Interoperability (Advertising Service CI) and Data Management (Gateway CI, DDICT CI, LIMGR CI, DIMGR CI) services and then determine the transaction rates, or database throughput that must be provided in support of the "pull" search activities that will be invoked by the user community. The transaction rate analysis is based on assumptions regarding the amount of processing associated with the different types of search requests that pertain to the Interoperability and Data Management software CIs. Release B transaction assumptions were made to define a transaction loading value per search request. Number and type of search request are provided by the User Characterization Team. Depicted transaction loading values are assumptions that are based on search complexity. The loading values for search requests will be refined with actual performance benchmarks as future prototypes are completed. The observed transaction loading from future prototyping/benchmarking activities will be compared to the predicted ones (documented below) and the sizing analysis will be updated as a result (these transaction loading assumptions are defined as "nominal" cases). The transaction data provided is projected for the Release B time-frame.

The processing (transactions per search invocation) assumptions are based on preliminary transaction analysis results for the Advertising Service and DM CIs and will be revised based on future prototyping/benchmarking results as they become available. Tables 3.4.2.3-6 and 2.4.2.3-7 list the predicted transaction load associated with the Gateway CI and Advertising Service CI based on frequency of science user search invocations. Searches/hour are calculated for the busiest time of day at the ASF DAAC site.

Table 3.4.2.3-6. ASF Science User Transaction Analysis for Gateway CI Service (Epoch m)

Search Type	Percentage Invoked	Searches/hour	Processing Assumptions (Transactions per Search Type)	Transactions /hour
Simple Search/1 Site	26.3	2	5	10
Simple Search/Multi-Site	27.9	3	10	30
Match-up Search/1 Site	27.2	2	5	10
Match-up Search/Multi-Site	18.5	2	10	20
Coincident Search/1 Site	0.0	0	5	0
Coincident Search/Multi-Site	.0374	.003	25	.07

Table 3.4.2.3-7. ASF Science User Transaction Analysis for Advertising Service CI (Epoch m)

Search Type	Percentage Invoked	Searches/hour	Processing Assumptions (Transactions per Search Type)	Transactions /hour
Simple Search/1 Site	100	2	5	10

Tables 3.4.2.3-8 and 3.4.2.3-9 list the transaction analysis for the Gateway CI and Advertising Service CI based on daily non-science user accesses as depicted in "User Characterization and Requirements Analysis" (19400312TPW). The estimated total non-science user system accesses per day for the Gateway CI and the Advertising Service CI is estimated to be 1092. The percentage that each search type, pertaining to the Gateway CI and Advertising Service CI, is invoked is also taken from the same document. Tables 3.4.2.3-8 and 3.4.2.3-9 are completed with the assumption that there will be at least ten search invocations per non-science user access on average.

Table 3.4.2.3-8. ASF Non-Science User Transaction Analysis for Gateway CI Service (Epoch m)

Search Type	Percentage Invoked	Searches/hour	Processing Assumptions (Transactions per Search Type)	Transactions /hour
Simple Search/1 Site	31	20	5	100
Simple Search/Multi-Site	29	18	10	180
Match-up Search/1 Site	09	6	5	35
Match-up Search/Multi-Site	06	4	10	40
Coincident Search/1 Site	0.0	0	5	0
Coincident Search/Multi-Site	25	16	25	400

Table 3.4.2.3-9. ASF Non-Science User Transaction Analysis for Advertising Service CI (Epoch m)

Search Type	Percentage Invoked	Searches/hour	Processing Assumptions (Transactions per Search Type)	Transactions/hour
Simple Search/1 Site	100	391	5	1955

Preliminary transaction analysis results for Interoperability and Data Management CI processes are depicted in Table 3.4.2.3-10. At this time the Data Dictionary CI transaction analysis is equated to the transaction analysis of the Advertising Service CI since the type and frequency of transactions are predicted to be very similar. Due to the fact that DIMGR and LIMGR CI processes are perceived as being the most expensive (in terms of cost to the CPU), and that prototypes will not be developed until after Release B CDR, preliminary sizing estimates have been achieved by doubling the transaction load of the Gateway CI and applying the result to LIMGR CI and DIMGR CI processes. Although equating Advertising Service CI and Data Dictionary CI processes, and doubling the Gateway CI transaction load to produce LIMGR CI and DIMGR CI transaction loading does not pin-point the performance cost that will be levied on the DMGHW CI, it does provide preliminary, expected CPU activity in the absence of real-time prototyping/benchmarking results. The preliminary transaction results for the Advertising Service CI, Gateway CI, Data Dictionary CI, LIMGR CI and DIMGR CI will be revised based on future prototyping/benchmarking analysis results as the Incremental Track software design matures.

Table 3.4.2.3-10 summarizes the science, and non-science user transaction loading per hour for the Advertising Service CI , Gateway CI, Data Dictionary CI, LIMGR CI and DIMGR CI services.

Table 3.4.2.3-10. DBMS Transaction Analysis Summary (Epoch m)

DAAC	User Type	Service	Searches/hour	Transactions /hour	TPM
ASF	Science	Gateway	9	70	1
ASF	Science	Advertising	2	10	.2
ASF	Science	Data Dictionary	2	10	.2
ASF	Science	LIMGR	18	140	2
ASF	Science	DIMGR	18	140	2
ASF	Non-Science	Gateway	64	755	13
ASF	Non-Science	Advertising	391	1955	33
ASF	Non-Science	Data Dictionary	391	1955	33
ASF	Non-Science	LIMGR	128	1510	25
ASF	Non-Science	DIMGR	128	1510	25
Totals:			1151	8055	134

A sensitivity analysis has been performed with larger loading allocations; the results are depicted below in Table 3.4.2.3-11.

Table 3.4.2.3-11. DBMS Transaction Sensitivity Analysis Results (Epoch m) (loading has been doubled for both search invocations and transaction rates)

DAAC	User Type	Service	Searches/hour	Transactions /hour	TPM
ASF	Science	Gateway	18	280	5
ASF	Science	Advertising	4	40	1
ASF	Science	Data Dictionary	4	40	1
ASF	Science	LIMGR	36	560	9
ASF	Science	DIMGR	36	560	9
ASF	Non-Science	Gateway	128	3000	50
ASF	Non-Science	Advertising	782	7820	130
ASF	Non-Science	Data Dictionary	782	7820	130
ASF	Non-Science	LIMGR	256	6000	100
ASF	Non-Science	DIMGR	256	6000	100
Totals:			2302	32120	535

Future Incremental Track Development prototyping/benchmarking activities will provide a more detailed performance analysis of Advertising Service CI, Gateway CI, Data Dictionary CI, Local Information Manager CI and Distributed Information Manager CI processes; therefore, performance transaction analyses will be revised accordingly.

DBMS Prototyping/Benchmarking Analysis: Currently, preliminary Incremental Track Development performance data is being used to size the processing capacity of the DMGHW CI DBMS/Web server. Performance analysis results will be revised as planned prototyping/benchmarking activities are completed. Major prototyping activities that will affect performance estimates for the DMGHW CI include, but are not limited to: 1) Prototype workshop 2, 2) EP7 prototype.

DBMS performance estimates provided in "DBMS Benchmark Report" technical paper (430-TP-003-001), show that for multi-user (32 users) queries (20 similar queries accessing different parts of the test database) running concurrently, the test-bed platform's CPU became saturated (SUN SPARCstation 20/50). A vendor supplied TPM benchmark for the selected platform (HP K400) for Release B operations is shown in Table 3.4.2.3-12. As a rule vendor supplied Transaction Per Second/Minute (TPS/TPM) ratings tend to be a maximum, or high-end value and do not take into account processing overhead associated with other system processes. Processes that will run on the DMGHW CI in Release B include DCE client, MSS agent, HTTP server, Sybase SQL Server, Sybase Replication Server, Sybase Backup Server, Operating System Services, Advertising Service Server, Gateway Server, Data Dictionary Server, LIMGR Server and DIMGR Server.

Table 3.4.2.3-12. Vendor Platform Performance Estimates

Platform	TPM	MIPS
HP K400 (SMP) with 1 processor (PA 7200 CPU)	1000	146

Disk Capacity Sizing: Disk storage for the DMGHW CI has been determined for each DAAC site based on preliminary Interoperability and Data Management CI DBMS application sizing estimates plus vendor inputs for the following COTS software: 1) DBMS software, 2) Development software, 3) HTTP server software, 4) Operating System software, 5) Communications and Utilities software. Capacity sizing for the Interoperability and Data Management databases was achieved by multiplying the expected byte size for core and collection specific attribute definitions by the total number of core and collection specific attributes. Temporary workspace has also been allocated for Interoperability CI and Data Management CI services dependent on frequency and variation of queries. For example, the DIMGR service has a larger capacity requirement than the Data Dictionary service because it requires more temporary workspace since it handles a greater number and more varied types of queries. The expected capacity of Interoperability CI, Data Management CI, COTS, Operating System and Communications and Utilities software to be installed on the DMGHW CI at the Release B ASF DAAC site is depicted in Table 3.4.2.3-13.

Table 3.4.2.3-13 is filled with preliminary disk sizing results for Release B Interoperability and Data Management software CIs, operational databases and COTS software packages that will be installed on the DMGHW CI at the ASF DAAC site. Some of the results are estimates (such as database sizes) since the DBMS design will mature and impact disk capacity sizing as the Advertising Service CI, Gateway CI, Data Dictionary CI, Local Information Manager CI, and Distributed Information Manager CI under-go future evaluation and prototyping.

Table 3.4.2.3-13. DMGHW CI Disk Capacity Requirements

S/W Component	Release B Capacity
COTS Software:	
Sybase System	300 MB
HTTP Server	10 MB
	Total: 310 MB
Databases:	
Sybase Master Database	3 MB
Sybase Tempdb Database	100 MB
Sybase Model Database	2 MB
Advertising Database	150 MB (Estimate)
Advertising DB Workspace	150 MB (Estimate)
Advertising DB Log	100 MB (Estimate)
Advertising HTML Files	100 MB (Estimate)
Data Dictionary Database	400 MB (Estimate)
Data Dictionary DB log	100 MB (Estimate)
DMS Working Store Database	500 MB (Estimate)
DMS Working Store DB log	100 MB (Estimate)
	Total: 1705 MB
Operating System & Utilities:	
Operating System Software	700 MB
Utilities	200 MB (Estimate)
DCE Client	46 MB
	Total: 946 MB
	Total: 2961 MB

3.4.2.3.2 Configuration

The selected DMGHW CI DBMS/Web server to be implemented in Release B is a low-end SMP server (HP K400) that is scaleable from one to four processors. A single physical DBMS/Web server will be implemented at the Release B ASF DAAC site. At this time a two CPU configuration has been determined to be appropriate for the DMGHW CI DBMS/Web server due to RMA requirements. The Release B HP K400 single server configuration will offer redundancy in the form of: 1) dual processors, 2) dual power supply units, 3) dual FWD SCSI-2 cards, and 4) dual FDDI network cards 5) duplicate OS boot/application disk. The components listed above are hot swap-able units which allow them to be replaced without shutting down the server. Also, the HP-UX operating system features memory page de-allocation which automatically blocks out any portion of memory in which an error has been detected; therefore, a failure to memory will not bring operations to a halt. The single server host configuration will allow applications to be run in parallel across both processors, which enhances load balancing and availability/recovery capabilities. The DMGHW CI DBMS/Web server will automatically reconfigure itself in a single CPU configuration in the event of failure to a single CPU. The dual power supply units, FWD SCSI-2 cards and FDDI network cards will also provide continued availability in the case of failure to a single component (per function). The redundant configuration of the DMGHW CI DBMS/Web server has been analyzed by the ECS Reliability Engineering Group using COTS vendor provided data to ensure that all functional availability requirements are met. Preliminary analysis results revealed that the DMGHW CI DBMS/Web server has an MTBF (mean-time-between-failures) of greater than 20,000 hours which meets all pertinent RMA requirements.

A RAID disk unit will be attached via FWD SCSI-2 (dual ported) to the DMGHW CI DBMS/Web server (see Figure 3.4.2.3.2-1-2). The RAID disk until will provide operational and mirrored sets of disk devices to the DMGHW CI server in order to provide uninterrupted data availability in the event of a disk failure. The RAID disk configuration will also be implemented such that a failure to a single disk will be recoverable via a "hot-swap" disk capability. The RAID disk until will be comprised of ten disks: five operational and five mirror disks. Each disk contained in the RAID unit will provide a capacity of 2.1GB.

Since the Release B processing requirements for the Local Information Manager CI and Distributed Information Manager CI are largely unknown at this time, the flexibility of the recommended hardware design assures minimum risk. The design allows for 100% growth in both processing and storage capacity in support of the Advertising Service, Gateway, Data Dictionary, Local Information Manager and Distributed Information Manager CIs in Release B.

The following configuration diagram, Figure 3.4.2.3.2-1-2, depicts the recommended server host/ RAID disk unit configuration:

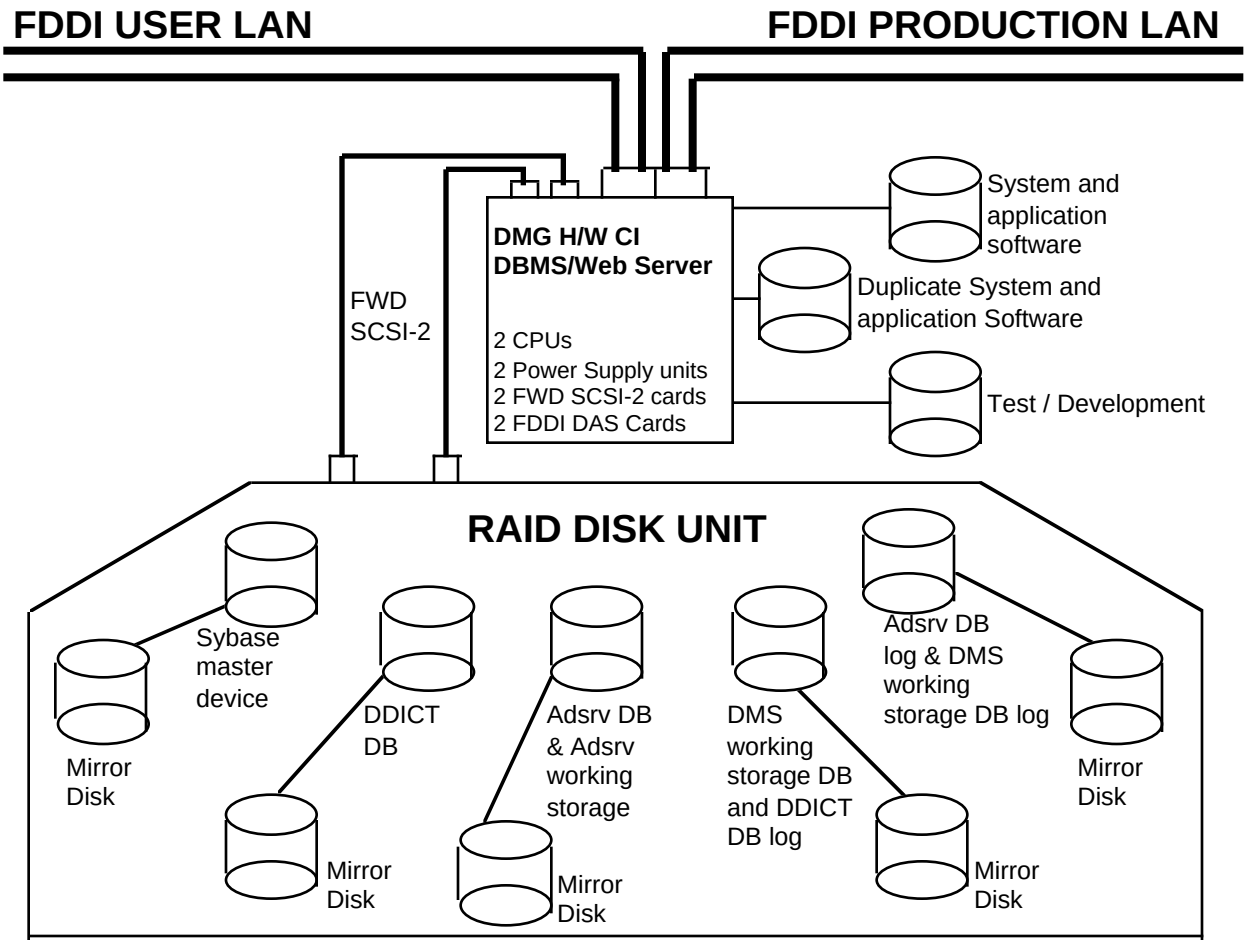

Figure 3.4.2.3.2-1. DMGHW CI RAID Disk Configuration

Although the estimates for Advertising Service and Data Management operational databases, COTS software, and operating system and utilities sizing are relatively small, the total disk volume for the DMGHW CI server has been increased in support of Sybase swap (workspace) area, 100% growth capacity for the core operational software, and mirror disk units. The Data Management databases will be replicated (using Sybase replication server) at each DAAC site. The Interoperability and Data Management software CIs will be distributed over multiple disk drives contained in the RAID disk unit in order to enhance performance (vendor and developer recommended); therefore, the total disk volume is well above the actual capacity needed to support the software alone. Additional disk capacity (internal to the server) in the form of a redundant system/application disk, and a test/development disk have also been added to the configuration in support of RMA, and integration and test requirements.

A single 8mm tape drive unit will be configured on the DMGHW CI server in Release B. The 8mm tape drives will be used to backup Advertising Service and Data Management CIs/databases, as well as perform DBA and routine maintenance operations.

A low-end DBMS/DBA uniprocessor workstation will be used for database/system administration activities. A single 8mm tape drive unit will be configured on the DBMS/DBA workstation in Release B. The 8mm tape drive will perform backup/recovery and routine maintenance operations in support of the DMGHW CI DBMS/Web host servers. A small pool of low-end uniprocessor workstations will support Data Specialist/User Support operations. At a minimum the DBMS/DBA and Data Specialist/User Support workstations will be configured with six gigabytes of local disk each. Workstation disk capacities were sized based on IR-1 workstation installation results which included recommendations for additional space per workstation to accommodate the following: 1) User/Temp workspace, 2) Personal development space, 3) Testing, 4) Software upgrades, 5) Working with large files/datasets, 6) future growth/flexibility. Exact capacities for disk drives are dependent on the procurement process as the type, and size of disks being offered for workstation platforms may fluctuate.

Table 3.4.2.3-14 summarizes the recommended DMGHW CI processing configuration for implementation at the Release B ASF DAAC.

NOTE: The HP K400 SMP depicted in Table 3.4.2.3-14 is a low-end SMP class server that is scaleable from 1-4 CPUs.

Table 3.4.2.3-14. ASF DAAC DMGHW Hardware Configuration

Component	Class/Type	Platform	Qty.	Number of Processors	Memory	Disk Capacity
DBMS/Web Server	SMP	HP K400	1	2	512 MB	27.3 GB
DBA Workstation	Uniprocessor	HP C100/64	1	1	64 MB	6 GB
Data Specialist and User Support Workstations	Uniprocessor	SUN UltraSparc 140	2	1 (each)	64 MB (each)	6 GB (each)

DBMS/Web Server Platform Technical Specifications:

Make: Hewlett Packard

Model: K400 (Low-End SMP class server)

CPU: PA7200 (upgradeable to future PA800 processor)

Clock Frequency: 100 MHz

Number of processors: 1 to 4

MIPS: 146 (1 processor)

TPM: 1000 (1 processor) 3160 (4 processors)

SPECint92: 136 (1 processor)

SPECfp92: 215 (1 processor)

Memory: Expandable to 2GB RAM

Internal Processor-Memory bus bandwidth: 960 MB/sec (peak)

I/O Bandwidth: 128 MB/sec (peak)

3.4.2.4 Ingest Subsystem

There is no Ingest subsystem hardware at ASF. Instead, the Ingest subsystem software resides on the ACMHW CI of the Data Server subsystem. Ingest Subsystem responsibilities at ASF differ somewhat from those at the other Release B DAACs due to several requirements unique to ASF and the interaction between ECS and ASF DAAC-unique elements. Much of the data received by ECS at ASF may be converted from one format to another prior to archiving. Examples of this include CEOS to HDF data product conversion and CSA catalog data swath to frame processing. Ingest subsystem software resources will be provided to support these conversions prior to permanent storage of the data in the Data Server deep archive. A preliminary assessment of the number and frequency of products to be ingested and the specific conversions to be performed has been completed for IDR. This analysis is still ongoing.

Data Server subsystem hardware will also be involved in the migration of existing Version 0 data into ECS Release B. Subsystem configuration and specific component sizing rationale are provided in the following paragraphs.

3.4.2.4.1 Rationale

The sizing of required hardware both from a system level and a component level is based on the February 1996 version of the ECS Technical Baseline. Among the information included in the baseline is:

- o data by instrument,
- o average daily data volume by level,
- o and data destination.

Table 3.4.2.4-1 provides a synopsis of the ingest data volumes required for Release B at ASF.

Table 3.4.2.4-1. ASF Ingest Data Volumes - Release B

Release B DAAC	Daily Data Volume Requiring Conversion or Reformatting (GB/day)	Annual L0 Volume (GB/year)	Version 0 Data Migration Volume (GB)
ASF	TBD	None	594

The average expected daily and annual data volumes at each site are still being analyzed.

3.4.2.4.2 Configuration

There is no Ingest subsystem hardware at ASF.

3.4.2.5 Interoperability Subsystem

For the Release B time frame, the hardware support for the Interoperability Subsystem, particularly the Advertising capabilities are provided by the Data Management HWCI. Please see Section 3.4.2.3 for a complete description of this capability.

3.4.2.6 Production Planning Subsystem

This DAAC facility has no ECS production operations, therefore, no hardware support for the Planning Subsystem is required.

3.4.2.7 Data Processing Subsystem

This DAAC facility has no ECS production operations, therefore, no hardware support for the Data Processing Subsystem is required.

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 CI (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 ASF 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 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 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. 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. To this must be added processing capacity to handle DCE server functions, HP Openview monitoring, processing of log files, Sybase report generation / ad hoc query capability, Remedy trouble ticketing, Tivoli monitoring, Tivoli software distribution management, mode management, order request tracking, and mail.

HP Openview and log file-to-Sybase data conversion are primary processing drivers that are expected to vary by DAAC. Table 3.4.2.8.1-1 shows estimated numbers of transactions for HP Openview data collection. HP Openview data collection is driven by the number of managed objects to be monitored and the number and frequency of management information base (MIB objects to be collected for each. Managed objects for each MIB type were counted based on the Release B hardware plan for ASF. The number and frequency of data collection for each class of managed objects was provided by MSS developers as specified in the CSMS Database Design and Database Schema Specification, (311-CD-003-003, Appendix B). HP Openview provided an estimate of 100,000 instructions per transaction. Using this information, an average number of instructions per second required for HP Openview data collection was developed. These estimates appear to be reasonably in line with HP-provided performance information, which indicates that an HP 9000/735, a machine rated at 125 MIPS, is capable of performing approximately 1300 collections per second.

Table 3.4.2.8.1-1. ASF HP Openview Collection Processing Requirement

	# MIB Objects	Average Size (Bytes)	ASF Managed Objects	Collections per hour*	Collections per second	Estimated MIPS
Release B LaRC (Hosts, RDBMS, Router, hubs)	1,953	4	81	60,357	17	1.7

* Note that the number of collections per hour was derived by multiplying each class of MIB objects (e.g., MIB II objects) by the number of managed objects within that class, and summing the results.

An estimate of 100,000 instructions per transaction was assumed for the conversion of each logged event to Sybase, based on the number of source lines of code for the MSS MDA component involved and an estimate of instructions needed to update the Sybase database. Instructions per transaction was multiplied by the number of logged events, including both HP Openview events and events collected from applications via the logging API. HP Openview events (transactions) are described in the previous paragraph. The number of application-generated entries was developed using the following assumptions:

- One log entry is generated for every system transaction, by every process that is included in the transaction thread.
- The number of "pull" transactions is based on the user model and reflects user service requests by DAAC. Pull transactions (e.g., directory, inventory search requests) are assumed to generate a conservative estimate of 10 log entries each from CIDM and data server processes.
- Order request tracking is dependent on the request for data by a user and the request for status of a data product by a user. For every user request for data, an EcRequest is stored in the management DBMS and updated as required by the DSS. The transaction frequency for EcRequest storage is related to the number of granules requested by user per DAAC. Updates made by the DSS to the EcRequest are considered to be a small percentage of the total granules requested. For every user request for status of a product, the appropriate EcRequest is retrieved from the management DBMS and made available to the client.
- In addition, major processes generate log entries of approximately 512 K (based on the MSS application MIB) once every 15 minutes. There are estimated to be 15 processes at each DAAC that will generate log entries every 15 minutes.
- Log files and HP Openview data will be kept for 14 days prior to archiving in long-term Data Server Storage.
- 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. An approximate number of user accounts per DAAC was estimated from the February 1996 user pull technical baseline.

- To implement the mode management service, multiple modes are assigned to each logged activity and can be simultaneously executed. The overhead required to provide mode management capability is estimated at 30% of the total logged activity.

Log entry storage volumes are given in Table 3.4.2.8.1-2.

The MIPs required to import the total number of log files per day are given in Table 3.4.2.8.1-3.

Table 3.4.2.8.1-2. ASF Log Entry Storage Volume - Release B

Log File	Log Events per Transaction	Transaction Frequency per Hour	Total Logged Events per Hour	Bytes per Transaction	Total Size of Bytes/Hr	14-Day Storage Requirements (MB)
User requests	10	69	690	420	289,800	98
Request tracking	10	35	350	420	147,000	50
Application MIB poll	15	7	105	512	53,760	18
Billing & accounting activity logging	2	50	100	420	42,000	15
Subtotal Rel B			1,245		532,560	181
Total Rel B (includes x30% for multiple modes)			1,619		692,328	235

Table 3.4.2.8.1-3. MDA Data Conversion to Sybase Processing Requirement

	Total HP Openview Events / Day	Total Log File Events / Day	MIPS for 8 hour Sybase import
Release B	1,448,568	38,856	6

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.

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. At ASF, the user model reflects a maximum of 69 users accessing per hour. 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.

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.

The server requirements, as dictated by the rationale given above, is synopsized in Table 3.4.2.8.1-4.

Table 3.4.2.8.1-4. CSS/MSS Server Configuration - Requirements Estimate

Server Load Sources	Estimated R-B MIPS
Basic configuration (includes HP Openview and DCE client)*	72
Additional HP Openview data collection*	2
Sybase Server and Client*	50
Tivoli *	20
Remedy*	11
MDA (log conversion to Sybase)	6
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. MDA database update is assumed to be run in off-peak hours, and not concurrently with Sybase report generation functions.)	170

Workstation Sizing There will be two MSS workstations at each DAAC site. 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 3.4.2.1-5 shows that processing utilizations increased significantly when queries were made to the DDTS database.

Table 3.4.2.8.1-5. 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 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 3.4.2.8.1-6 and 3.4.2.8.1-7 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 3.4.2.8.1-6. 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 3.4.2.8.1-7. MSS Workstation #2 Configuration - Requirements

Workstation Load Sources	Estimated MIPS
Basic configuration (includes Billing & Accounting and Operating System)*	35
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
Other Common Services (Mail, file transfer, etc.)	5
Total * These items are considered to be potentially active at the same time	102

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 3.4.2.8.1-2 based on an assumption of fourteen days storage prior to archiving in the data server archive.

The storage requirement for the Management DBMS was based on a worst case assumption that all the records from both the log files and HP Openview are stored in the Management DBMS, with an additional 10% for table overhead and summarization records. It is assumed that one months worth of data are maintained in the Management DBMS at a time.

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-029-002, 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 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. 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.

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 3.4.2.8.1-8. 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 3.4.2.8.1-8. 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 1 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 3.4.2.8.1-9.

Additional RAID storage is allocated for safeguard 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 15 and 17 GB as specified in Table 3.4.2.8.1-10 (includes additional storage for Sybase swap space).

Table 3.4.2.8.1-9. ASF *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 3.4.2.8.1-10. ASF MSS Release B Storage Requirements

Datastore	Freq. of Events/Hr	Size in Bytes/ Transaction	Size in Bytes Transmitted/Hr	14-Day Storage Requirements (MB)
HP Openview Datastore	60,357	5	301,785	102
Application log files	1,619	420*	692,328	235
Sybase DBMS				742
Clearcase				3,942
Tivoli	1320	256	337,920	114
Remedy	17	256	4,352	2
DDTS	8	2400	19,200	7
DBMS Report Generator	1	15,000	15,000	5
Other Datastores (ILM, XRP, B&A client, training, policy & procedures)				145
Application Disk Space Requirements				5,400
Total Storage Requirement				10,700

* Application polling generates 512 byte logs. These have been included in the per hour total.

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. Based on the Release B processing requirements, a medium-range server class platform was chosen. 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.

3.4.2.8.2 Configuration

The following configuration will be provided for the ASF 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: 28 GB total storage
- Workstations:
  - 1 Sun SPARC 20/50, 128 MB of RAM and 8 GB of storage (This workstation will house configuration management software)
  - 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
- Printer
  - 1 HP Laser Jet 4M+ Printer, 12 ppm/14 MB

The ASF DAAC will contain two primary servers for its LSM configuration, cross-strapped to RAID disk to enable warm backup. MSS and CSS applications will run on separate systems but in case of contingency, either system will be capable of running both subsystems.

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

The configuration at ASF will include two Sun SPARC 20/50 workstations. One of the workstations which will house configuration management software will be configured with higher memory and higher storage (128 MB of RAM and 8 GB of hard drive).

The DAAC configuration at ASF includes a Digital Linear Tape (DLT) drive which provides better performance transfer rates and higher capacity per cartridge than standard helical scan technology.

3.5 Software/Hardware Mapping

With the exception of the Client subsystem, each subsystem has been designed to incorporate hardware CIs that include the components (processors, servers, archive robotics, etc.) on which the software components run. Table 3.5-1 provides a mapping of ASF ECS Release B software components to the applicable hardware components.

Table 3.5-1. ASF Hardware to Software Component Mapping (1 of 5)

HWCI / units	Subsystem	CSCI	CSC
ACMHW/administration and operations workstations	Client	DESKT	All CSCs
		WKBCH	All CSCs, except - User Preference Tools
	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
ACMHW/APC servers	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	Data Server	SDSRV	All CSCs
		STMGT	Service Clients File Peripherals Resource Management
	Ingest	INGST	All CSCs except User Network Ingest Interface
	Management	MACI	All CSCs

Table 3.5-1. ASF Hardware to Software Component Mapping (2 of 5)

HWCI / units	Subsystem	CSCI	CSC
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
DIPHW/distribution servers	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	Data Server	DDIST	All CSCs
		STMGT	Service Clients Peripherals Resource Management
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
DRPHW/FSMS servers	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	Data Server	STMGT	All CSCs
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy

Table 3.5-1. ASF Hardware to Software Component Mapping (3 of 5)

HWCI / units	Subsystem	CSCI	CSC
DDSHW/document server	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	Data Server	DDSRV	All CSCs
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
DMGHW/data specialist workstations	Client	DESKT	All CSCs
		WKBCH	All CSCs
	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
DMGHW/administration and operations workstations	Client	DESKT	All CSCs
		WKBCH	All CSCs
	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services

Table 3.5-1. ASF Hardware to Software Component Mapping (4 of 5)

HWCI / units	Subsystem	CSCI	CSC
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
DMGHW/DBMS servers	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	Data Management	DDICT	All CSCs
		DIMGR	All CSCs
		GTWAY	All CSCs
		LIMGR	All CSCs
	Interoperability	ADSRV	All CSCs
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
MSS/MSS workstations	Client	DESKT	All CSCs
	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
	ISS	INCI	All CSCs
	Management	MACI	All CSCs
		MCI	All CSCs
		MLCI	All CSCs
		MHCI	All CSCs
MSS/MSS LSM Server	ISS	INCI	All CSCs

Table 3.5-1. ASF Hardware to Software Component Mapping (5 of 5)

HWCI / units	Subsystem	CSCI	CSC
	Management	MACI	All CSCs
		MCI	All CSCs
		MLCI	All CSCs
		MHCI	All CSCs
	Communication	DCCI	Electronic Mail Services Event Logger Services File Access Services Life Cycle Services Message Passing Services Thread Services Time Services
CSS/CSS server	Communication	DCCI	All CSCs
	Management	MACI	All CSCs
		MCI	Automatic Actions Fault Management Management Proxy Performance Management Performance Management Proxy
User workstation	Client	WKBCH	All CSCs
	Ingest	INGST	User Network Ingest Interface

Note: "All CSCs" refers to those CSCs for a specific CSCI that is identified in the Component Analysis Table in Section 3.3.2 of this document.

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4. Future Releases

This document has described the design of ECS subsystems for the ASF ECS DAAC at Release B. Two other releases are currently planned. The next release, Release C, is scheduled for December 1999. The Release Plan Content Description for the ECS Project describes in detail the capabilities being provided in Releases C and D. An updated version of this document will precede Release C and will reflect the design corresponding to that release.

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Abbreviations and Acronyms

ACMHW	Access Control and Management HWCI
ADC	Affiliated Data Center
ADSHW	Advertising Service HWCI
ADSRV	Advertising Service CSCI
AHWGP	Ad Hoc Working Group on Production
AITHW	Algorithm Integration & Test HWCI
AITTL	Algorithm Integration and Test Tools (CSCI)
APC	Access/Process Coordinators
API	Application Programming Interface
APS	Acquisition Planning System (ASF DAAC-Unique)
AQAHW	Algorithm QA HWCI
ASF	Alaska SAR Facility (DAAC)
BAAC	Billing and Accounting
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CEOS	Committee on Earth Observing Satellites
CI	Configuration Item
CLS	Client Subsystem
COTS	Commercial off-the-shelf
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSA	Canadian Space Agency
CSDT	Computer Science Data Type
CSMS	Communications and Systems Management Segment
CSS	Communication Subsystem (CSMS)
DAAC	Distributed Active Archive Center

DADS	Data Archive and Distribution System
DBA	Data Base Administration
DBMS	Database Management System
DCE	Distributed Computer Environment
DCN	Document Change Notice
DDICT	Data Dictionary CSCI
DDIST	Data Distribution CSCI
DDSRV	Document Data Server CSCI
DDTS	Data Defect Tracking System
DESKT	Desktop CI
DEV	Developed code
DID	Data Item Description
DIM	Distributed Information Manager
DIMGR	Distributed Information Management CSCI
DIPHW	Distribution & Ingest Peripheral Management HWCI
DM	Data Management
DMGHW	Data Management HWCI
DMS	Data Management System
DMS	Data Management Subsystem
DOF	Distributed Object Framework
DPS	Data Processing Subsystem
DPS	Derived Product System (ASF DAAC-Unique)
DRPHW	Data Repository HWCI
DS	Data Server
DSS	Data Server Subsystem
EBnet	EOSDIS Backbone Network
ECS	EOSDIS Core System
EDC	EROS Data Center (DAAC)
EDF	ECS Development Facility

EDHS	ECS Data Handling System
EGS	EOS Ground System
ERS-1/2	European Remote Sensing Satellite
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
EP	Evaluation Package
ESA	European Space Agency
ESDIS	Earth Science Data and Information System
ESDT	Earth Science Data Type
FAIF	Flight Agency Interface (ASF DAAC-Unique)
FDDI	Fiber distributed data interface
FOO	Flight-Of-Opportunity
FOS	Flight Operations Segment
FPS	Film Processing System
FSMS	File and Storage Management System
GB	Gigabyte
GCMD	Global Change Master Directory
Gnrc	Generic
GSFC	Goddard Space Flight Center
GTWAY	Version 0 Interoperability Gateway CSCI
GUI	Graphic user interface
HiPPI	High Performance Parallel Interface
HP	Hewlett Packard
HTTP	Hypertext Transfer Protocol
HW	Hardware
HWCI	Hardware Configuration Item
I&T	Integration and Test
I/O	Input/Output
IATO	Independent Acceptance Test Organization

ICD	Interface Control Document
ICLHW	Ingest Client HWCI
IDR	Incremental Design Review
IIAS	Interactive Image Analysis System (ASF DAAC-Unique)
IMS	Information Management System
INCI	Internetworking CI
INGST	Ingest
IP	International Partner
IR-1	Interim Release 1
IRD	Interface Requirements Document
ISS	Internetworking Subsystem
IST	Instrument Support Team
IV&V	Independent Verification and Validation
JERS-1	Japanese Earth Resources Satellite
JPL	Jet Propulsion Laboratories
L1	Level 1
L2	Level 2
L3	Level 3
LaRC	Langley Research Center
LAN	Local Area Network
LIM	Local Information Manager
LIMGR	Local Information Management CSCI
LSM	Local Site Manager
MACI	Management Agent CI
MB	Megabyte
MCI	Management CI
MD	Maryland
MFLOPS	Millions of Floating Point Operations Per Second
MIPS	Millions of Instructions Per Second

MLCI	Management Logistics CI
MSFC	Marshall Space Flight Center
MSS	Management Subsystem (CSMS)
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NOAA	National Oceanic and Atmospheric Administration
NSI	NASA Science Internet
NSIDC	National Snow and Ice Data Center (DAAC)
ODC	Other Data Center
OODCE	Object Oriented Distributed Computing Environment
ORNL	Oak Ridge National Laboratory (DAAC)
OTS	Off-the-shelf
PGS	Product Generation System
PLNHW	Planning HWCI
PPS	Production Planning System (ASF DAAC-Unique)
PRONG	Processing CSCI
PVS	Product Verification System (ASF DAAC-Unique)
Q	Quarter
QA	Quality Assurance
RAID	Redundant Array of Inexpensive Disks
RAM	Random Access Memory
RGS	Receiving Ground Station (ASF DAAC-Unique)
RID	Review Item Discrepancy
RRR	Release Readiness Review
SAR	Synthetic Aperture Radar
SCDO	Science and Communications Development Office
SCF	Science Computing Facility
SDP	Science Data Processing
SDPS	Science Data Processing Segment

SDPTK	SDP Toolkit CSCI
SDSRV	Science Data Server CSCI
SMC	System Monitoring and Coordination
SMP	Symmetric Multi Processing
SNMP	Simple Network Management Protocol
Spfc	Specific
SPRHW	Science Processing HWCI
SPS	SAR Processing System (ASF DAAC-Unique)
STMGT	Storage Management CSCI
SW	Software
TBD	To be determined
TPM	Transactions Per Minute
TPS	Transactions Per Second
TRMM	Tropical Rainfall Measuring Mission
TRR	Test Readiness Review
UR	Universal Reference
URL	Universal Reference Location
V0	Version 0
V1	Version 1
WKBCH	Workbench CI
WRP	Wrapper
WWW	World Wide Web