

305-CD-029-002

EOSDIS Core System Project

**Release B CSMS System Management
Subsystem Design Specification
for the ECS Project**

March 1996

Hughes Information Technology Systems
Upper Marlboro, MD

Release B CSMS System Management Subsystem Design Specification for the ECS Project

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SUBMITTED BY

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EOSDIS Core System Project

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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

Object models presented in this document have been exported directly from CASE or DBMS tools and in some cases contain too much detail to be easily readable within hard copy page constraints. The reader is encouraged to view these drawings on line using the Portable Document Format (PDF) electronic copy available via the ECS Data Handling System (EDHS) at: URL <http://edhs1.gsfc.nasa.gov>.

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.

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Abstract

The CSMS Systems Management Subsystem Design Specification defines the detailed design of the CSMS Systems Management Subsystem (MSS). It defines the MSS architectural design, as well as subsystem design based on Level 4 CSMS requirements. This document will be updated prior to the Release Readiness Review to incorporate the as-built configuration of the CSMS design.

Keywords: CSMS, system, management, communications, networks, DCE, OODCE, OMT, Release A, Release B

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Appendix A. Requirements Trace

Appendix B. Application MIB Definition

Abbreviations and Acronyms

1. Introduction

1.1 Identification

This Release B Communications and System Management Segment (CSMS) Systems Management Subsystem Design Specification for the ECS Project, Contract Data Requirement List (CDRL) item 046, with requirements specified in Data Item Description (DID) 305/DV3 is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract NAS5-60000.

1.2 Scope

The Release B CSMS Systems Management Subsystem Design Specification defines the detailed design of the Systems Management Subsystem (MSS). It defines the Release B MSS architectural design, as well as subsystem design based on Level 4 MSS requirements. This document will be updated for the Release Readiness Review to incorporate the as-built design of the MSS.

This document reflects the February 14, 1996 Technical Baseline maintained by the contractor configuration control board in accordance with ECS Technical Direction No. 11 dated December 6, 1994.

1.3 Status and Schedule

This submittal of DID 305/DV3 meets the milestone specified in the Contract Data Requirements List (CDRL) of NASA Contract NAS5-60000. This version of the document is to be reviewed during the Release B Critical Design Review, and subsequent comments will be incorporated into the final version.

1.4 Organization

The document is organized to describe the Systems Management Subsystem (MSS) design.

Section 1 provides information regarding the identification, scope, status, 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 an overview of the MSS, focusing on the MSS high-level design concept. This provides general background information to put MSS into context.

Section 4 contains the design of the Management Software CI (MCI). This contains the management applications, the management data access service, and the management DBMS.

Section 5 contains the design of the Management Logistics CI (MLCI). This includes the baseline manager, the change request manager, and the software change manager.

Section 6 contains the design of the Management Agents CI (MACI). This consists of the management agent services.

Section 7 contains the design of the Management Hardware CI (MHCI).

Appendix A contains the Traceability Matrix for Level 4 requirements to the design document.

Appendix B contains the application MIB definition.

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

2. Related Documentation

2.1 Parent Documents

The parent documents are the documents from which this CSMS Systems Management Subsystem Design Specification's scope and content are derived.

194-207-SE1-001	System Design Specification for the ECS Project
304-CD-003-002	Communications and System Management Segment (CSMS) Requirements Specification for the ECS Project
305-CD-013-001	Release A CSMS Systems Management Subsystem Design Specification for the ECS Project
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System

2.2 Applicable Documents

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

209-CD-002-003	Interface Control Document Between EOSDIS Core System (ECS) and ASTER Ground Data System
194-219-SE1-001	Interface Requirements Document Between EOSDIS Core System (ECS) and the NASA Science Internet (NSI)
193-219-SE1-008	Interface Requirements Document Between EOSDIS Core System (ECS) and Program Support Communications Network, Draft
505-41-11	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and the Version 0 System
505-41-12	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Science Computing Facilities
505-41-13	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Landsat 7 System
505-41-14	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Tropical Rainfall Measuring Mission (TRMM) Ground System

505-41-15	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Earth Observing System (EOS) AM-1 Flight Operations
505-41-19	Goddard Space Flight Center, Interface Requirements Document Between the EOSDIS Core System (ECS) and the National Oceanic and Atmospheric Administration (NOAA) Affiliated Data Center (ADC)
505-41-21	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and NASA Institutional Support Systems

2.3 Information Documents

2.3.1 Information Documents Referenced

The following documents are referenced herein and, amplify or clarify the information presented in this document. These documents are not binding on the content of the ECS CSMS Systems Management Subsystem Design Specification.

102-CD-001-004	Development Configuration Management Plan for the ECS Project, Revision 1
305-CD-020-002	Release B SDPS/CSMS Design Overview Specification for the ECS Project
516-CD-002-002	Release B Reliability Predictions for the ECS Project
518-CD-002-002	Release B Maintainability Predictions for the ECS Project
193-00632TPW	DME Migration Study for the ECS Project
194-00605TPW	Use of ClearCase in the ECS Operational Environment
540-TP-001-001	Communications and System Management Segment (CSMS) Preliminary Design Review (PDR) Trade Studies for the ECS Project

2.3.2 Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify or clarify the information presented in this document. These documents are not binding on the content of the CSMS Systems Management Subsystem Design Specification.

209-CD-002-003	Interface Control Document Between EOSDIS Core System (ECS) and ASTER Ground Data System
209-CD-003-003	Interface Control Document Between EOSDIS Core System (ECS) and the EOS-AM Project for AM-1 Spacecraft Analysis Software
209-CD-004-003	Data Format Control Document for the ECS Flight Operations Segment AM-1 Project Data Base (PDB) Preliminary
220-CD-001-004	Communications Requirements for the ECS Project
193-TP-561-001	Technical Paper: DCE Migration Study for the ECS Project

502-ICD-JPL/GSFC Goddard Space Flight Center/MO&DSD, Interface Control Document Between the Jet Propulsion Laboratory and the Goddard Space Flight Center for GSFC Missions Using the Deep Space Network

530-DFCD-NCCDS/POCCGoddard Space Flight Center/MO&DSD, Data Format Control Document Between the Goddard Space Flight Center Payload Operations Control Centers and the Network Control Center Data System

560-EDOS-0230.0001 Goddard Space Flight Center/MO&DSD, Earth Observing System (EOS) Data and Operations System (EDOS) Data Format Requirements Document (DFRD)

FIPS PUB 127-1 Federal Information Processing Standards Publication: Database Language SQL

RFC768 J. Postel; User Datagram Protocol

RFC791 J. Postel; Internet Protocol, 9/1/81 (obsolete/updated by RFC1060)

RFC792 J. Postel; Internet Control Message Protocol, 9/1/91

RFC793 J. Postel; Transmission Control Protocol, 9/1/91

RFC826 D. Plummer; "Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware, 11/1/82

RFC894 C. Hornig; Standard for the Transmission of IP Datagrams Over Ethernet Networks, 4/1/84

RFC895 J. Postel; Standard for the Transmission of IP Datagrams Over Experimental Ethernet Networks, 4/1/84

RFC903 R. Finlayson, et al; Reverse Address Resolution Protocol, 6/1/84

RFC1058 C. Hedrick; Routing Information Protocol, 6/1/88

RFC1060 J. Postel, J. Reynolds; ASSIGNED NUMBERS, 3/20/90 (obsolete/updated by RFC1340)

RFC1105 K. Lougheed and Y. Rekhter; A Border Gateway Protocol, June 1989

RFC1157 M. Schoffstall, et al; A Simple Network Management Protocol (SNMP), 5/10/90

RFC1188 D. Katz; A Proposed Standard for the Transmission of IP Datagrams over FDDI Networks, 10/30/90 (obsolete/updated by RFC1390)

RFC1209 J. Lawrence, D. Piscitello; The Transmission of IP Datagrams Over the SMDS Service, 3/6/91

RFC1213 K. McCloghrie, M. Rose; Management Information Base for Network Management of TCP/IP-based Internets: MIB-II, 3/26/91

RFC1340 J. Reynolds, J. Postel; ASSIGNED NUMBERS, 7/10/92

RFC1374 J. Renwick, A. Nicholson; IP and ARP on HIPPIE, 11/2/92

RFC1390 D. Katz; Transmission of IP and ARP over FDDI Networks, 1/5/93

RFC1583 J. Moy; OSPF Version 2, 3/23/94
RFC1623 F. Kastenholz; Definitions of Managed Objects for the Ethernet-like
Interface Types, 5/24/94
RFC1654 Y. Recker and T. Li; A Border Gateway Protocol 4 (BGP-4), July 1994

3. Systems Management Subsystem Overview

3.1 Introduction and Context

The MSS provides ECS Maintenance and Operations (M&O) Staff with the capability to manage the ECS enterprise, i.e., to perform network and system management services for all ECS resources, including all SDPS, FOS, and CSMS components. The MSS is composed of a combination of Commercial Off The Shelf (COTS) and custom management applications to provide a highly automated means for monitoring and managing the various ECS resources. At each ECS installation,¹ M&O Staff autonomously provide local management services associated with its ECS resources and, hence, are provided a local management view. At the System Monitoring and Coordination Center (SMC), M&O Staff provide enterprise monitoring and coordination services associated with ECS installations and are provided a system-wide management view. Extensive configurability is provided by the MSS applications to enable these views to be shared or controlled as necessary based on ECS management policy. Beside providing these views to M&O Staff for monitoring and control purposes, the management services make use of legacy CSS services such as electronic mail and bulletin board for coordination. The services provided by CSMS at the SMC, located at Goddard Space Flight Center (GSFC), are collectively referred to as Enterprise Monitoring and Coordination (EMC) throughout this document. In the same context, services provided by CSMS at DAACs and the EOS Operations Center (EOC) (sites) are collectively referred to as Local System Management (LSM).

The System Management Subsystem (MSS) provides the management framework and enterprise management (network and system 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 ESN 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 are fully decentralized, no single point of failure exists which would preclude user access. In principle every service is distributed unless there is an overriding reason for it to be centralized. MSS has two key specializations: Enterprise Monitor and Coordination Services and Local System Management Services. The distribution of these services, shown in Table 3.1-1, provides maximum flexibility and policy neutrality in the design and implementation of MSS services.

¹. Release B ECS installations includes all DAACs, System Monitoring and Coordination Center (SMC, at GSFC), and the EOS Operations Center (EOC, at GSFC).

Fully distributed client-server system management application services for distributed enterprises such as ECS are not commercially available today. For Release B, HP OpenView and Tivoli T/EC has been chosen as a framework for integration of multi-vendor network and system management products to support migration to a fully integrated management solution as such products become commercially available. This document covers the MSS services that will be fully implemented in Release B.

Table 3.1-1. Management Service Distribution (1 of 3)

Management Service	Enterprise Monitor and Coordination (EMC)	Local System Management (LSM)	Comments
Policies and Procedures	Prepare, store, maintain, view, print, and distribute ECS policies and procedure	Prepare, store, maintain, view, and print Site specific policies and procedures.	Use of Bulletin Board to post information on ECS status, events, and news. Reuse of Document Data Server, Ingest, and Client for all other functions associated with Policies and Procedures.
Fault Management	Receive Summary Reports from Sites, Monitor System Wide Resources (WANs), Perform Trend Analysis	Monitor, detect, isolate, diagnose, and recover from faults within domain	Largely COTS capabilities (HPOV and TIVOLI), EMC maintains system-wide view from Site updates and monitoring
Performance	Trend analysis and system-wide view provided from Site updates	Collect server, hardware, and network performance data, analyze performance data, tune and report to SDPS/FOS/EMC	Site performance is cooperative effort between LSM and SDPS/FOS. Trends are through roll up of site reports. Largely COTS (HPOV and Tivoli).
Trouble Ticketing	Summary Reports, View selected Site problems, support resolution	Document problem reports, track actions and closure. User and resource summaries	Remedy Action Request System selected as TT package.
Physical Configuration Management	Same as DAAC	Maintain Physical location and configuration information	Commercial package to locate and record resources, detects changes to approved configuration
Security	Policy flowdown, system-wide monitoring and analysis	DCE Cell Management	Authentication, authorization, intrusion detection, DCE Cell Management. Largely public domain and COTS: Tivoli, HP Cell Administration Tools for cell management. Policy flowdown and user account administration is custom software

Table 3.1-1. Management Service Distribution (2 of 3)

Management Service	Enterprise Monitor and Coordination (EMC)	Local System Management (LSM)	Comments
Inventory/ Logistics/ Maintenance	System-wide inventory creation and management. Monitoring of spares and consumables, and maintenance analysis.	Site inventory data maintenance and management, establish and maintain PM schedules, monitor and coordinate off-site maintenance, and site-level monitoring of spares and consumables, to include replenishment.	A commercial package to maintain and track inventory. The package will integrate logistics and maintenance activities
Configuration Management (CM): Software Change Manager (ClearCase)	Version controlled software library	Software CM of ECS baseline	ClearCase has been selected as the Software Change Manager package.
Baseline Manager (XRP-II)	Consolidated baseline for system wide configuration and dependencies	Maintain site baseline for operational system configuration	XRP-II has been selected as the Baseline Manager package.
Change Request Manager (DDTS)	Maintain system wide status of change requests	Maintain record of configuration change requests, tracks status	DDTS has been selected as the Change Request Manager package.
Training	Coordinate training schedules, curricula, user feedback, and develop materials	.Provide input on training schedules, curricula, local course development, and evaluation	
Planning	System-wide schedule policy, priorities, performance assessment System wide ground event coordination	Schedule own resources based on system-wide priorities and policies, plan ground events and interface with FOS and PDPS	
Reports	System-wide reporting based on "roll-up" of Site level data	Site-level reporting on performance, security, fault, and configuration information	

Table 3.1-1. Management Service Distribution (3 of 3)

Management Service	Enterprise Monitor and Coordination (EMC)	Local System Management (LSM)	Comments
Billing and Accounting	Receive user resource utilization and data order information; provide capability to price resources and products; maintain standard pricing tables; generate statements of account and bill invoices; track accounting data	Collect and provide user resource utilization and data order information. Query account data	Tracking and billing for resources used by users
Software Distribution Manager	Distributes software upgrades, toolkit software, and accompanying documentation to ECS sites.	Distribute software to the appropriate hosts at the local site.	Tivoli Courier has been selected as the Software Distribution Manager package
Software License Manager	Controls and manages the distribution of COTS licenses across ECS sites	Controls and manages the distribution of COTS licenses at the local site.	FLEXIm and NLS have been selected as the Software License Manager packages
Mode Management	Initiates and Controls mode activities across sites	Initiates and Controls mode activities within a given site	HP-Openview has been selected to monitor and control mode activities.
Events/Errors	Log and provide history of ECS wide events and errors	Log and provide history of DAAC events and errors	HP-Openview, Tivoli , custom management agents and event processing software.
Specilized Event Handling	ECS wide Request Tracking, "Food Chain"	Request Tracking, "Food Chain"	Custom software

The following sections describe the individual MSS Services in detail. An Overview, Object Model, Scenario, and Implementation Section is included for each service. Table 3.1-2 and Table 3.1-3 provide a road map to the MSS Design Section.

Table 3.1-2. MSS Design Section Overview

Service	Section
Management Agent CI	4
Management Agents	4.1
Management Logistics CI	5
Baseline Management	5.3.1
Software Change Management	5.3.2
Change Request Management	5.3.3
Software Distribution Management	5.7
License Management	5.8
Training Management	5.9
Policies and Procedures Management	5.10
Inventory, Logistics, Maintenance Management	5.11
Management Software CI	6
Mode Management	6.1
Accountability Management	6.2
Billing and Accounting	6.3
Report Generation	6.4
Fault Management	6.5
Performance Management	6.6
Physical Configuration Management	6.7
Security Management	6.8
Trouble Ticketing	6.9
Management Data Access	6.10
Management DBMS	6.11
User Comment Survey	6.12
Enterprise Framework Management Service	6.13

Table 3.1-3. MSS CSC to Object Trace (1 of 6)

Service	CSC	Object Models
Management Agent Services	ECS Subagent	MsAgSubAgent MsAgSubAgent MsAgMonitor MsAgDeputyGate MsAgDiscoverer MsAgRegistry MsAgEventMgr MsAgEventEntry MsAgStaticBuffer MsAgSubAgentConfig MsAgPortMonitor MsAgCfgFileInfo MsAgPathFinder MsAgScheduler MsAgScheduleEntry MsAgMgmtBindingVector
	Proxy Agent	EcAgProxy EcAgCOTSMgr EcAgCOTSMgrFactory EcAgCOTSLog EcAgPatternVec ECagPattern
	Encapsulator	MsAgEncps
	SNMP Manager'sDeputy	MsAgDeputy MsAgSNMPPdu
	Instrumentation class library	EcAgManager EcAgShutdown EcAgNamedList EcAgConfigFile EcAgException EcAgMetric EcAgFaultMetric EcAgConfigMetric EcAgPerfMetric MsAgIntConfigMetric MsAgUpDateConfigMetric MsAgProcPerfMetric MsAgProclInfo MsAgProcSShotInfo MsAgMetVector EcAgEvent
	Application MIB	MsAgAppMIB

Table 3.1-3. MSS CSC to Object Trace (2 of 6)

Service	CSC	Object Models
Baseline Manager	Baseline Management Services	BaselineManager BaselineChange BaselineProfile BaselineManagementReport CmBmCotsLog ResourceProfile DocumentProfile ConfiguredDivice HardwareControllItem SoftwareControllItem
	Baseline Manager Proxy Agent	MsCmBmProxyAgent
Software Change Manager	Software Change Management Services	SoftwareChangeManager SoftwareLibrary LibraryFile AccessProfile SoftwareChangeReport BuildRecord CmScmCotsLog
Change Request Manager	Change Request Management Services	ChangeRequestManager CmCrmCotsLog ResourceChangeRequestReport ResourceChangeRequest
	Change Request Proxy Agent	MsCmCrmProxyAgent
Software Distribution Manager	Software Distribution Management Services	MsMISdDistributionMgrB MsMISdLogB MsMISdSiteListB MsMISdNonECSSiteB MsMISdECSSiteB MsMISdPackingListB MsMISdSWPackageB MsMISdSWUpgradeB MsMISdToolkitSWB MsMISdDocumentationB MsMISdCotsSWB
Software License Manager	Software License Management Services	MsMILiLicenseMgrB MsMILiLogB MsMILiMeterB MsMILiReportGeneratorB MsMILiLicenseB MsMILiCOTSSoftwareB

Table 3.1-3. MSS CSC to Object Trace (3 of 6)

Service	CSC	Object Models
Training Manager	Training Management Services	MsMITrMgrB MsMITrMOSStaffIFB MsMITrScheduleB MsMITrTraineeB MsMITrCourseB MsMITrCourseLocationB MsMITrTrainingCostB MsMITrEvaluationB MsMITrCurriculumB MsMITrCertificationB MsMITrCertSkillsCatalogB MsMITrInventoryIFB MsMITrInstructorB MsMITrRequirementsB MsMITrMaterialB
Policies and Procedures Manager	Policies and Procedures Management Services	MsMIPpPoliciesProceduresMgrB
Inventory/Logistics/Maintenance Manager	ILM Management Services	ILMMgrB ILMItemB ILMReportGenerator ILMLog SiteMaintenance SystemWideMaintenance SiteLogistics SystemWideLogistics SiteInventory SystemWideInventory
Common Management Services (Mode Management)	Mode Management Service	MsMmMode MsMmModeInit MsMmModeTerm MsMmCtrl MsMmSuspend MsMmResume MsMmShutdown ManagementFramework
Billing and Accounting	Billing and Accounting Service	MsBaBAASB - COTS MsBaManagerUIB MsBaBAASManagerB
	Billing and Accounting COTS Manager	EcAgCOTSManager
	Pricing Table	EcPriceTableB MsBaPriceTable

Table 3.1-3. MSS CSC to Object Trace (4 of 6)

Service	CSC	Object Models
Accountability Management	Accountability Manager	MsAcManager, MsAcReport, MsAcAuditTrail, MsAcUserAuditTrail
	User Account User Interface	MsAcManagerUI
	User Account Management	MsAcRegUserMgr, MsAcRegUserDB, MsAcRegUser, MsAcDCEAcct, MsAcUsrResUsage, MsAcUsrResUsageP
	Account Creation Management	MsAcUsrRequestMgr, MsAcUsrRequest, MsAcUsrRequestP
	User Profile Access	MsAcUsrProfileMgr, MsAcUsrProfile, MsAcUsrProfileP, MsAcAddress, MsAcAddressP, MsAcUsrName, MsAcUsrNameP
	Request Tracking Management	MsAcTrackingMgr, MsAcTrackingUI, MsAcTrackingDB, MsAcCostAcctReport
	Request Tracking Collection	EcRequest, EcOrder, EcSubOrder, EcService, EcRequestEvent, EcOrderEvent, EcSubOrderEvent, EcServiceEvent
Report Generation	Report Generation Manager	MsRgManagerB MsRgUIMgrB MsRgRepGenSchedulerB MsRgStandMgmtRepB
	Report Generator COTS	MsRgRepWriterB
	Trend Analysis COTS	MsRgTrendAnalysisB
	Report Generator Proxy Agent	MsRgProxyB
Fault Management	Network Management Framework	ManagementFramework (HP Openview - COTS) MsFIConfig MsTrap
	System Management Framework	EnterpriseFramework (Tivoli/TE - COTS)
	Diagnostic Tests	MsFITest
	Application Management	MsFIManager
	Automatic Actions	MsFIAction EnterpriseFramework - COTS

Table 3.1-3. MSS CSC to Object Trace (5 of 6)

Service	CSC	Object Models
	Resource Class Category	EcDAAC MsFISMC MsFIEExtSys
Performance Management	Performance Manager	ManagementFramework EnterpriseFramework MsPmConfig MsPmEvent MsPmList
	Report Generation and Distribution	ManagementFramework MsPmExtSys MsPmManager MsPmSMC
	Performance Test	ManagementFramework MsPmTest
	Performance Management Proxy	MsPmCallbacks MsPmProxy
Physical Configuration Management	Physical Configuration Manager	MountainView COTS
	Network Manager	HP OpenView COTS
Security Management	Security Manager	MsScManager, MsScReport, MsScSMC
	Security Databases	MsScAuthenticationDB, MsScAuthorizationDB, RouterACLs, OSACL, TCPWrapperConfig, DCEACL_EDIT, DCERGY_EDIT, OS
	Tests	MsScTest, ComplianceTest, IntrusionDetectionTest,
	DCE Cell Management	HPDCEAccntMgr
Trouble Ticketing	Trouble Ticketing Management Services	MsTtManager
	Trouble Ticketing HTML Menu	MsTtHTMLMenu
	Trouble Ticketing HTML Submission/List	MsTtHTMLItems, MsTtServiceRequestor, MsTtEntryList, MsTtEntry
	Trouble Ticketing Proxy Agent	MsTtProxy

Table 3.1-3. MSS CSC to Object Trace (6 of 6)

Service	CSC	Object Models
Management Data Access	Management Data Access Services	MsMdManager MsMdConfigurationList MsMdConfigurationEntry MsMdSchedule MsMdScheduleEntry MsMdBrowseLog MsMdEventList MsMdEventField MsMdAggregateLogFileList MsMdAggregateLogEntry MsMdUserInterface MsMdArchiveLog MsMdProcessEvent
	Management Data Access User Interface	MsMdUserInterface
User Comment Survey	Survey Manager	MsCsSurveyMgr, MsCsProcessingTimerMetric, MsCsTimer
Enterprise Framework Management Service	Software Distribution	MsEfSoftwareDistribution
	Event Monitoring	MsEfEventMonitoring
	System Administration	MsEfSystemAdmin, MsEfUnixAdmin, MsEfDatabaseAdmin, MsEfDceAdmin, MsEfSystemBackup, MsEfNetworkerProxy
	Tivoli Framework	MsEfTivoliFramework, MsEfTivoliServer, MsEfTivoliClient, MsEfTivoliServerProxy, MsEfTivoliClientProxy

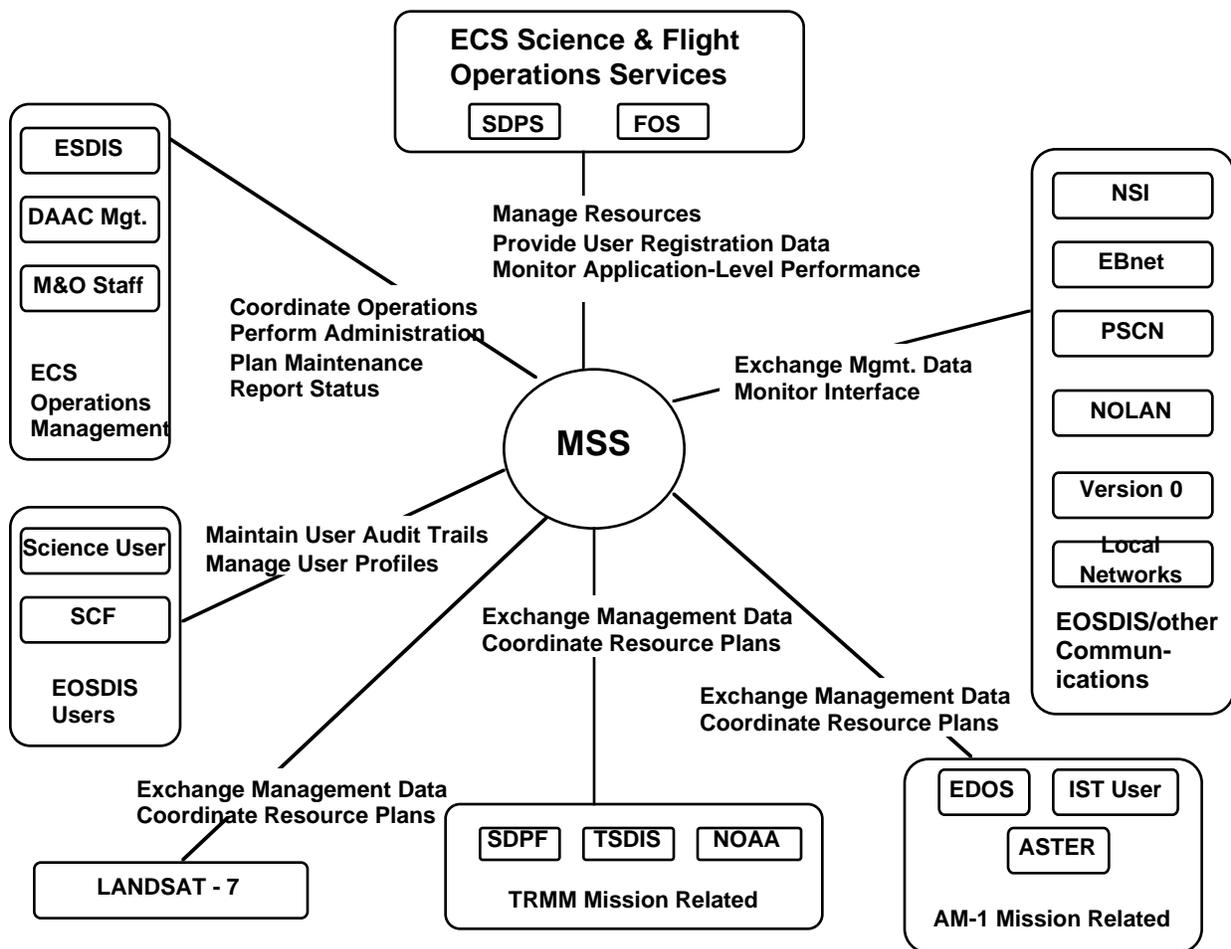


Figure 3.1-1. MSS High Level Context

3.2 Systems Management Subsystem Overview

3.2.1 Systems Management Subsystem Structure

A brief description of the MSS CSCI is provided in this section, a detailed description of each CSCI and components is presented Sections 4, 5 and 6 of this document.

The MSS is largely in the application domain, above the Open Systems Interconnection Reference Model (OSI-RM) application layer services. The management applications are supported by, and functionally dependent upon, other MSS and CSS services. The Management Agent Services are used to monitor and control managed objects (network, hardware, and software objects) within each management domain and provide the primary means of communicating status and control information between managed objects and management applications.

MSS is implemented mainly through the use of COTS, with some “wrapper” and custom code to support ECS unique requirements and to provide a layer of abstraction from COTS to minimize impact of migration to new technology or enhancements. The selection of each COTS package

takes into consideration factors such as ECS requirements, commonality of the HMI, integration with HP OpenView, adherence to standards, vendor track record, and flexibility of operation.

The MSS implementation uses HP OpenView as the common framework for integration of the suite of common management functions, providing elements of fault management, configuration management, accountability management, performance management, security management (FCAPS) and mode management. This framework, and integrated applications, utilize the defacto industry standard Simple Network Management Protocol (SNMP) as the primary means of monitoring and controlling ECS management objects. Table 3.2-1 summarizes the MSS implementation for Release B.

Table 3.2-1. MSS Implementation (1 of 3)

Services	COTS (W/Glue) Custom Code	Notes
Management Software CI		
Fault	COTS+ Custom	Network provided through HPOV, Host, Peripheral and applications provided through Tivoli, + customization of COTS. Contains release B enhancements for fault evaluation.
Performance	COTS+ Custom	Network provided through HPOV, Host, peripheral, and software (applications) provided through Tivoli. Contains release B enhancements for trending.
Security	COTS+ Public Domain + Custom	Implemented through HP DCE Administration Tools for DCE Cell management, public domain for password checking, intrusion detection, Custom for accountability data
Accountability	COTS+ Custom	Significant part implemented through RDBMS, Agent provides for data collection, custom development for collection and processing of accountability data.
Report Generaton	COTS + Custom	GUI, report writer and trend analysis COTS new for Release B
Mode Management	COTS+Custom+Scripts	Implemented through HP OpenView and DCE Cell Manager, Custom to incorporate mode management aspects, scripts for startup. New code for subagent support. New for Release B.
Billing and Accounting	COTS + Custom	New for Release B.
Physical Configuration Management	COTS+ Scripts	COTS integrated with HP OpenView
Trouble Ticketing	COTS+ Scripts, Custom	COTS integrated with HP OpenView, Minimal custom and scripting
Management Data Access	Custom	All custom code. Combination of C++, Scripts, and SQL
Resource Planning	Heritage / Custom	Reuse of PDPS Planning Subsystem which includes MSS specific Methods

Table 3.2-1. MSS Implementation (2 of 3)

Services	COTS (W/Glue) Custom Code	Notes
Management DBMS	COTS+ Custom	SQL to support report generation and Data filtering and import
Events and Errors	COTS+ Custom	HP Openview, Tivoli and custom managemtn agent software
Common Management Services	COTS	HP OpenView provides these services. Customization includes building maps, defining roles, scripting for operations resulting from events, configuration of HPOV parameters
User Comment Survey	COTS+ Custom	Significant part implemented through RDBMS, custom development for the interface to the RDBMS
Enterprise Framework Managemet Services	COTS+ Scripting Custom	Implemented through the following COTS software products: Tivoli Management Platform, Tivoli/Courier, Tivoli/Enterprise Console, Tivoli/Admin, ESSM Tivoli Plus Module, HP CDS Browser, HP acctmgr, HP CellMon, HP DCE Cell Configurator, and NetWorker with scripts written to configure the products for the ECS system and software to provide the interface to the ECS management agent.
Management Logistics CI		
Baseline Manager	COTS + Scripts (HTG: XRP II)	COTS with minimal scripting
Software Change Manager	COTS + Scripts (Atria: ClearCase)	COTS with minimal scripting
Configuration Management (Change Request manager)	COTS + Scripts (PureSoftware: DDTs)	COTS is ClearCase; scripts for rules and reports. RDBMS-based application for Baseline Manager
Software Distribution Manager	COTS + custom (Tivoli/ Courier)	New for Release B.
License Manager	COTS + custom (FLEXIm and NLS)	License Management provided by FLEXLM + NLS server, useage statistic and reporting custom
Inventory/ Logistics/ Maintenance Manager	COTS + custom	New for Release B.
Training Manager	custom	A custom Sybase application. A Significant part implemented through RDBMS, custom development for the interface to the RDBMS

Table 3.2-1. MSS Implementation (3 of 3)

Services	COTS (W/Glue) Custom Code	Notes
Policies and Procedure Manager	Reuse of Document Data Server, Ingest, Client, and use of the Bulletin Board Service.	New for Release B.
Management Agent CI		
Management Agents	COTS+ Custom	Management Agent and MIB, includes COTS extensible agent and extendible MIB to support ECS specific requirements. Contains release B enhancements for mode management and MIB.

As shown in Table 3.2-1, the MSS design depends heavily on COTS products, each of which will be configured to support ECS unique requirements. Release B is build on top of the Release A baseline. Custom code development for services indicated as new or enhancements to release A is roughly uniform across each service. HP Open View Network Node Manager (Common Management Services) provides the framework for integration of other management applications and an industry standard network management platform. Open View itself must be configured to support the ECS specific design and implementation. Part of this configuration is supported by the Open View “Discovery” service which can automatically detect network devices which support the industry standard Simple Network Management Protocol (SNMP). Identification of other ECS managed objects is provided by custom development in the Management Agent to add these elements to the Open View database. This information, along with mode management information, is used to build operations maps which depict the logical layout of network devices and other ECS managed objects. Part of the configuration then, entails the definition of operational “views” which support different operation modes within ECS. A second significant part of the configuration is developing scripts that define action routines for each event that is received for each managed object. The other services depicted in Table 3.2-1 will require varying amounts of configuration and customization. Integration into the Open View framework is minimized through selection of COTS which have been integrated by the vendor whenever possible.

3.3 ECS Management Framework

3.3.1 Overview

As documented in 193-00632, DCE Migration Study for the ECS Project, and 193-00156, DME Migration Study for the ECS Project, the Open Software Foundation's (OSF) Distributed Management Environment (DME) is the selected distributed management architecture for ECS project. DME is an open architecture that is capable of evolving with new technologies and offers an integrated Distributed Enterprise System and Network Management Architecture for ECS.

Even though a full DME compliant implementation will not exist for Release B, most industry enterprise management players are adopting these technologies and migrating their existing products toward the DME architecture.

To mitigate risk, a DME precursor product (HP OpenView) was selected as the ECS Management Framework for Release A. HP OpenView will remain as the ECS Management Framework for Release B. This selection provides an ECS migration path to management applications under the full DME architecture.

In conjunction with custom management agents, the suite of Tivoli COTS products has been selected to perform system administration, software distribution, fault correlation, performance monitoring and client and server applications management (both custom and COTS applications). It consists of the Tivoli Admin for system administration, Courier for software distribution, Sentry for performance and event monitoring, the Enterprise Console for event correlation and Tivoli Plus modules for monitoring and control of selected COTS products. The Tivoli Plus module, ESSM, will be used for monitoring and controlling SYBASE.

With this early selection prior to the preliminary design process, a detailed design of the Management Framework is not required. However, to support the design and object models of the management applications services and management agents services, a limited collection of DME object class interfaces, and their implementation in HP OpenView Network node Manager, are described in the following sections.

Since HP OpenView and Tivoli are COTS products, their design will not be modeled. Further, HP OpenView's constituent components are not object-based. However, for purposes of clarity, the Figure 3.3-1 shows the components of HP OpenView as an aggregation of interface classes. The interface classes, as indicated before, are not real objects, but serve to clearly indicate the functionality provided by the set of interfaces abstracted by the representation. This functionality is available to management applications. Figure 3.3-2 shows the components of Tivoli.

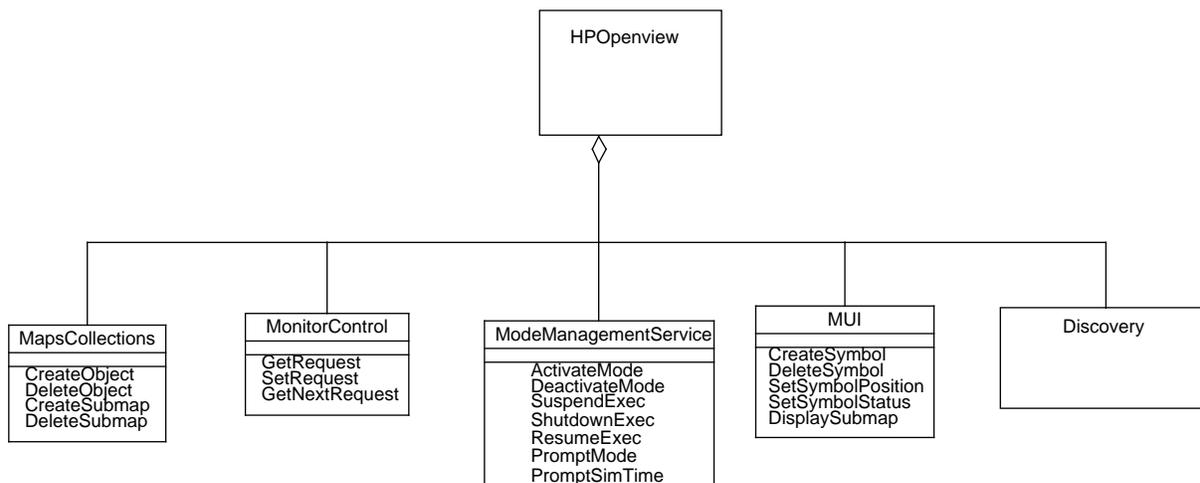


Figure 3.3-1. HP OpenView Model

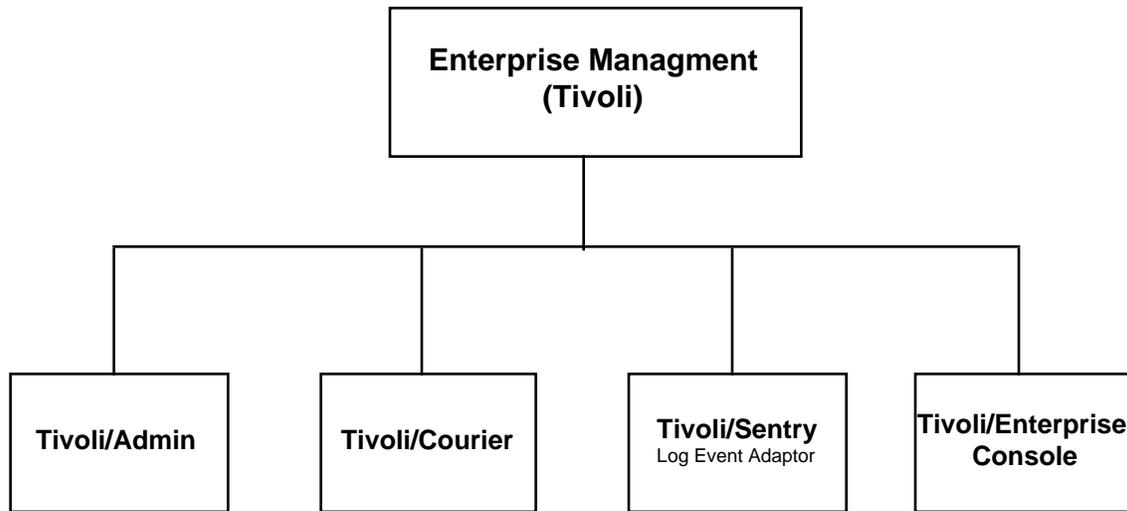


Figure 3.3-2. Tivoli Model

3.3.2 Databases

Since the DME architecture does not define the architecture for the data store for the Management Framework, a short description of the data stores implemented in HP OpenView Network Node Manager is provided here. This provides the context for the description of the interfaces described in the following sections, and referenced in the sections on the Management Application Services. HP OpenView Network Node Manager maintains its data in three major databases:

Object Database

The Object database contains all the objects (physical and logical) in the network that have been discovered. HP OpenView NNM automatically adds entries for objects (IP-addressable) that it discovers. Each object in this database has a set of fields (attributes) that describe the object. HP OpenView fills in values of all these objects as it discovers them. All developer-created objects (non-IP-addressable) need to be registered in this database. For each such object created, appropriate fields (attributes) must be created, and values must be assigned.

Map Database

The map database stores presentation information on each object stored in the object database. A map is a collection of objects from the Object database along with their relationships. A map contains a subset of all the objects in the Object database.

Topology Database

The topology database contains an electronic representation of the topology of the infrastructure of the network. This includes all entities that are IP-addressable.

3.3.3 MUI

HP OpenView has a graphical user interface which provides the capability to integrate the presentation of management applications. This provides a set of interfaces which provide the capability to support dialog interaction across the user interface.

The Management User Interface provides tools and services needed to build user interfaces for management applications in a technology independent way. Important features of the MUI are the ability to present management information maps, to support dialog interaction, and to separate presentation from interaction. For example, applications post the presentation information to the MUI which in turn maps this information to a specific tool kit like Motif. This allows the management application to remain independent of the underlying tool kit.

3.3.4 Maps/Collections

HP OpenView provides the interfaces that provide the capability to create and modify maps and submaps, as well as to retrieve information about maps, submaps and the objects on the maps and submaps.

The uniform management of the relationships between managed objects and the collection of objects in maps and sub-maps is provided by the Maps/Collections service. This service manages the collection-object and map-object relationships. The collection-object relationship provides the basic capability to manage unordered sets of references to other objects. The map-object relationship, in addition to maintaining the object references, maintains a graph to describes the connection between individual members of the map.

3.3.5 Monitor/Control

HP OpenView provides a set of interfaces which provide the capability for management applications to query remote management agents using the SNMP v1 protocol.

The Monitor/Control Service provides a uniform means for management applications to monitor and control managed objects, request and receive status on managed objects and process events/traps from managed objects. This service provides the infrastructure via Simple Network Management Protocol (SNMP) for management applications to control the collection and monitoring of managed objects attributes that are defined in the Management Information Base (MIB); and the event management capabilities to support receiving, reporting, disseminating, logging of system event and for triggering actions in response to system events.

3.3.6 Discovery

HP OpenView provides the capability for automatic discovery of network devices, the capability for registering these newly discovered objects, and storing information about these managed objects in the databases. However, this service does not provide a callable interface for management applications to use.

The discovery service provides the basis for managed resource identification and detection (such as a repaired router returning to service). This service provides a capability to keep track of the system configuration by providing a common set of rules and interfaces to:

- register and unregister new objects

- store information about them (e.g. in maps, collections etc.)
- notify M&O staff about discovery instances.

3.3.7 Enterprise Management

The Tivoli Management Environment has been selected to provide system wide management support for ECS. For Release B the management configuration consists of the Tivoli Management Platform with the Tivoli components: Admin, Enterprise Console, Courier, Sentry and Log Event Adapters.

Tivoli/Admin provides system administration functions for establishing and controlling host, NIS and user environments.

Tivoli/Courier provides automatic ECS wide software management and distribution capabilities including remote instillation of software from a central location.

Tivoli/Sentry provides performance monitoring of ECS host and client software. It collects both Tivoli defined and user defined performance metrics and provides for the setting of thresholds to generate alerts. The Log Event Adapter allows the monitoring of events output to logs files. It can be configured to provide event notification from COTS software that produce log files.

Tivoli/Enterprise Console consists of a graphical GUI to view and control the ECS enterprise. It centralizes the collects of management events form the ECS system including HP Openview. It performs rules based fault correlation and response to events received from HP Openview and Sentry. It provides event filtering to reduce unnecessary information flows.

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