625-CD-610-001

EOSDIS Core System Project

ECS Training Material
Volume 10: Archive Processing

March 2001

Raytheon Systems Company
Upper Marlboro, Maryland

ECS Project Training Material
Volume 10: Archive Processing

March 2001

Prepared Under Contract NAS5-60000
CDRL Item 129

RESPONSIBLE ENGINEER

Paul E. Van Hemel — Date
EOSDIS Core System Project

SUBMITTED BY

Gary Sloan, M&O Manager — Date
EOSDIS Core System Project

Raytheon Systems Company
Upper Marlboro, Maryland

This page intentionally left blank.

Preface

This document is a contract deliverable with an approval code of 3. As such, it does not require formal Government approval. This document is delivered for information only, but is subject to approval as meeting contractual requirements.

Any questions should be addressed to:

Data Management Office
The ECS Project Office
Raytheon Systems Company
1616 McCormick Dr.
Upper Marlboro, MD 20774-5301

Note: This document contains change bars to indicate the addition or revision of material since the issuance of the predecessor document containing training material for Release 5B of the Earth Observing System Data and Information System (EOSDIS) Core System (ECS).

This page intentionally left blank.

Abstract

This is Volume 10 of a series of lessons containing the training material for Release 6A of the Earth Observing System Data and Information System (EOSDIS) Core System (ECS). This lesson provides a detailed description of the process required to perform the tasks associated with archive functions.

Keywords: training, archive, AMASS, ACSLS, AAWin, granule deletion tool, course objective

This page intentionally left blank.

Change Information Page

List of Effective Pages	
Page Number	**Issue**
Title	Original
iii through xii	Original
1 through 92	Original
Slide Presentation 1 through 48	Original

Document History			
Document Number	**Status/Issue**	**Publication Date**	**CCR Number**
625-CD-610-001	Original	March 2001	

This page intentionally left blank.

Contents

Overview of Archive Processing

Starting and Shutting Down AMASS

Archive Storage Structures

Insert Data Into the Archive

Monitor Archive Requests

Retrieve Data From The Archive

Deleting Granules

Loading Archive Media

Backup Archived Data

Restore Archive Data

AMASS Graphical User Interface

Archive Monitoring and Troubleshooting

Practical Exercises

Slide Presentation

Introduction

Identification

Training Material Volume 10 is part of Contract Data Requirements List (CDRL) Item 129, whose requirements are specified in Data Item Description (DID) 625/OP3 and is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

Scope

Training Material Volume 10 describes the process and procedures associated with Archive Processing. It describes archive hardware, software, and data. In addition, it addresses starting and shutting down the tape archive control software, monitoring archive requests, and performing archive management tasks. This lesson is designed to provide the operations staff with sufficient knowledge and information to satisfy all lesson objectives.

Purpose

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

Status and Schedule

This lesson module provides detailed information about training for Release 6A. Subsequent revisions will be submitted as needed.

Organization

This document is organized as follows:

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

This page intentionally left blank.

Related Documentation

Parent Document

The parent document is the document from which this ECS Training Material's scope and content are derived.

423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work

Applicable Documents

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

420-05-03	Goddard Space Flight Center, Earth Observing System (EOS) Performance Assurance Requirements for the EOSDIS Core System (ECS)
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)

Information Documents

Information Documents Referenced

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

609-CD-600	Release 6A Operations Tools Manual for the ECS Project
611-CD-600	Mission Operation Procedures for the ECS Project
910-TDA-022	Custom Configuration Parameters for ECS Release 6A

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 ECS Training Material.

305-CD-600	Release 6A Segment/Design Specification for the ECS Project
311-CD-600	Release 6A Data Management Subsystem Database Design and Database Schema Specifications for the ECS Project
311-CD-601	Release 6A Ingest Database Design and Database Schema Specifications for the ECS Project

311-CD-602	Release 6A Interoperability Subsystem (IOS) Database Design and Database Schema Specifications for the ECS Project
311-CD-603	Release 6A Planning and Data Processing Subsystem Database Design and Schema Specifications for the ECS Project
311-CD-604	Release 6A Science Data Server Database Design and Schema Specifications for the ECS Project
311-CD-605	Release 6A Storage Management and Data Distribution Subsystems Database Design and Database Schema Specifications for the ECS Project
311-CD-606	Release 6A Subscription Server Database Design and Schema Specifications for the ECS Project
311-CD-607	Release 6A Systems Management Subsystem Database Design and Schema Specifications for the ECS Project
311-CD-608	Release 6A Registry Database Design and Schema Specifications for the ECS Project
313-CD-600	Release 6A ECS Internal Interface Control Document for the ECS Project
334-CD-600	6A Science System Release Plan for the ECS Project
601-CD-001	Maintenance and Operations Management Plan for the ECS Project
603-CD-003	ECS Operational Readiness Plan for Release 2.0
604-CD-001	Operations Concept for the ECS Project: Part 1-- ECS Overview
604-CD-002	Operations Concept for the ECS Project: Part 2B -- ECS Release B
605-CD-002	Release B SDPS/CSMS Operations Scenarios for the ECS Project
607-CD-001	ECS Maintenance and Operations Position Descriptions
152-TP-001	ACRONYMS for the EOSDIS Core System (ECS) Project
152-TP-003	Glossary of Terms for the EOSDIS Core System (ECS) Project
211-TP-005	Transition Plan 4PX to 4PY, 4PY to 5A, and 5A to 5B for the ECS Project
220-TP-001	Operations Scenarios - ECS Release B.0 Impacts
500-1002	Goddard Space Flight Center, Network and Mission Operations Support (NMOS) Certification Program, 1/90
535-TIP-CPT-001	Goddard Space Flight Center, Mission Operations and Data Systems Directorate (MO&DSD) Technical Information Program Networks Technical Training Facility, Contractor-Provided Training Specification

Archive Processing

Lesson Overview

This lesson reviews the process of archiving data, including a description of processing for monitoring the ingest/archival/distribution performance, maintaining configuration of peripherals and data servers, documenting archive errors, maintaining the archive processing queue (storage and retrieval), managing archive content and capacity, and providing archive status.

Lesson Objectives

Overall Objective - The overall objective of this lesson is proficiency in the methodology and procedures for archive processing in the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) during maintenance and operations. The lesson includes a description of processing for monitoring the ingest/archival/distribution performance, maintaining configuration of peripherals and data servers, documenting archive errors, maintaining the archive processing queue (both storing and retrieval), managing archive content and capacity, submitting new data archive requests to the Science Coordinator, and providing archive status.

Specific Objective 1 - The student will list DAAC operator positions for Archive Manager personnel interfaces and identify responsibilities associated with each interface.

Condition - The student will be given a list of DAAC operators.

Standard - The student will select four personnel positions with which the Archive Manager interfaces and list at least one major area of responsibility for each selected position.

Specific Objective 2 - The student will identify the major hardware facility for archival storage and its associated storage cartridges.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, a working system archive facility, a D-3 tape cartridge, and a 9840 tape cartridge.

Standard - The student will correctly point out the StorageTek Library Storage Module (LSM) and its associated D-3 and 9840 tape cartridges.

Specific Objective 3 - The student will describe the File Storage Management System (FSMS) software.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project* and a copy of 609-CD-600-001 *Release 6A Operations Tools Manual*.

Standard - The student will identify the FSMS software as the Archival Management and Storage System (AMASS), correctly describe AMASS by stating its nature as a UNIX file system installed on an SGI XL computer, and state the five steps in the AMASS control path without error.

Specific Objective 4 - The student will start the AMASS tape archive system.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will operate the STK control panels, power up the archive hardware, and then boot AMASS host and start AMASS without error.

Specific Objective 5 - The student will shut down the AMASS tape archive system.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility with AMASS started.

Standard - The student will terminate AMASS and shut down the LSM without error.

Specific Objective 6 - The student will use manual mode to enter the LSM.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility with AMASS started.

Standard - The student will vary the LSM offline, enter the LSM, leave the LSM, and vary the LSM back online, without error and following all required safety precautions.

Specific Objective 7 - The student will describe the relationships between Earth Science Data Types (ESDTs), Logical Volume Groups (LVGs) in the Archive, and physical archive volume groups.

Condition - The student will be given a diagram depicting the relationships.

Standard - The student will correctly explain the logical and physical structure of ECS archive storage.

Specific Objective 8 - The student will describe the process of, and monitor the progress of, inserting new data into the archive.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will describe without error the process of inserting new data into the archive.

Specific Objective 9 - The student will launch available Data Server Subsystem (DSS) Graphical User Interfaces (GUIs) and monitor retrieval of data from the archive.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedures relating to monitoring retrieval of data from the archive.

Specific Objective 10 - The student will purge expired files from the pull monitor cache.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for purging expired files from the pull monitor cache.

Specific Objective 11 - The student will use the granule deletion capability to delete granules from the archive and inventory.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for deleting granules from the archive and inventory.

Specific Objective 12 - The student will perform automatic and manual loading of archive storage cartridges.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, a working system archive facility, D-3 tape cartridges, and 9840 tape cartridges.

Standard - The student will perform procedures for automatic and manual loading of the proper cartridges for the LSM without error.

Specific Objective 13 - The student will create a backup for AMASS.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will correctly use the *vgexport -q* command to create the AMASS backup.

Specific Objective 14 - The student will replace a full Backup Volume.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedures for replacing the Backup Volume (Volume 1).

Specific Objective 15 - The student will manually create a replacement backup for an archive data tape.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedures for manually creating a replacement backup for an archive data tape.

Specific Objective 16 - The student will "restore" archive data by inserting a backup copy cartridge.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for inserting a backup copy cartridge to replace a lost archive data tape.

Specific Objective 17 - The student will launch and use the AMASS Graphical User Interface (GUI).

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will successfully start the AMASS GUI, display icons and data for volume groups and volumes, and execute procedures for modifying volume groups and volumes without error.

Specific Objective 18 - The student will use the *quedisplay* command to display what is in the AMASS queue.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for viewing what is in the AMASS queue.

Specific Objective 19 - The student will use the *amass_log* script to display AMASS errors.

Condition - The student will be given a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*, 609-CD-600-001 *Release 6A Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for using the *amass_log* script to display AMASS messages from the system log file.

Importance

The Archive Manager's role in maintaining the archive data is key to the successful implementation and operation of ECS. Ensuring the smooth operation of the archive is crucial for ECS core functionality.

This page intentionally left blank.

Overview of Archive Processing

Archive processing is at the heart of the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) at the Distributed Active Archive Centers (DAACs). Through archive processing, data that have been ingested into the system are archived to tape for permanent storage and distributed to users via hard media (tape or disk) or electronic means.

The DAAC Archive Manager's job entails working with the Science Data Specialist, the Science Coordinator, and the Resource Manager, as well as providing direction for the Data Ingest Technician. These personnel interfaces are illustrated in Figure 1.

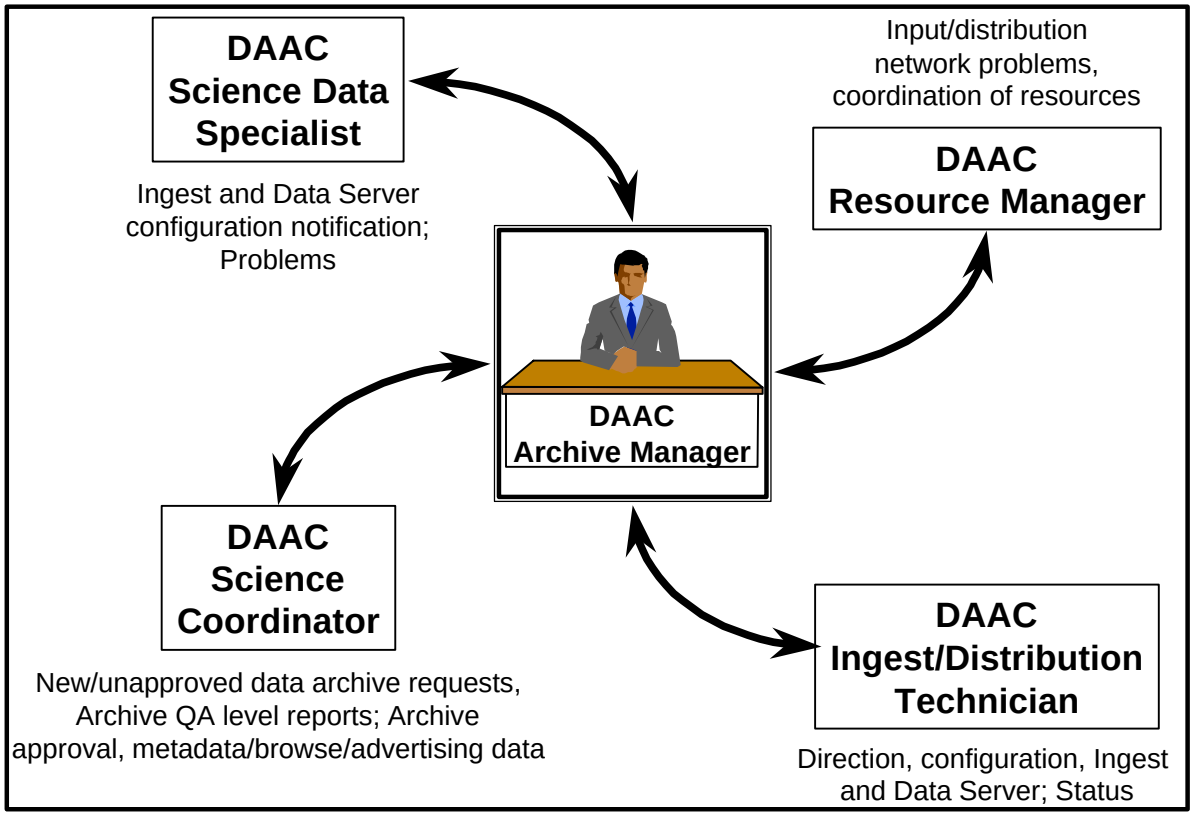


Figure 1. Archive Manager Personnel Interfaces

The Data Server Subsystem (DSS) is responsible for persistent storage of earth science and related data, for providing search and retrieval access to this data, and for supporting the administration of the data, hardware devices, and software products. As part of its retrieval function, the subsystem also provides for distribution of data electronically or on physical media.

Hardware

The ECS Archive uses one major type of archival storage hardware for storing science data, browse data, and other ECS data. The StorageTek (STK) Powderhorn Model 9310 Automated Cartridge System tape storage tower, illustrated in Figure 2, is a mass storage system of removable media jukeboxes. The software that manages the storage in the ECS architecture is hosted on a Silicon Graphics Inc. (SGI) Challenge XL or on an SGI Origin 2000.

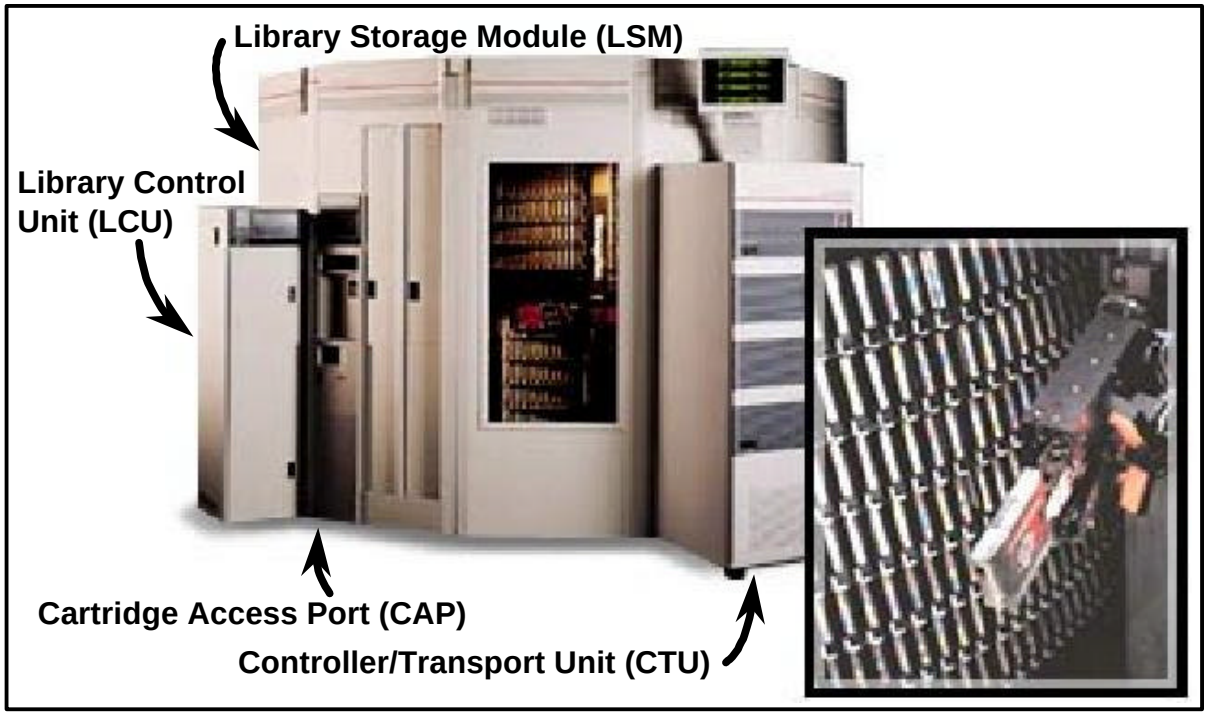


Figure 2. StorageTek (STK) Powderhorn Data Storage

The typical ECS data storage archive consists of the following major elements:

- Library Storage Module (LSM), Powderhorn Model 9310, Automated Cartridge System (ACS) tape storage tower.
- Cartridge Access Port (CAP), where media are inserted or ejected from the LSM; standard capacity is 21 cartridges.
- dual tape-transport "robots" for moving cartridges from the tower to a tape drive or CAP and from the tape drive or CAP to the tower.
- Controller/Transport Unit (CTU) with four D-3 tape drives and status display (to be replaced with a tape rack with eight 9940 cartridge tape drives (rack capacity is 20 drives).
- Library Management Unit (LMU), Model 9330, a serial port for the ACS Library Software (ACSLS) that controls and monitors the ACS.

- Library Control Unit (LCU), Model 9311, a hardware interface for managing LSM intercommunications.
- browse tape rack with eight 9840 cartridge tape drives (rack capacity is 20 drives).

The LSM tape archive can store thousands of tapes. Initially, the archive used D-3 tapes for science data, each tape capable of storing 50 gigabytes of data. Because of discontinued vendor support of D-3 storage, the archive is migrating to 9940 tapes, each of which can store 60 gigabytes of data, and the D-3 tapes and drives will be retired. Browse data are stored on 9840 tapes, each capable of storing 80 gigabytes (compressed) of data. Each D-3 tape cartridge is identified by a colored bar code label that shows the media number (Figure 3). The 9940 tapes are the same physical dimensions as the D-3 tapes, and also use bar code labels (see Figure 4). The 9840 tapes are also of the same physical dimensions and use bar code labels, as shown in Figure 5. An archive catalog or database tracks the location of each cartridge within the library, based on information provided by the laser bar code reader.

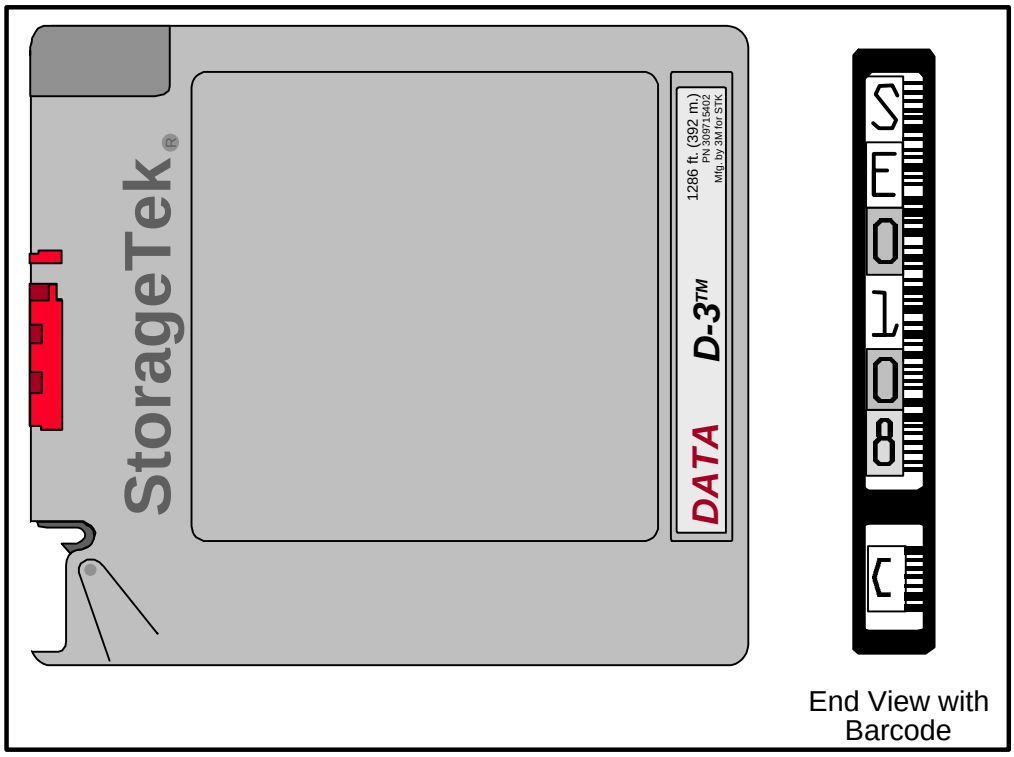
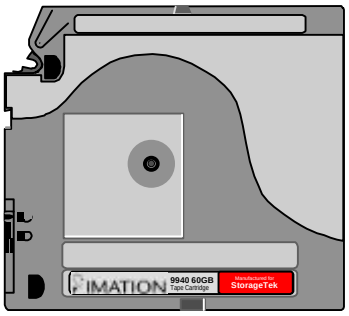
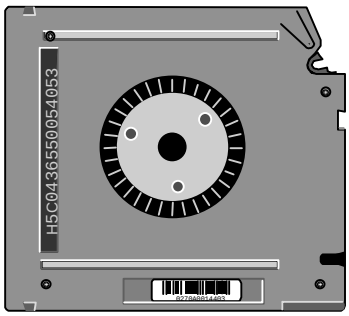


Figure 3. StorageTek (STK) D-3 Tape Cartridge

9940 Tape Drives



Front



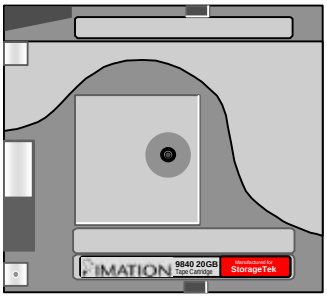
Back

- 10 MB/sec uncompressed sustained data transfer rate
- 60 GB capacity per cartridge (uncompressed)
- 10-sec load time
- 50-sec search/access

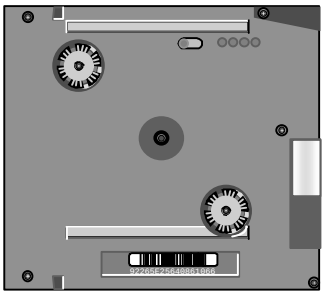
End View with Barcode

Figure 4. STK 9940 Tape System

9840 Tape Drive



Front



9840 Tape Cartridge

Back

- 10 MB/sec uncompressed sustained data transfer rate
- 20 MB/sec compressed sustained data transfer rate
- 80 GB capacity per cartridge (compressed)
- Mid-point load for rapid search/access

End View with Barcode

Figure 5. 9840 Tape System for Browse Data

Software

Archive operations rely on both custom and commercial off the shelf (COTS) software for complete mass storage archive management, providing the capability to accept Graphical User Interface (GUI) and command line interface inputs, and to interpret them to the appropriate level needed to control and monitor archive operations. The File Storage Management Service (FSMS) software is the Archival Management and Storage System (AMASS), a product of Advanced Digital Information Corporation (ADIC). The purpose of AMASS in the ECS is to provide an easy-to-use interface to a large tape archive. AMASS is a UNIX file system that manages files, volumes (media), drives and jukeboxes. It allows UNIX File System (UFS) access methods to be employed (e.g., ftp, rcp, uucp, nfs, RPC, native) while removing some of the limitations of the UFS. Primary among these is reliance on UNIX Index Node (inode) structures. AMASS maintains all inode information in database files rather than in associated disk structures. This minimizes or eliminates many of the file search problems inherent in searching large numbers of files in multiple directories. In addition, AMASS organizes files as groups of blocks which can be individually retrieved. This differs from UFS resident systems that require staging the entire file.

As of ECS Release 6A, archive improvements provide a more standardized format and content for logging of data access and staging activity, which may assist in system troubleshooting. The system also provides parallel AMASS input/output capability for improved system throughput. Furthermore, the system uses a logical archive ID capability for complete separation of the physical location of data in the archive from its logical reference in the inventory. This means that client requests for data do not change based on a change of the physical location of the data, and as a result there can be improved load balancing, cross-archive fault recovery, and archive upgrades.

AMASS is installed on an SGI Challenge XL or Origin 2000 computer. Control information is communicated from the SGI to the LMU using TCP/IP protocols via the FDDI network. Figure 6 shows the basic route taken by control information in the process of sending a file to AMASS.

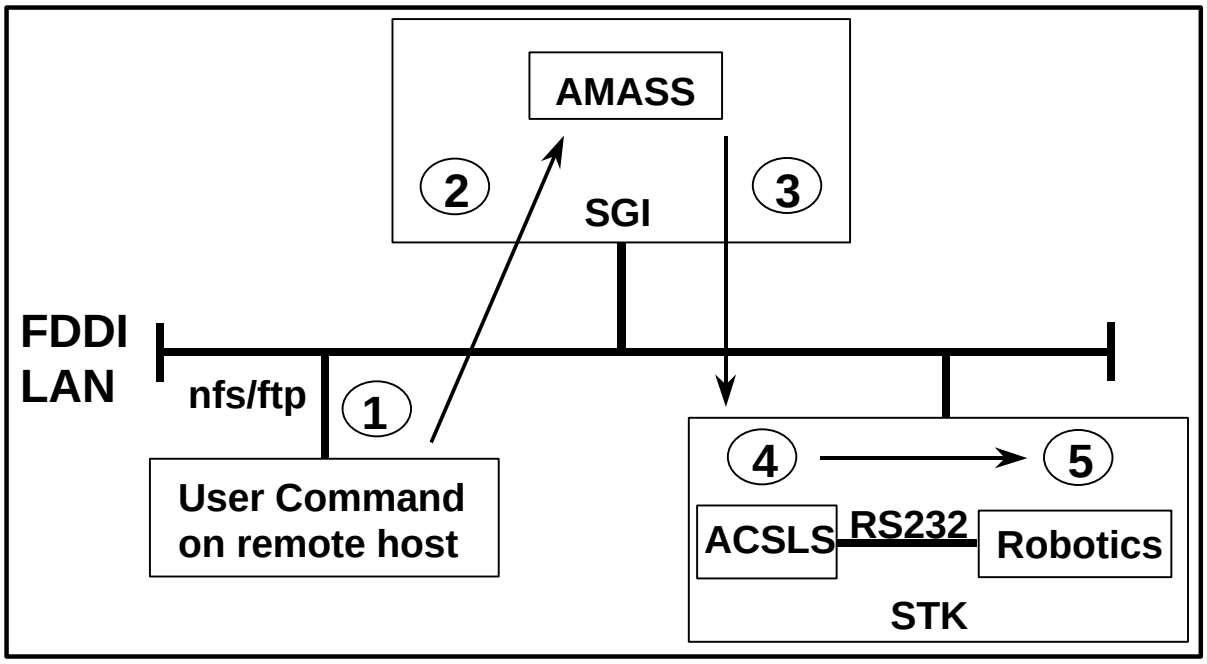


Figure 6. AMASS Control Path

As the figure suggests, there are five elements in the path:

1. The user or application initiates transfer of the file to AMASS.
2. AMASS receives the file over the network via nfs, ftp, dd, or cp, or locally via dd or cp to its cache.
3. AMASS sends information to ACSLS to specify the tape to load.
4. The ACSLS application sends the LMU robot to retrieve the tape.
5. The robot grips the tape, retrieves it, and inserts it into the tape drive to complete the mount.

ACSLS

For the StorageTek Powderhorn, Steps 4 and 5 in the AMASS control path are managed by the Automated Cartridge System Library Software (ACSLS), running on a Sun computer under Solaris 2.6. Full guidance for using ACSLS is provided in the *Automated Cartridge System Library Software System Administrator's Guide, Version 5.3*. Table 1 lists the commands covered in that *Guide*.

Table 1. ACSLS Command Reference

Command	Function
audit	Creates or updates the database inventory of the volumes in a library component.
cancel	Cancels a current or pending request.
clear lock	Removes all active and pending locks on transports or volumes
define pool	Creates or modifies scratch pools.
delete pool	Deletes empty scratch pools.
dismount	Dismounts a volume.
eject	Ejects one or more volumes from the Automated Cartridge System (ACS).
enter	Sets a Cartridge Access Port (CAP) to enter mode.
idle	Stops ACSLS from processing new requests.
lock	Locks (dedicates) a volume or transport to a user.
logoff	Exits the command processor.
mount	Mounts a data or scratch volume.
query	Displays the status of a library component.
set	Sets various attributes of different library components.
show	Displays your lock ID or user ID.
start	Starts ACSLS request processing.
unlock	Removes active locks on volumes or transports.
vary	Changes the state of an ACS, LSM, CAP, transport, or port.
venter	Enters one or more volumes with missing or unreadable labels into the ACS.

ACSLS commands use the following general syntax:

command type_identifier state [options]

where **type_identifier** is the ACS component and its identifier (these are listed in the *System Administrator's Guide*), **state** is a device state for the **vary** command only, and **options** are command options (these are specified for each command in the *System Administrator's Guide*. The two most useful commands in ACSLS are **query** and **vary**. Other frequently used commands are **enter** and **eject**, for inserting and removing cartridges, respectively. ACSLS does not have an online help facility, but if you enter a command (e.g., **vary**), it will prompt you for the parameters.

There are also several utilities provided with ACSLS. These are listed in Table 2.

Table 2. ACSLS Utilities

Utility	Function
bdb.acsss	Backs up the ACSLS database.
kill.acsss	Terminates ACSLS.
rc.acsss	Starts and recovers ACSLS.
rdb.acsss	Restores the ACSLS database.
Volrpt	Creates a volume report.
db_command	Starts or stops the Oracle database.

To control and interact with ACSLS, you use the following user IDs:

- **acssa** lets you enter ACSLS commands from a command processor window.
- **acsss** lets you run ACSLS utilities from the UNIX command line prompt.

It is typical to log in as both user IDs to permit entering both ACSLS utilities and commands. You can, however, open a command processor window from the **acsss** user ID if you prefer to work from a single user ID. The *System Administrator's Guide* provides full details.

Data Sources and Uses

Data that are inserted into the archive are managed by the Data Server Subsystem (DSS) and can be received from such sources as the ingest subsystem, processing subsystem, other DAACs, and authorized users (Figure 7). Uses of data from these sources include:

- from ingest – any ECS function that uses data (e.g., production).
- from processing – various ECS functions (e.g., further processing, distribution to users).
- from other DAACs – various ECS functions (e.g., may be needed as inputs for production of other products).
- from authorized users (via ingest) – typically for distribution or processing.

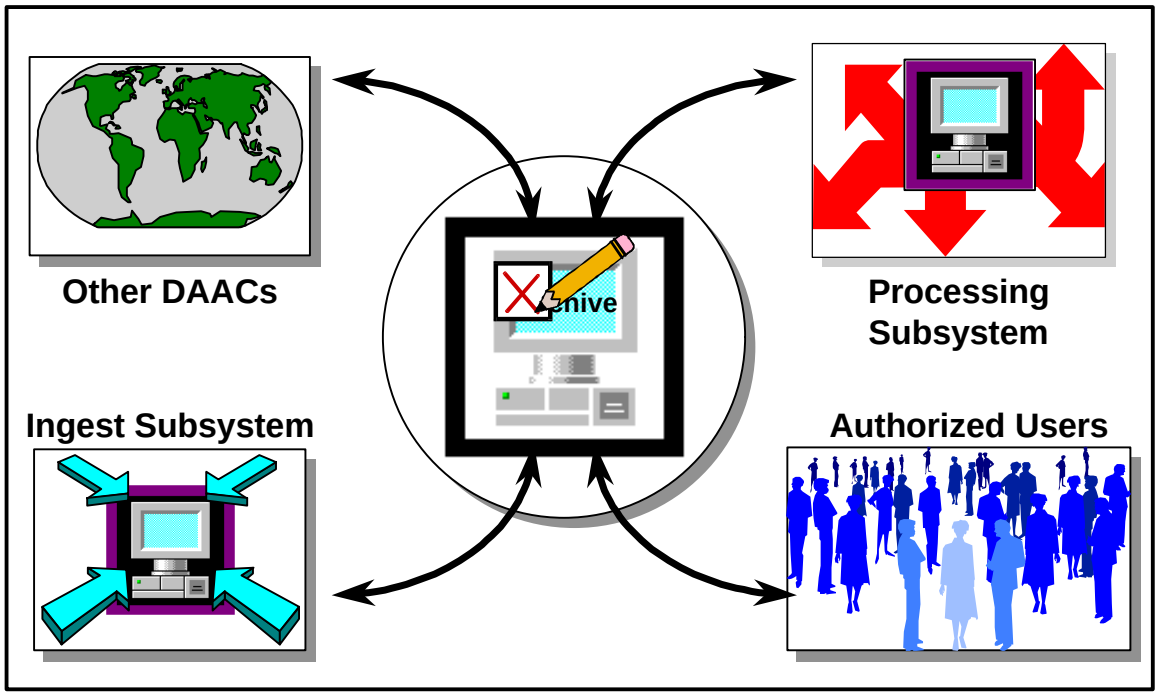


Figure 7. Sources and Uses of Archive Data

Starting and Shutting Down AMASS

The AMASS Tape Archive System can be started and shutdown with little or no impact on the rest of the ECS.

Starting the AMASS Tape Archive System

Starting the AMASS FSMS requires actions to ensure that the STK Powderhorn storage system is powered up as well as actions at the SGI FSMS host. Powering up the STK will require actions at its control panels, including the Library Management Unit (LMU), Library Control Unit (LCU), Controller/Transport Unit (CTU) [the Library Storage Module (LSM) is powered through the LCU}. Figure 8 - Figure 11 illustrate major locations of relevant controls and displays.

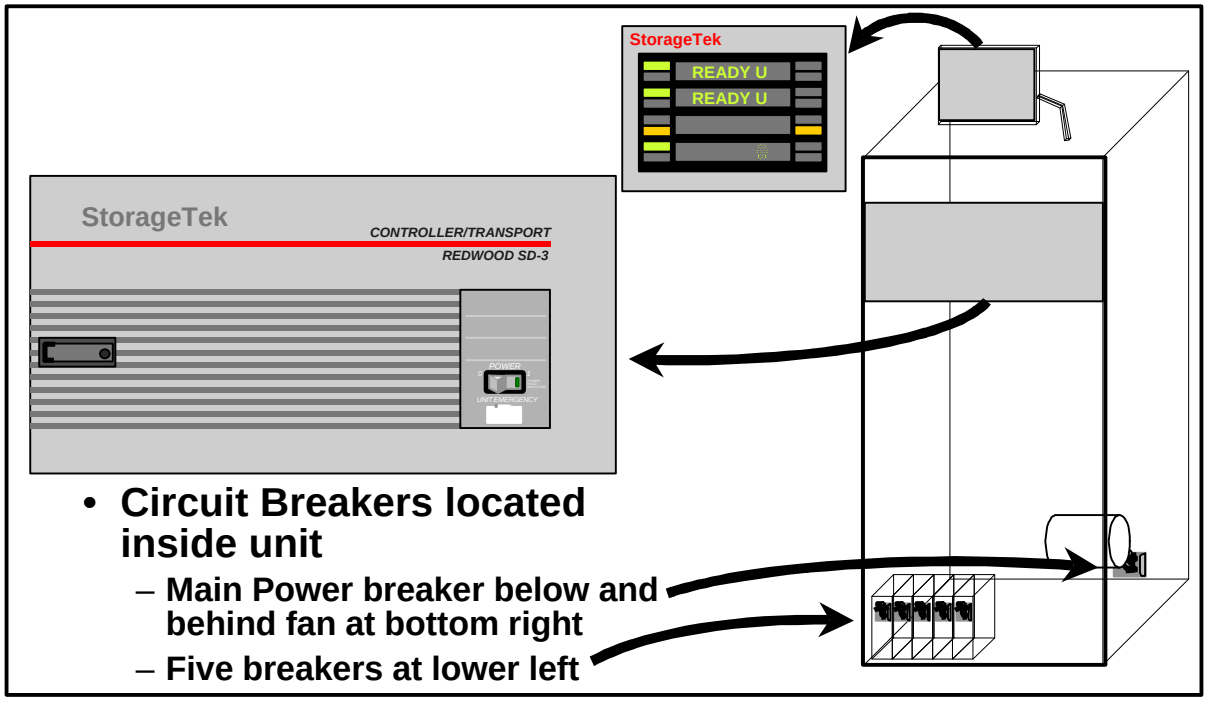


Figure 8. Controls/Displays for the STK Controller/Transport Unit (CTU)

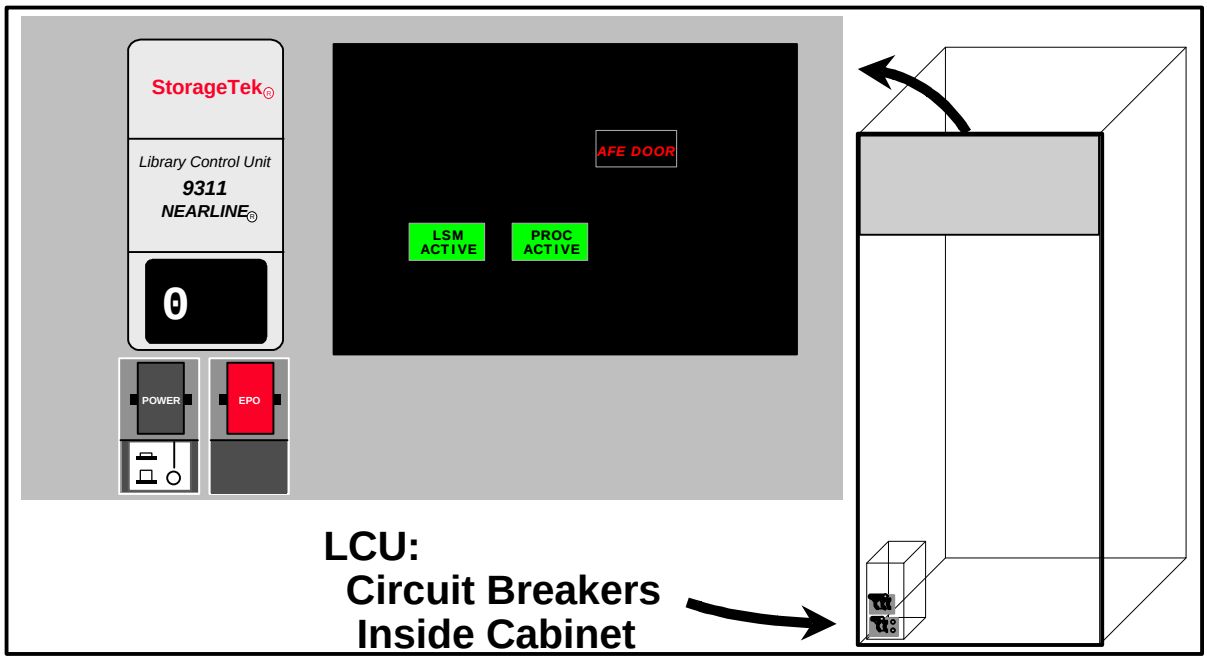


Figure 9. Controls/Displays for the STK Library Control Unit (LCU)

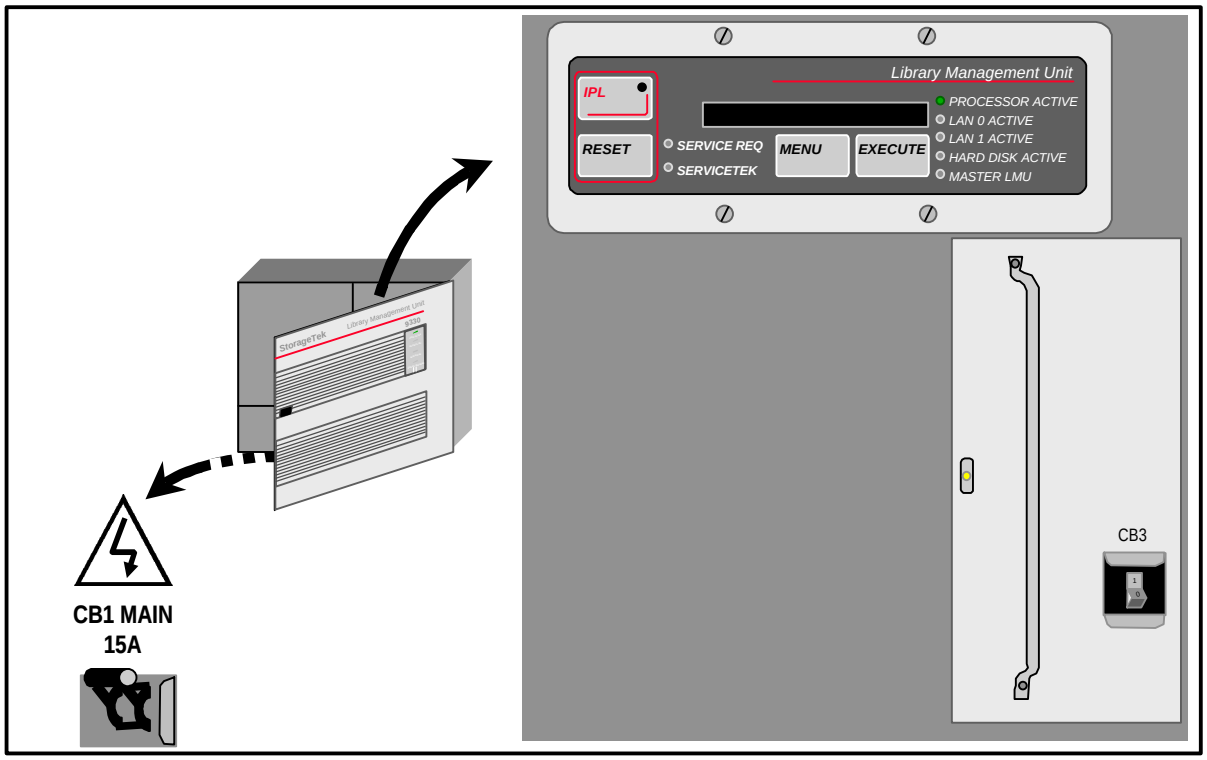


Figure 10. Controls/Displays for the STK Library Management Unit (LMU)

Figure 11. Controls/Displays for the STK Library Storage Module (LSM)

Use the following procedure to start the AMASS software.

Starting the AMASS Application

Note: Preconditions include that 1) the FDDI network is up and running and 2) power to all units is functional and available.

1 Make sure power switches for the StorageTek CTU, LCU, and LMU are **ON**.

- *NOTE*: The LCU should be the last unit powered up, but otherwise there are no dependencies within the group.

2 If it is not already running, boot the FSMS SGI host normally.

- There are no dependencies on other hosts, COTS or custom software.
- AMASS normally starts automatically on bootup. If it does, go toe **Step 4**. If it does not, or if you are restarting AMASS after a shutdown, go to **Step 3**.

3 At the FSMS SGI host (workstation ***x*0drg##**, **xacg##**, or ***x*wkg##**), as a system administrator (logged in as **root**), type **/usr/amass/tools/amass_start** and then press the **Return/Enter** key.

- NOTE: The ***x*** in the workstation name will be a letter designating your site: **g** = GSFC, **m** = SMC, **l** = LaRC, **e** = EDC, **n** = NSIDC, **o** = ORNL, **a** = ASF, **j** = JPL; the **##** will be an identifying two-digit number (e.g., **n0drg01** indicates an FSMS SGI server at NSIDC).
- The AMASS application starts.

4 To verify that AMASS has started correctly, type **/usr/amass/bin/amassstat -c** and then press the **Return/Enter** key.

- The message **FILESYSTEM IS ACTIVE** is displayed.

Shutting Down AMASS Tape Archive System

If it is necessary to shut down AMASS, use the following procedure.

Shut Down the AMASS Application

1 Log in as **root** (system administrator) at the FSMS SGI host (workstation ***x*0drg##**, **xacg##**, or ***x*wkg##**).

- NOTE: The ***x*** in the workstation name will be a letter designating your site: **g** = GSFC, **m** = SMC, **l** = LaRC, **e** = EDC, **n** = NSIDC, **o** = ORNL, **a** = ASF, **j** = JPL; the **##** will be an identifying two-digit number (e.g., **n0drg01** indicates an FSMS SGI server at GSFC).

2 Type **/usr/amass/tools/killdaemons**.

- A message is displayed indicating that all daemons have been terminated.

Entering the Archive After AMASS is Started

If it is necessary to enter the STK Powderhorn after AMASS is started, use the following procedure.

Entering the STK Powderhorn

1 At the host for ACSLS, log in using the **acssa** user ID and password.

- The **acssa** command-process window is displayed with the **ACSSA>** prompt.

2 Type **vary lsm 0,0 offline** and then press the **Return/Enter** key.

- The access port is unlocked (audible unlatching sound).

3 Use the key to unlatch and open the access door.

- A red **DO NOT ENTER** warning is visible inside the enclosure.

Warning

If it is necessary to enter the STK Powderhorn after AMASS is started, it is necessary to perform the following step to avoid hazard and ensure safety of personnel and equipment.

4 Remove the key from the door to ensure that no one inadvertently locks the enclosure with someone inside.

- The red **DO NOT ENTER** warning is extinguished and a green **ENTER** message is displayed inside the enclosure.

5 Upon leaving the enclosed area, insert the key in the access door and latch the door.

- The LED display indicates that the door is locked.

6 At the ACSLS host, type **vary lsm 0,0 online** and then press the **Return/Enter** key.

- After a few seconds, the archive robots execute an initialization sequence and the LSM is back online.

Archive Storage Structures

Although the physical archive stores data on cartridges (referred to as volumes), it is treated in the system as a large UNIX directory. As such, it is prudent to apply good space management practices in managing the archive just as you would for any computer disk. However, there are other factors that must be considered in archive management, addressing unique system requirements (e.g., on-site backups, off-site backups, desirability of physical consolidation of related data).

Storage Element Relationships

It is important for the Archive Manager to know the relationship between physical storage archives (Library Storage Modules, or LSMs) and the Archive Server software applications at the site. For example, a data repository identified as DRP1 is served by the software application EcDsStArchiveServerDRP1.

Subdivisions within LSMs (e.g., for storage of different data types) are reflected in the Storage Management database, where each Volume Group (a logical group of volumes in the archive) has its own path. As suggested in Figure 12, each path maps to an AMASS volume group, and thus to a physical volume group in the archive.

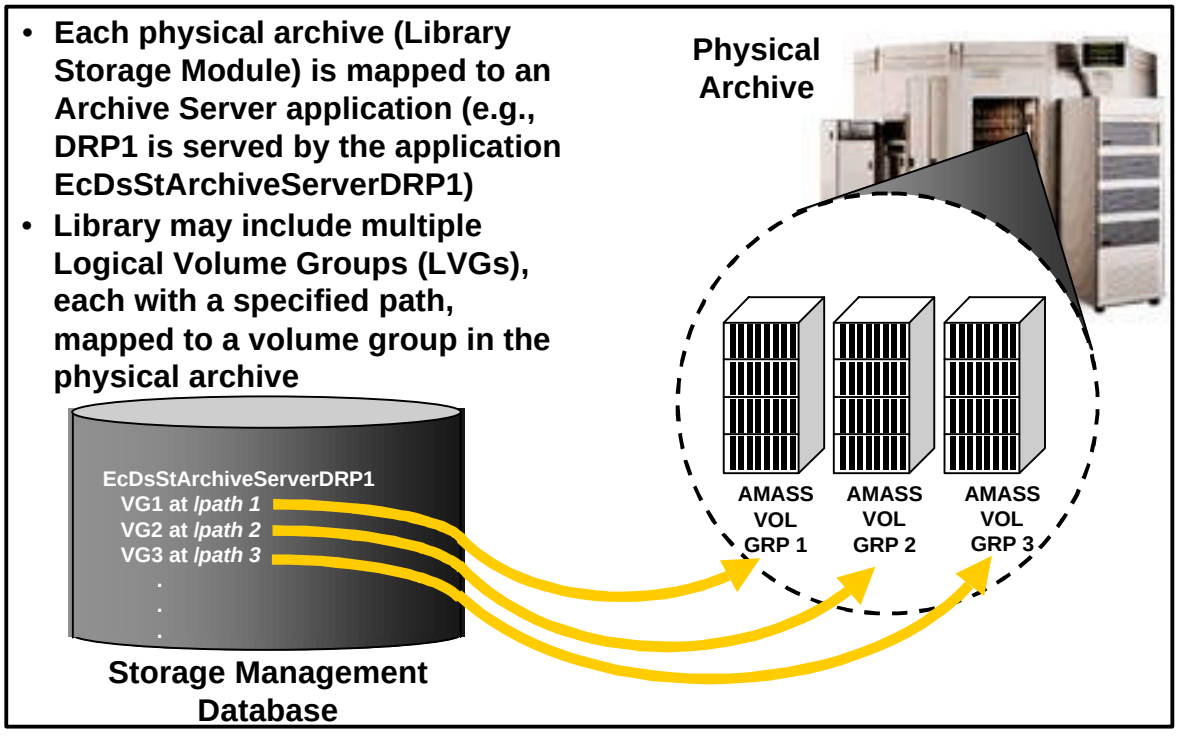


Figure 12. Archive Storage Element Relationships.

Information concerning archive servers and the logical volume groups served may be obtained from the Storage Management Control Graphical User Interface (GUI). Specifically, as illustrated in Figure 13, the Storage Configuration tab on the Storage Management GUI permits display of server information and access to related status information.

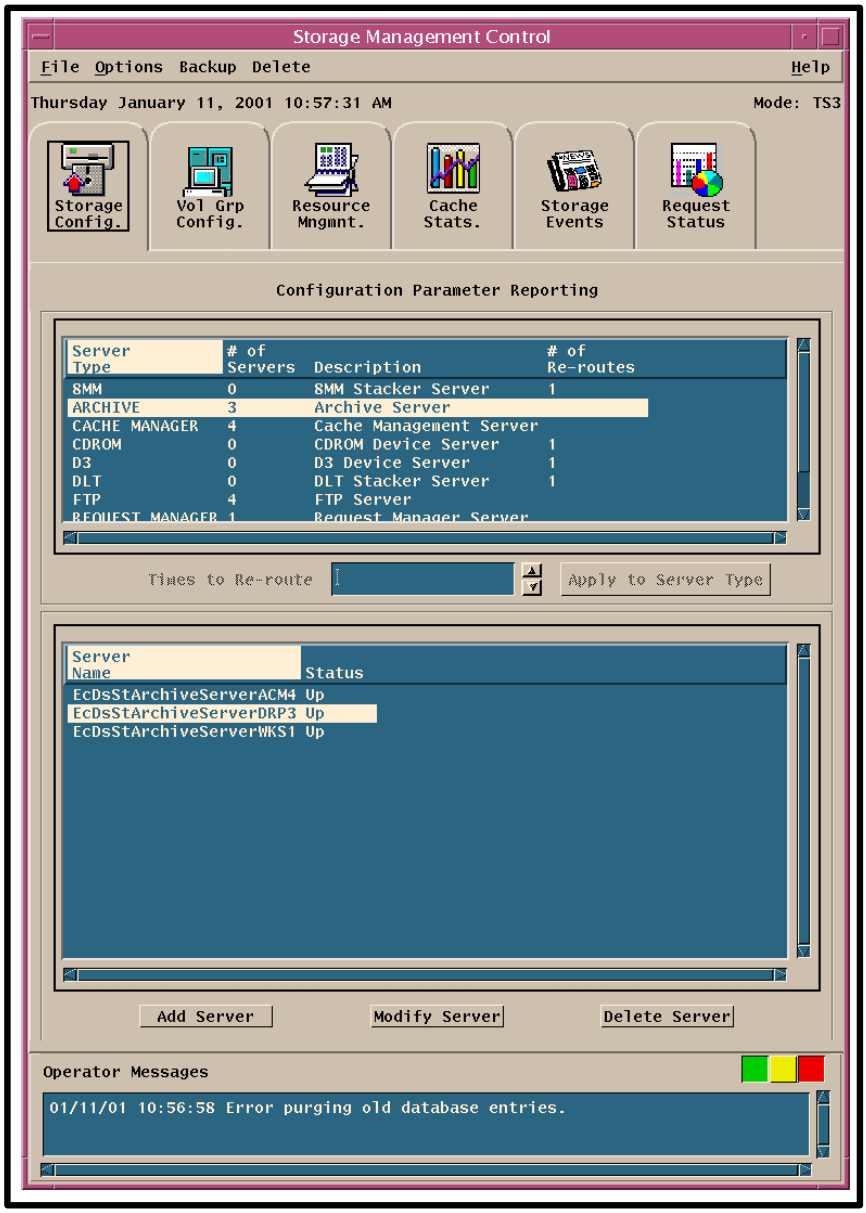


Figure 13. Storage Management, Storage Configuration Tab.

The Vol.Grp,.Config. tab, illustrated in Figure 14, permits display of volume group information and history.

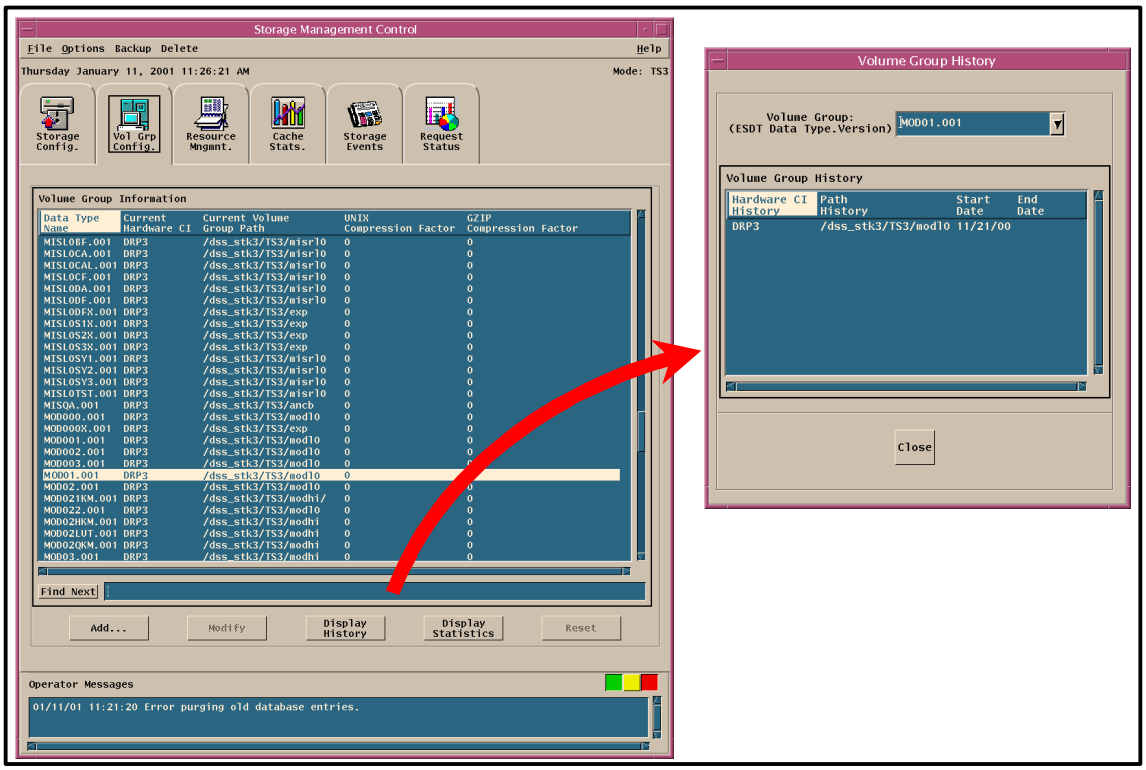


Figure 14. Storage Management, Vol.Grp. Config. Tab.

Launching DSS GUIs

The following software applications are associated with DSS:

- Science Data Server (SDSRV).
- Storage Management (STMGT) Servers.
  - Request Manager Server.
  - Staging Disk Server.
  - Cache Manager Server.
  - Archive Server.
  - Request Manager Server.
  - IFTP Server.
  - D3 Tape Server.
  - 8mm Tape Stacker Server.
  - CD-ROM Server.
  - DLT Server.
- Data Distribution (DDIST) Server.

- DDIST Graphical User Interface (GUI).
- STMGT GUIs.
- Science Data Server GUIs.

Access to Storage Management, Data Distribution (DDIST), and other GUIs is gained through the use of UNIX commands. The procedure for launching the GUIs begins with the assumption that the applicable servers are running and that the operator (Archive Manager or System Administrator) has logged in.

Launching DSS GUIs Using UNIX Commands

1 Access the command shell.

- The command shell prompt is displayed.

NOTE: Commands in Steps 2 through 11 are typed at a UNIX system prompt.

2 Type **setenv DISPLAY *clientname*:0.0** and then press the **Return/Enter** key.

- Use either the terminal/workstation IP address or the machine-name for the ***clientname***.

3 Start the log-in to the DDIST client server by typing **/tools/bin/ssh *hostname*** (e.g., **e0dis02**, **g0dis02**, **l0dis02**, or **n0dis02**) and then press the **Return/Enter** key.

- If you receive the message, **Host key not found from the list of known hosts. Are you sure you want to continue connecting (yes/no)?** type **yes** ("**y**" alone does not work).
- If you have previously set up a secure shell passphrase and executed **sshremote**, a prompt to **Enter passphrase for RSA key '<*user@localhost*>'** appears; continue with Step 4.
- If you have not previously set up a secure shell passphrase; go to Step 5.

4 If a prompt to **Enter passphrase for RSA key '<*user@localhost*>'** appears, type your ***Passphrase*** and then press the **Return/Enter** key. Go to Step 6.

5 At the **<*user@remotehost*>'s password:** prompt, type your ***Password*** and then press the **Return/Enter** key.

6 Type **setenv ECS_HOME /usr/ecs**.

7 Type **cd /*path*** and then press the **Return/Enter** key.

- Change directory to the directory (e.g., /usr/ecs/<*MODE*>/CUSTOM/utilities) containing the startup scripts for DSS.
- The <*MODE*> will most likely be one of the following operating modes:
  - OPS (for normal operation).
  - TS1 or TS2 (for testing).
  - SHARED (for other uses).
- Note that the separate subdirectories under /usr/ecs apply to different operating modes.

8 Type **setenv MODE <*MODE*>**, where **<*MODE*>** is the same as in Step 8, and then press the **Return/Enter** key.

9 To launch the Storage Management Control GUI, use a similar procedure and type the following command: **EcDsStmgtGuiStart <*mode*>** and then press the **Return/Enter** key.

- The Storage Management Control GUI, used for review of storage events and status of devices, is displayed.

10 To launch the Data Distribution Requests GUI, type the following command: **EcDsDdistGuiStart <*mode*>**, where **<*mode*>** is the one selected in Step 8, and then press the **Return/Enter** key.

- The Data Distribution GUI is displayed.

11 To launch the **DSS Science Data Server** GUI, log in to the host for Science Data Server (e.g., **e0acs05**, **g0acs03**, **n0acs04**, or **l0acs04**). Use a similar procedure and type the following command: **EcDsSdSrvGuiStart <*mode*>** and then press the **Return/Enter** key.

- The Science Data Server Operator GUI is displayed.

Suppose you are an Archive Manager and are asked by someone on the SSI&T team to provide archive path information for a particular Earth Science Data Type (ESDT) stored in the archive. The SSI&T team can tell you the name for the ESDT, because that information is typically in the descriptor file specified when an ESDT is loaded, using the **Data Types** tab of the Science Data Server GUI and the **Add Data Type** dialog illustrated in Figure 15. The figure also illustrates the dialog used to **Update ESDT** information, providing capability permitting updates without reloading ESDTs when changes are necessary.

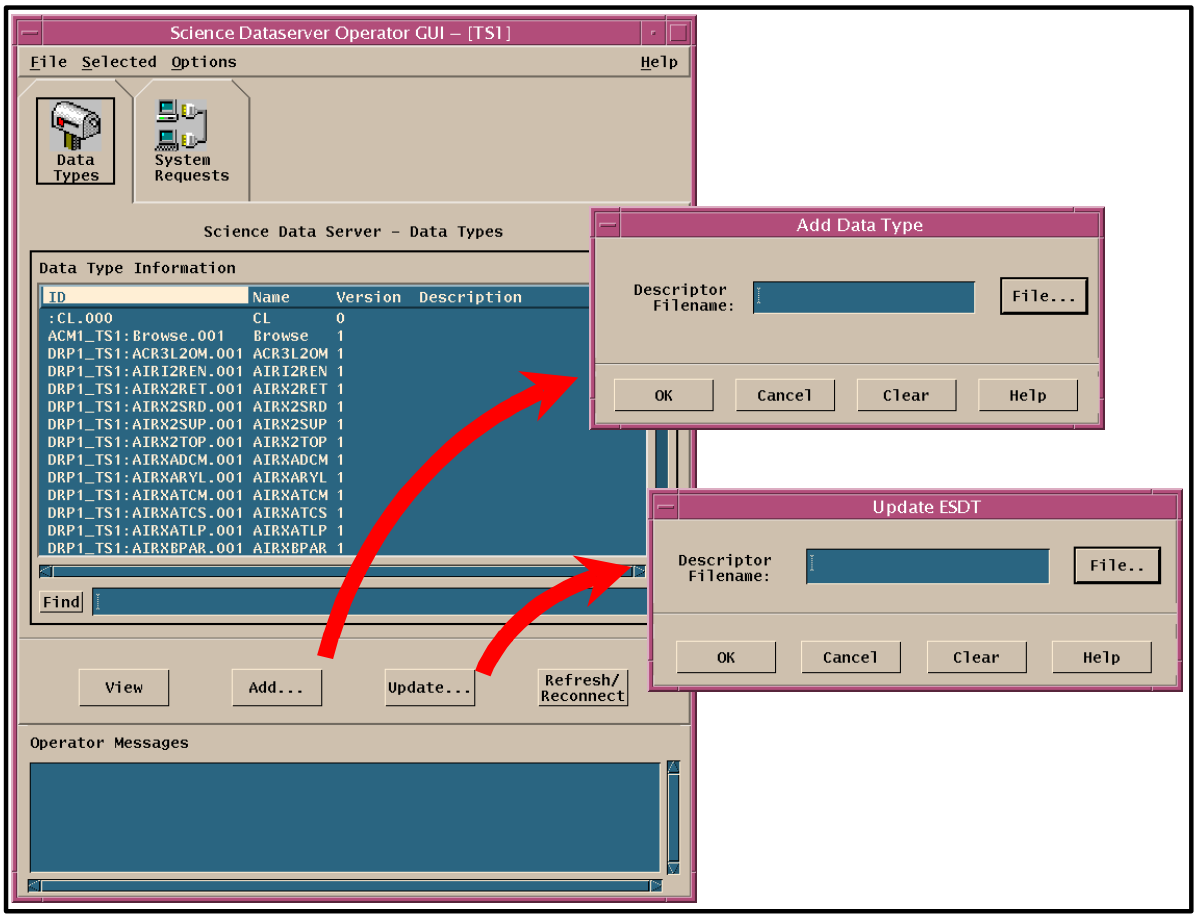


Figure 15. Science Data Server, Data Types Tab and Add/Update Dialogs.

Use the following procedure to display specific path information for the archive server.

Use Storage Management GUIs to Display Archive Path Information

1 Launch the DSS Storage Management GUI using UNIX commands.

- The DSS Storage Management GUI is displayed.

2 Click on the **Storage Config.** tab to ensure that the Storage Configuration display is available.

- The **Storage Config.** tab is displayed.

3 In the field listing **Server Type**, click on the **ARCHIVE** line to highlight it.

- The selected line is highlighted and the **Server ID** and **Status** of archive servers are displayed in the field listing **Server Name**.

4 Click on the **Vol.Grp. Config.** tab.

- The **Volume Group Information** is displayed showing volume groups and their current paths.

5 If it is desirable to display the path history for a data type, on the **Vol. Grp. Config.** tab, click on the **Data Type Name** entry for the specific server for which path history information is desired.

- The selected line is highlighted.

Click on the **Display History** button.

A **Volume Group History** window is displayed showing the path history for the highlighted data type.

Archive Resource Management

The management of archive resources and data is governed by local policy. The software permits sites to establish unique naming and mapping conventions for relating ESDTs to logical volume groups and physical archive volume groups. However, to foster consistency and ease of management of the data in the archive, and to increase the supportability of the system, it is desirable to establish and follow conventions (e.g., naming conventions, assignment of data to volume groups). To facilitate support of local archives by centralized resources (e.g., the System Monitoring and Coordination Center), it is desirable that the DAACs work together (e.g., through Operations Working Groups) to implement consistent and compatible data management practices. Of course, it is necessary for each DAAC to enforce policies and procedures to ensure the long-term viability of archived data.

Logical volume groups are specified using the ESDT short name with the version ID as an extension (e.g., **MOD01.001**). Achieving this convention can be facilitated by adoption of an approach in which specific data products are assigned to the same storage path. In fact, it may be desirable to assign all related products (e.g., **MOD01.001**, **MOD01.002**, **MOD01.003** . . .) to the same storage path. This will have the effect of consolidating related products ultimately in the same physical archive volume group.

The Storage Management GUIs provide tools for managing archive resources. As noted previously, the **Storage Config.** tab (see Figure 13) provides information and control functions for setting and modifying configurations of various Server Types (e.g., 8mm tape, Archive Server, D3 tape) and to manage data location within the archive and on disk. Another Storage Management GUI is the **Resource Mngmnt.** tab, shown in Figure 16. It allows the operator to monitor and adjust the availability of given storage devices. Buttons provide access to pop-up windows permitting management of hardware, including the ability to put specific resources on line or take them off line, and management of media sets.

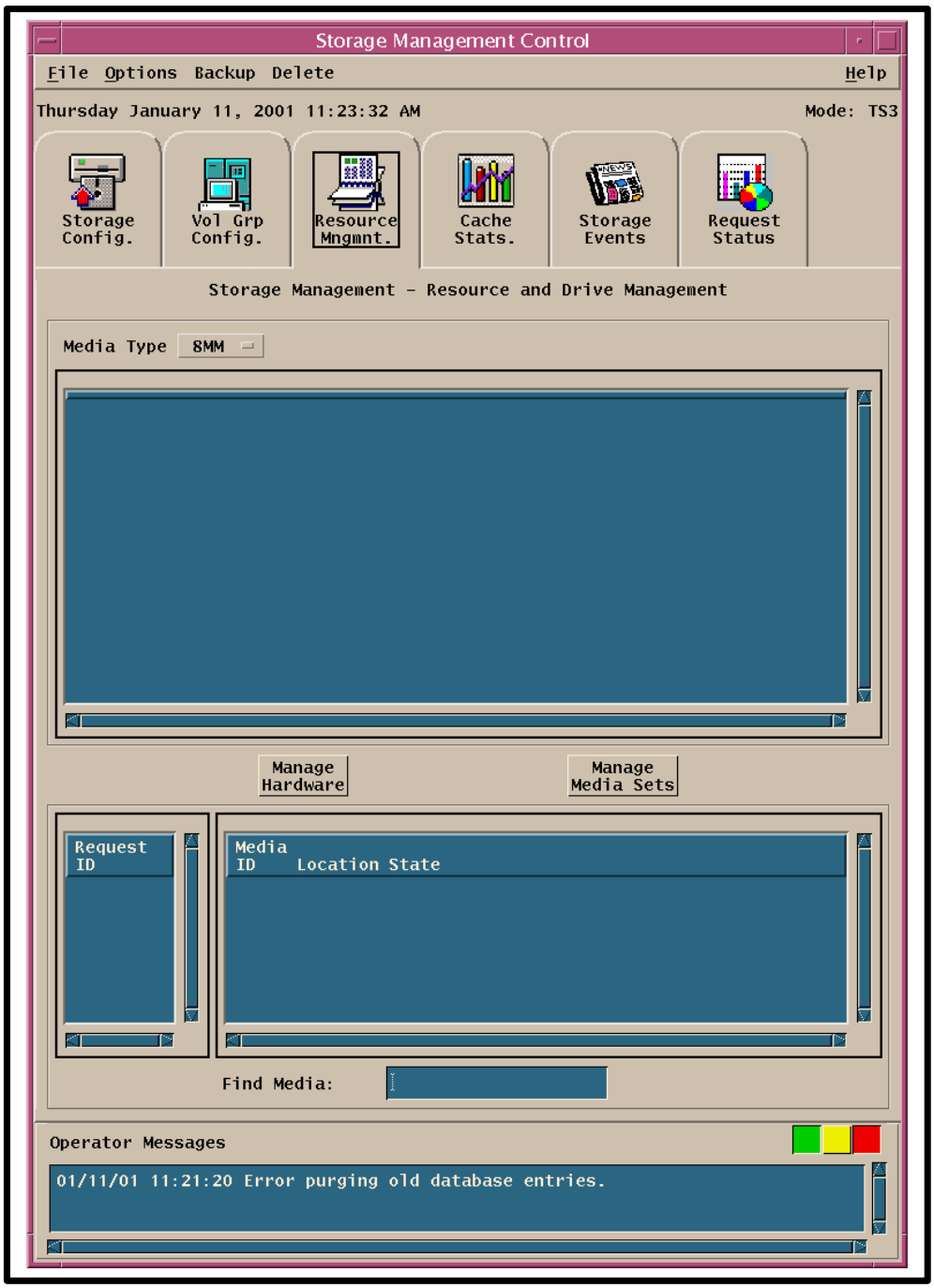


Figure 16. Storage Management, Resource Mngmnt. Tab.

Another Storage Management GUI is the **Cache Stats.** tab, shown in Figure 17. It permits the operator to view various system caches, along with statistics on their use. When a cache gets too full (i.e., exceeds a tunable threshold), a warning message is displayed to the operator, who can then delete expired files.

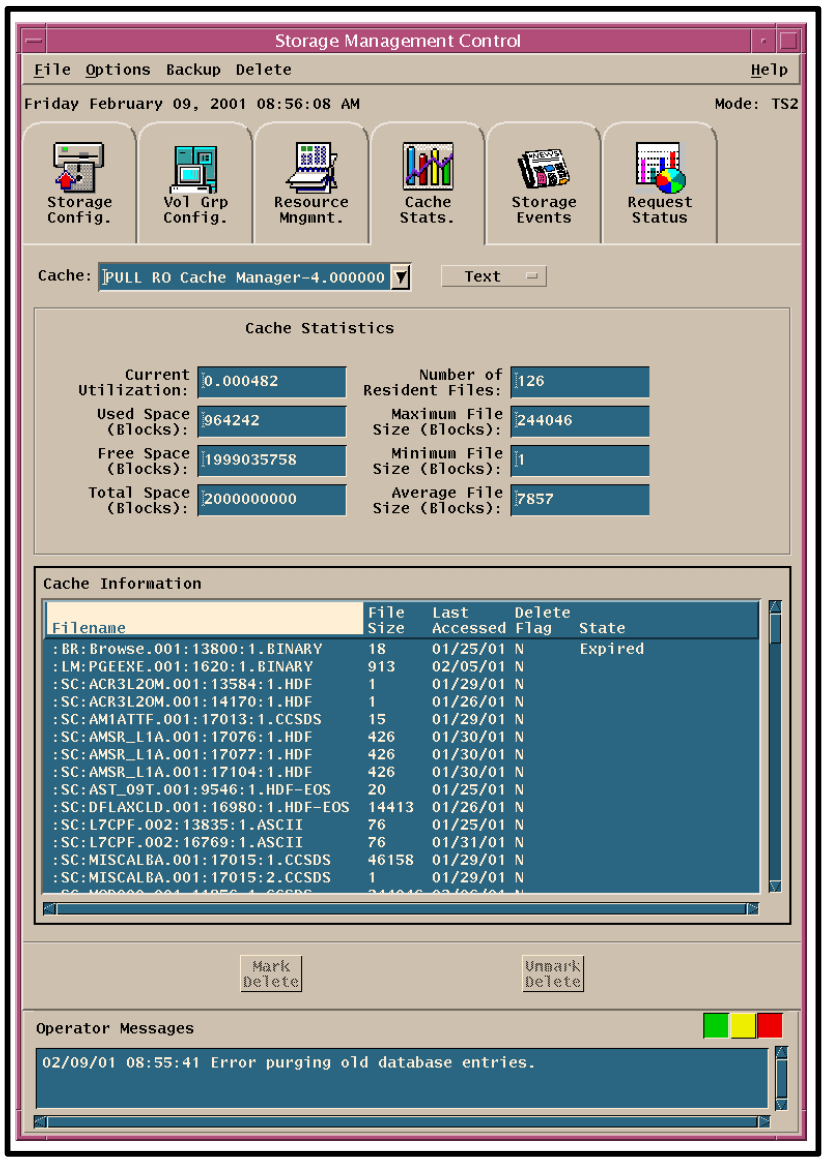


Figure 17. Storage Management, Cache Stats. Tab.

Suppose you are a Data Distribution Technician monitoring a request for distribution of a data granule by FTP pull. You note that the request is not completing. You display the Storage Management **Cache Stats.** tab and observe a message that the Pull Monitor cache is nearly full. Use the following procedure to display the Pull Monitor cache data and purge expired files.

Delete Expired Files from Pull Monitor Cache

1 Launch the DSS Storage Management GUI using UNIX commands.

- The DSS Storage Management GUI is displayed.

2 Click on the **Cache Stats.** tab to ensure that the Storage Configuration display is available.

- The **Cache Stats.** tab is displayed.

3 Click on the pull-down list arrow to the right of the **Cache Id:** field.

- A list of cache areas is displayed, including a **Pull RO Cache Manager** and one or more other **Cache Manager** entries.

4 Click on the list entry for **Pull RO Cache Manager**.

- The selected entry appears in the **Cache:** field and statistical data on the cache utilization are displayed (*Note*: There is an option button to the right of the **Cache:** field that may permit selection of a graphical display instead of the text display.).
- A list of files in the selected cache is displayed in the **Cache Information** field under the statistical data, with indication for each file whether it is expired. Unless one or more files have been previously marked for deletion, the **Delete Flag** column contains the annotation **N** for each listed file.

5 In the displayed list of files, click on any expired file.

- The label on the **Mark Delete** button turns from gray to black.

6 Click on the **Mark Delete** button.

- The annotation **Y** appears in the **Delete Flag** column in the row for the **Filename** of the selected file.

7 Repeat steps 5 and 6 for as many expired files as desired.

- The annotation **N** appears in the **Delete Flag** column in the row for the **Filename** of each selected file.

8 Click on the **Purge** button.

- The expired files marked for deletion are purged from the cache.

Insert Data Into the Archive

Storing new data in the archive repository is largely an automated process that does not normally require operator interaction and occurs as a result of operations such as ingest and data production. Any operations involvement would be to support archive administration operations, resolve problems, periodically monitor working storage and archival operations, and coordinate with the appropriate external/internal sources to resolve schedule conflicts.

Because of the automated nature of this process, step-by-step procedures are not required.

Archive Insert Scenario

NOTE: The scenario that follows describes the insertion of data into the Data Server at an ECS DAAC and is derived from document 605-CD-002-001, *Release B SDPS/CSMS Operations Scenarios for the ECS Project (March 1996).*

As we have seen, data and associated metadata can be received from numerous sources. This scenario focuses on a routine data insert from the processing subsystem. It assumes that all components are active and not in any degraded modes of operation, that ESDT data collection types have been established, and that the data server's nominal activity rate is 50% of capacity.

Insert Data into the Archive Scenario

1 Initiate the session between the Processing Subsystem and the Data Server.

- The Processing Subsystem sends a Data Insert Request to the Science Data Server.
- Receipt of the request is logged (via MSS Logging Services) and a request identifier is associated with the Data Insert Request.
- The content of the request is validated; if successful, it is queued for later processing. If unsuccessful, a rejection message is issued.
- *The operator may examine the progress of a request by reviewing storage events using the Data Server Subsystem **SDSRV and DDIST GUIs** as described in the next section.*

2 Transfer data from Processing Subsystem to Data Server.

- The queued Data Insert Request is reached and processing begins.
- Associated data granules and metadata are transferred from the Processing Subsystem to the Data Server working storage.
- Data transfer status, including recoverable errors, is indicated in the event log via MSS Logging Services.
- *The operator may check the request status using the Data Server Subsystem **SDSRV & DDIST GUIs**.*

3 Validate metadata received from the Processing Subsystem.

- The metadata update file(s) produced by the associated product PGEs are validated for completeness and correctness.
- Validation success or failure is logged via MSS Logging Services with the associated Data Insert Request Identifier and the appropriate status message is returned to the Processing Subsystem.

4 Store data granules in the permanent archive.

- Upon successful validation of the metadata update file, Science Data Server sends a Data Storage Request to Storage Management.
- The data granules in working storage associated with the Data Storage Request are stored.
- The Archive Activity Log (via MSS Logging Services) records each data product being stored and storage status of each storage operation.
- A checksum value is calculated for each data object associated with each granule. (*Note*: This calculation can be turned off, and if it is, it may result in the archiving of a corrupted granule with no ready means of detecting the corruption.)
- The checksum value (if calculated), storage status, and other selected metadata are forwarded to the Science Data Server in a status message upon completion of the Data Storage Request.

5 Store metadata.

- Science Data Server receives and logs the Data Storage Request status message from Storage Management.
- The additional metadata items are validated.
- The PGE produced metadata update file and the storage management provided metadata are loaded into the metadata database.
- The status of the metadata load is entered in the event log.
- *The operator may examine the progress of a request by reviewing storage events using the Data Server Subsystem* ***SDSRV and DDIST GUIs*** *as described in the next section.*

6 Report Data Insert Request status.

- The Science Data Server logs completion of the Data Insert Request in the event log and reports completion of the Data Insert Request to the Data Archive Manager, the operator console and to the insert Requester (the Processing Subsystem in this scenario).
- Each of the above entities would also be notified if the request failed and reason(s) for failure identified.

7 Process subscriptions based on newly inserted data.

- The Science Data Server will then examine the event list for all subscriptions for that event.
- Subscription notifications are sent to the appropriate entities as appropriate and distribution processing is initiated.
- The Science Data Server sends an Advertisement Update Message to the Advertising Server to advertise the new data.

This page intentionally left blank.

Monitor Archive Requests

As previously noted, data that are inserted into the archive can be received from a number of sources including the Ingest Subsystem, Processing Subsystem, other DAACs, and Authorized Users. The Data Ingest Technician (DIT) or other operator can monitor the insertion of data into the archive using the Data Server Subsystem (DSS) GUIs.

System Requests Window

A primary GUI tool for monitoring of archive processing is the **System Requests** window, accessible from the **Science Data Server** Operator GUI or from the **Data Distribution** Operator GUI.

The **System Requests** window (Figure 18) displays the following information:

- **Request ID** is a unique identifier for the request.
- **Requester** is the login name of the individual requesting the job or the name of the application running the request.
- **Component** identifies the data server component initiating the request, i.e., Science Server, Document Server, Distribution, and Storage Management.
- **Service request** may be **insert, acquire, store, retrieve**, or **ship**.
- **Status** of a request can be one of the following: **queued, active**, or **completed**.
- **Priority** is **express**, **very high**, **high, normal**, or **low**, which can be changed by the operator by using the **Priority Option** button at the bottom of the screen, then clicking on the **Apply** push button.
- The operator can reduce the display list by clicking on the **Filter** push button, which opens the **System Management Filter Requests** window.

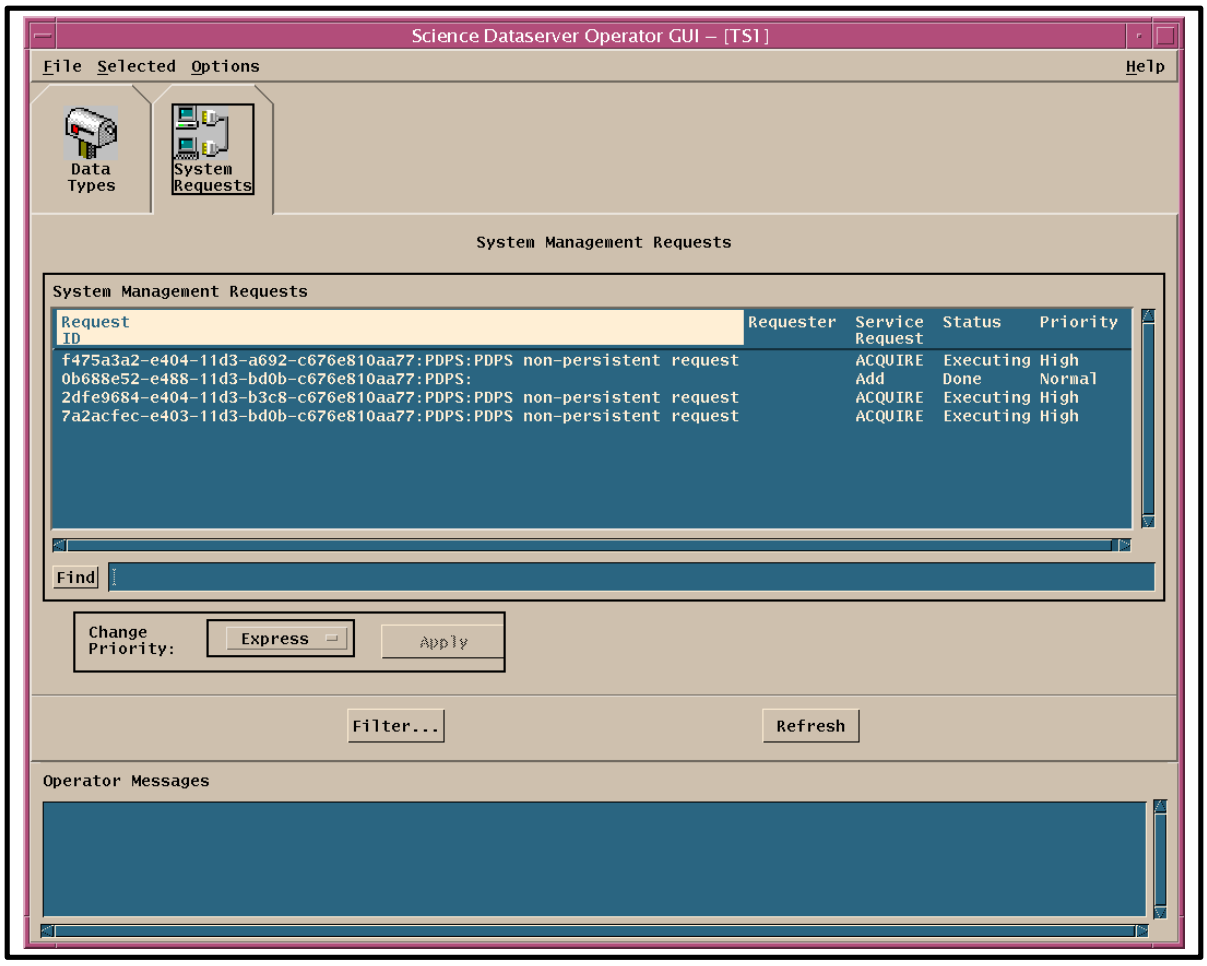


Figure 18. System Management Requests Window

System Management Filter Requests Window

The System Management Filter Requests Window (Figure 19) allows you to limit the scope of the System Management Requests listing by selecting various delimiters such as request IDs, requester names, state, and priority.

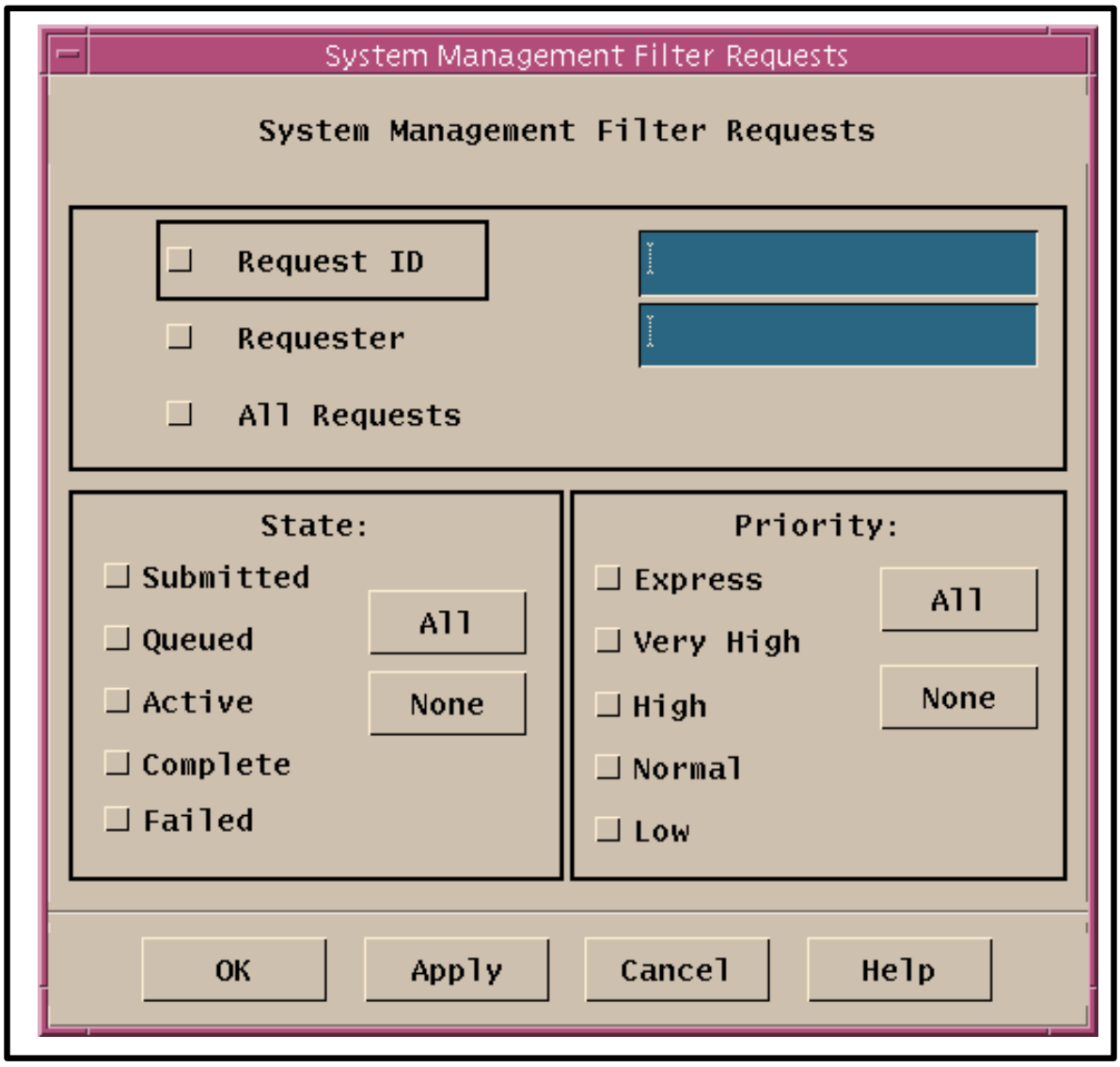


Figure 19. System Management Filter Requests Window

The operator may implement all the filter changes while keeping the window open by using the **Apply** push button, or implement all the filters and close the filter window by using the **OK** push button**.**

Distrib'n Requests Window

The Distrib'n Requests window, illustrated in Figure 20, displays detailed information on individual data distribution requests and provides the capability to filter requests, change priority of requests, and designate shipping status. The window contains a list of data distribution requests that can be sorted by column. To change the priority of a selected request, select the desired priority and click on the **Apply** button in the **Change Priority** area. A selected request can be marked to indicate that it has been shipped. An **Abort** button is used to cancel a selected request. Distribution requests can also be filtered by attributes, using the **Distribution Filter Requests** window shown in Figure 21.

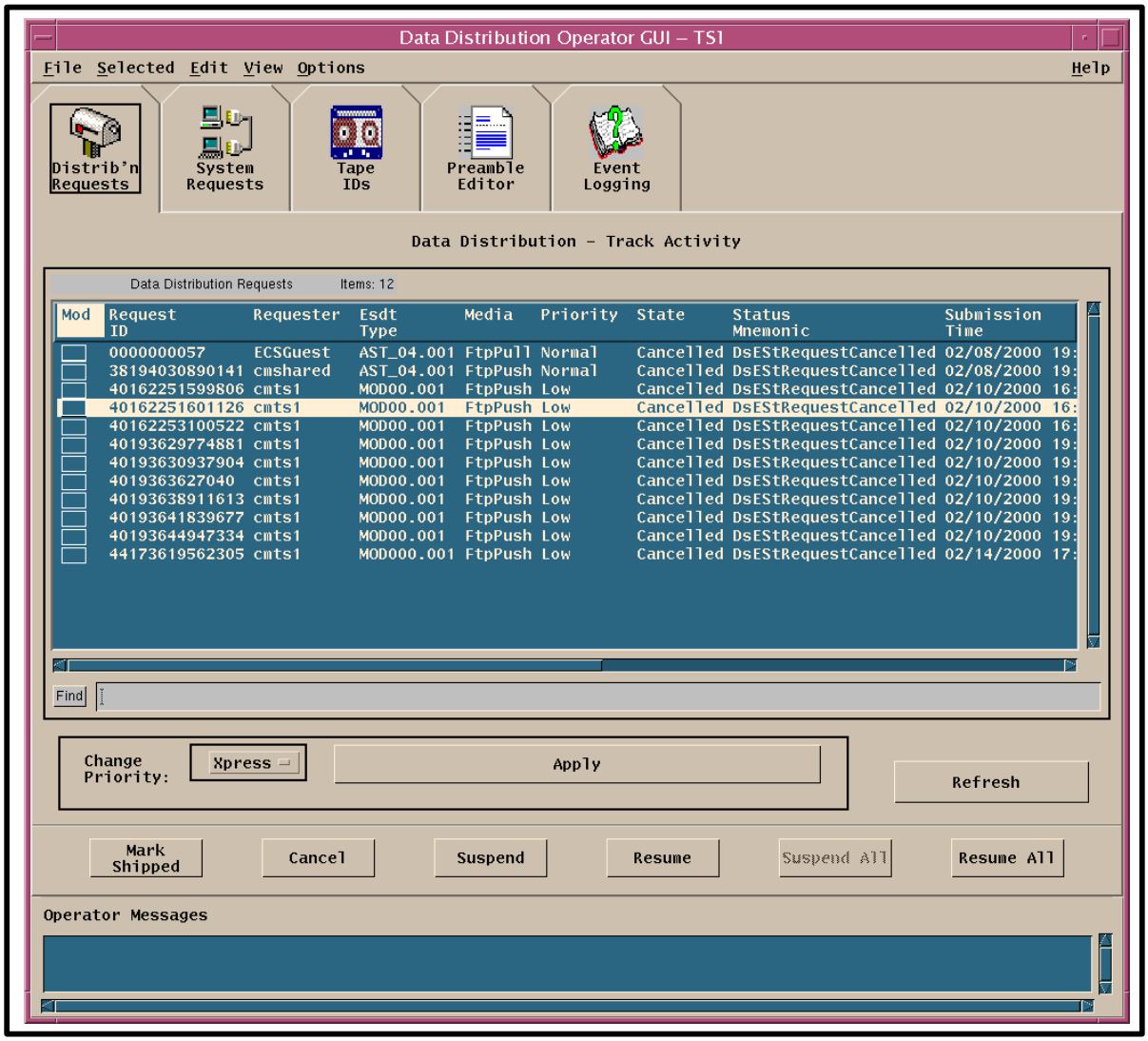


Figure 20. DDIST Distrib'n Requests Window

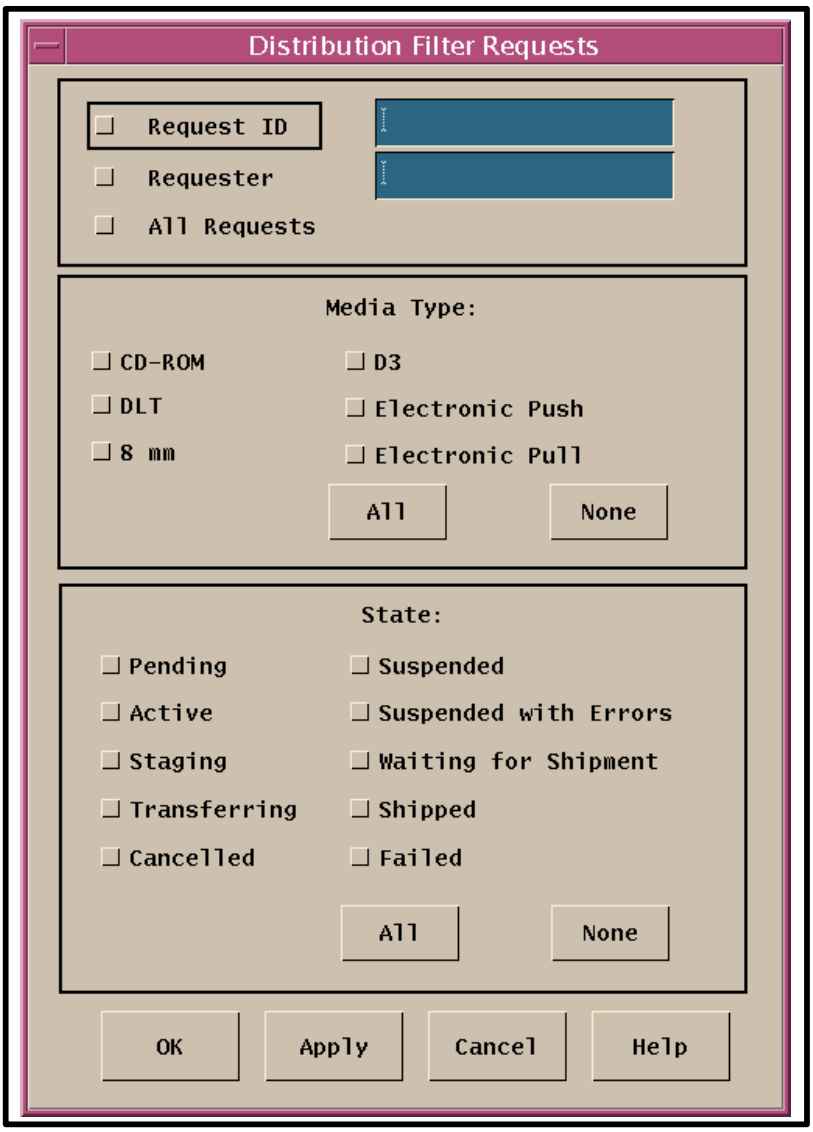


Figure 21. Distribution Requests Filter Window

The following procedure illustrates how to monitor requests using the **System Requests** tool and the associated **Filters**.

Monitor Archive Requests Procedure

1 Launch the **DDIST GUI** by using the command line procedure or, if the DDIST icon is available on the DAAC Desktop available, by clicking on that icon.

- The Data Server tool is displayed.

2 **Click** on the **System Requests** tab.

- The System Management Requests window is opened.
- A list of requests is displayed (if not, click on the **Refresh** button).

3 **Click** the **Filter** push button.

- The **System Management Filter Requests** window is displayed.

4 **Click** on the **Requester** button located in the radio box.

- The cursor moves to the **Requester** field to the right of the radio box.
- The other two selections in the radio box are **Request ID** and **All Requests**.

5 Enter the Requester, then press the **Return/Enter** key.

6 Click on the **All** push button located in the State radio box.

- The remaining choices in the **State** radio box are **Queued, Active, Complete** and **None**.

7 **Click** on the **All** push button, located in the **Priority** radio box.

- The remaining choices in the **Priority** radio box are **Express**, **Very High**, **High, Medium, Low** and **None**.

8 **Click** on the **OK** push button, located at the bottom of the window.

- The other push buttons located at the bottom of the window are **Apply**, **Cancel**, and **Help**.
- The **System Management Filter Requests** window is closed.
- Because the **All** filter was used for **State** and **Priority** in the **System Requests** window, every request for the specific Provider indicated is displayed.

9 **Click** on a **request** that requires a priority change.

- The request is highlighted.

10 **Click** on the **Priority** Option menu button, until the priority of choice is displayed.

- Choices are **High**, **Medium**, and **Low**.

11 **Click** on the **Apply** push button.

- The priority on the highlighted request is changed.

12 To exit, follow menu path **File→Exit**.

Retrieve Data From The Archive

Retrieval of data from the archive is a largely automated process that occurs in response to Data Distribution requests. There are a number of possible sources for Data Distribution requests:

- data orders from scientists or other ECS end users.
  - one-time orders.
  - standing orders placed as subscriptions for acquiring data.
- data requests from other ECS sites.
  - cross-DAAC orders for end users.
  - data needed as input for processing at other sites (subscriptions placed for ingest by those sites).
- internal requests for data needed for processing.

Monitoring Distribution Requests

Placing orders and subscriptions on behalf of scientists or other ECS end users is typically done by User Services representatives. Procedures for these activities are addressed in the training materials for User Services. As ECS responds to these requests, and to requests from other ECS sites or internal processes, the Archive Manager or other operators can monitor the progress of the distribution requests. Suppose that a User Services representative at your DAAC asks you to check on the status of a data distribution request from a user named Ivan Ohrdurr. The following procedure is applicable.

Monitor Distribution Requests

1 Launch the **DDIST GUI** by using the command line procedure or, if the DDIST icon is available on the DAAC Desktop available, by clicking on that icon.

- The Data Server tool is displayed.

2 **Click** on the **Distrib'n Requests** tab.

- The Distribution Requests window is opened.
- A list of requests is displayed.

3 **Click** on the **Filter** push button.

- The **Distribution Filter Requests** window opens.
- Three filter types are displayed: **Request ID**, **Requester**, and **All**.

4 **Click** on the **Requester** button, in the radio box.

- The cursor moves to the selection field to the right of the **Requester**.

5 Enter the requester's name (in this case, **Ohrdurr**) in the text entry field opposite the **Requester** button and label.

6 Click on the **All** button in the **Media Type:** area.

- All of the Media Type toggle buttons show as selected (depressed).
- If you are seeking only requests for a particular set of media, you can select just the button(s) for that set instead of clicking on the **All** button.

7 Click on the **All** button in the **State:** area.

- All of the State toggle buttons show as selected (depressed).
- If you are seeking only requests in a particular state or states, you can select just the button(s) for the desired state(s) instead of clicking on the **All** button.

8 **Click** on the **OK** push button, located at the bottom of the window.

- The other push buttons located at the bottom of the window are **Apply**, **Cancel**, and **Help**.
- The **Filter Requests** window is closed.
- The Distribution Requests screen shows any requests that meet the filter criteria in the **Data Distribution Requests** field.

9 If necessary, use the scroll bar at the bottom of the **Data Distribution Requests** field to scroll horizontally to view the state of the Ohrdurr request(s).

Deleting Granules

As of Release 6A, the system provides a **Granule Deletion** capability, complementing the automatic, scheduled deletion capability that permits operators to delete products produced and archived by the Planning and Data Processing subsystems on a scheduled basis (e.g., deletion at a certain time (configurable by the operator) after product creation.

The **Granule Deletion** capability allows operators to delete products on demand. There are a variety of circumstances that may require deletion on demand, such as:

- New PGE versions have been created and are used to reprocess large amounts of past data, creating new ESDT versions. As reprocessing progresses, operations deletes the granules for the old ESDT versions from the archive and inventory.
- It is determined that certain lower-level (e.g., Level 2) products are of little or no interest to the science or public user community. In concert with the science teams, DAAC operations personnel decide to remove these products from the inventory. Since the products are still referenced by higher-level products as inputs, the DAAC decides to keep the inventory records for production history purposes.
- One or more granules were found defective and were reprocessed on an individual basis. When the reprocessing is complete, the operator wishes to delete the old, defective granule(s) from the inventory.
- A DAAC has extended ECS with subsetting services. The subsetted products are produced outside ECS, but are then inserted into the ECS archive to take advantage of the ECS distribution capability. The DAAC writes a script to delete the subsetted products on a regular basis.

Deletion Capability and Features

The Science Data Server has provided an application programming interface (API) for deleting granules from the archive, or from both the archive and inventory since earlier releases, but the Granule Deletion capability adds a front-end command-line utility that provides several ways for selecting granules for deletion. Confirmation is generally required so that granules are not inadvertently deleted. However, the confirmation may be suppressed so that operators can run regularly scheduled deletion scripts using background execution. This suppression possibility presents an opportunity for inadvertent loss of data and so must be used with care and only after thorough testing of any deletion script.

The Science Data Server captures deletions and related errors in the application log. Operators may also specify a separate and independent delete log for immediate analysis of the success or failure of a delete operation.

Deletion Sequence

The deletion of granules from the archive involves three elements, and therefore actually occurs in stages. Two of the elements are parts of the Science Data Server (SDSRV), and the third is a part of the Storage Management (STMGT) software and Graphical User Interface (GUI).

- *Logical Deletion*: For the first stage, a command-line delete utility specifies selection criteria for deletion of granules and "logically" deletes from the inventory those granules that meet the criteria. These granules are flagged as 'deleted' and can no longer be accessed, but their inventory entries are not yet removed. The logical 'deletion' may specify, via command line input, removal of granule files from the archive (*Delete From Archive*, or DFA) only, leaving the inventory record, or it may specify *Physical Deletion*, which entails removal of the inventory record as well as removal of the files from the archive. The deletion flag consists of records in the SDSRV database. Specifically, in the DsMdGranules table, the value of the DeleteFromArchive entry is changed from **N** to **Y**, and the granule is entered in the DeletedGranules table with a time stamp recording the logical deletion time.

- *Physical Deletion*: The second stage is actual deletion from the inventory of those granules marked for physical deletion (not DFA only), which occurs when the operations staff runs the physical deletion cleanup utility script. For Physical Deletion, the script removes all inventory rows for granules that were flagged as 'deleted,' including rows referencing related information (e.g., QA data). The script writes to the STMGT database (and therefore must be run under a log in by ***sdsrv_role*** with authorization to write to that database), creating entries in the DsSdPendingDelete table for granules to be deleted. This includes entries for granules that are to be physically deleted, as well as those designated DFA only. The operations staff controls the lag time between logical deletion and physical deletion. That lag time is entered into the physical deletion script, which deletes only inventory entries for granules that have been logically deleted prior to that time period.

- *Deletion from Archive (DFA)*: STMGT provides a GUI screen, as illustrated in Figure 22, that allows the operator to initiate the removal from the archive of the files listed its deletion table (populated by SDSRV). STMGT creates requests to the archive servers to delete files. The STMGT GUI can be used to look at the state of the deletion requests. Files that are successfully deleted have their associated rows removed from the STMGT database table.

Periodically, as sufficient data removal from the archive makes it appropriate, operations may elect to reclaim the tape space and recycle archive tapes. The AMASS software commands (*volcomp, volclean, volformat, volstat*) are used for that purpose.

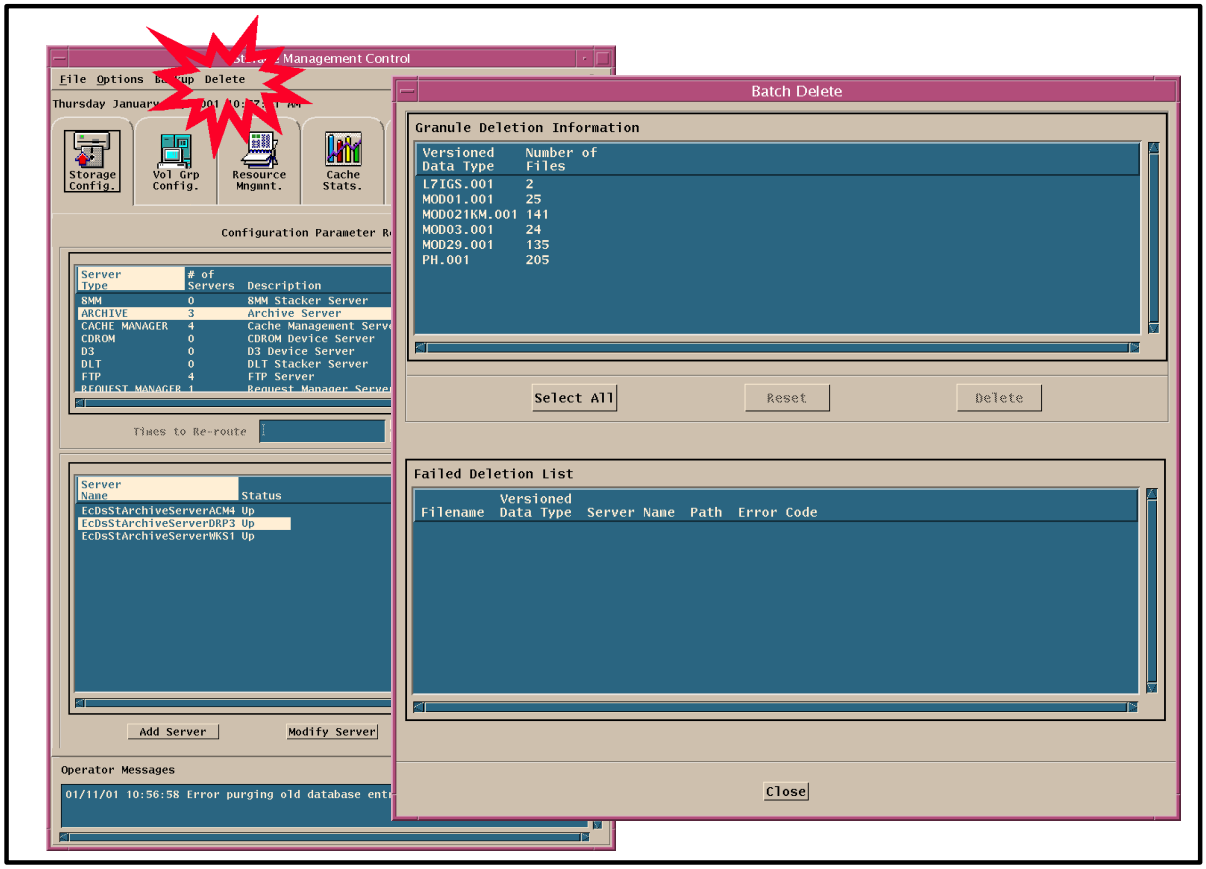


Figure 22. STMGT GUI screen for granule deletion from archive

Suppose you learn from one of the production monitors at your DAAC that a defective granule inserted during Data Processing on January 12, 2001 at 11:03:42 (Granule ID is :SC:MOD29.001:5936:1.HDF-EOS) has been replaced through reprocessing. Use the following procedure for deleting the defective granule from the inventory and archive.

Delete Granule from the Inventory and Archive

1 Access the command shell.

- The command shell prompt is displayed.

NOTE: Commands in Steps 2 through 11 are typed at a UNIX system prompt.

2 Type **setenv DISPLAY *clientname*:0.0** and then press the **Return/Enter** key.

- Use either the terminal/workstation IP address or the machine-name for the ***clientname***.

3 Start the log-in to the SDSRV client server by typing **/tools/bin/ssh *hostname*** (e.g., **e0acs05**, **g0acs03**, **n0acs04**, or **l0acs04**) and then press the **Return/Enter** key.

- If you receive the message, **Host key not found from the list of known hosts. Are you sure you want to continue connecting (yes/no)?** type **yes** ("**y**" alone does not work).
- If you have previously set up a secure shell passphrase and executed **sshremote**, a prompt to **Enter passphrase for RSA key '<*user@localhost*>'** appears; continue with Step 4.
- If you have not previously set up a secure shell passphrase; go to Step 5.

4 If a prompt to **Enter passphrase for RSA key '<*user@localhost*>'** appears, type your ***Passphrase*** and then press the **Return/Enter** key. Go to Step 6.

5 At the **<*user@remotehost*>'s password:** prompt, type your ***Password*** and then press the **Return/Enter** key.

6 To run the Granule Deletion Client specifying ESDT ShortName, ESDT version, and granule insert time coverage, type the command **EcDsGranuleDelete –name MOD29 -version 001 -insertbegin 01/12/2001 11:03:00 –insertend 01/12/2001 11:04:00 –log /usr/ecs/<*MODE*>/CUSTOM/logs/GranDel1.log -physical ConfigFile /usr/ecs/<*MODE*>/CUSTOM/cfg/EcDsGranuleDelete.CFG ecs_mode <*MODE*>**, and then press the **Return/Enter** key.

- The client executes and displays the number of granules for deletion (in this case, 1), and prompts the user **Do you want to continue [y/n]?**.
- ***NOTE*:** The Granule Delete tool provides other ways to delete granules. The deletion specified here could be achieved using one of these ways. For example, if the granule time coverage is available, the command can specify that instead of the insert time. The tool also permits referencing a list of granules by geoid in a file created for the purpose of providing that list as input to the tool. The desired deletion could be achieved by creating a file (e.g., dbids1.in) containing the geoid(s) for the granule(s) to be deleted (in this case, **SC:MOD29.001:5936**) and typing the command **EcDsGranuleDelete –geoidfile dbids1.in –log /usr/ecs/<*MODE*>/CUSTOM/logs/GranDel1.log -physical ConfigFile /usr/ecs/<*MODE*>/CUSTOM/cfg/EcDsGranuleDelete.CFG ecs_mode <*MODE*>**. The file can contain geoids for multiple granules. Similarly, the deletion could be achieved by creating a file containing the local granule Id and using a command specifying **. . . -localgranulefile locgrn1.in . . .**.

7 Type **y** and then press the **Return/Enter** key.

- The process continues to completion.
- ***Note***: The deletion actions are displayed in the Deletion log and in the Science Data Serve ALOG, including information on the user ID of the requester, the ShortName, VersionID, and granule insert time of the request. In addition, the EcDsGranuleDelete.ALOG may contain useful information. It is also possible to

view the SDSRV database to verify the granule tagging for deletion; the granule should appear in the database with a value of the **time the tool was run** for DeleteEffectiveDate, and a value of **N** for DeleteFromArchive. The DsMdDeletedGranules table should list the granule just requested for deletion.

8 To run the Deletion Cleanup Utility, type **EcDsDeletionCleanup.pl** and then press the **Return/Enter** key.

- The script prompts **Enter lag time in days:**.

9 Type **0** and then press the **Return/Enter** key.

- The script prompts **Is this correct? [y/n]**.
- ***NOTE*:** In this training exercise, this step specifies a lag time of **0** and the next step confirms the entry as correct. This lag time is used in the exercise to illustrate the functioning of the tool within the time allotted for training. Typically, a lag time of **0** is not used; instead, it is recommended to use a lag time of **30** days, allowing time when the data are not accessible but before the data are physically removed to identify possible deletion errors.

10 Type **y** and then press the **Return/Enter** key.

- The script prompts **Enter mode of operation:**.

11 Type **<*MODE*>**, where **<*MODE*>** is the mode in which you are making the deletion (typically **OPS**, **TS1**, or **TS2**) and then press the **Return/Enter** key.

- The script prompts **Enter log file name:**.

12 Type **DelCleanup1.log** and then press the **Return/Enter** key.

- The script prompts **Enter Sybase User:**.
- ***NOTE*:** It is possible to press the **Return/Enter** key without typing a name for the log file; in response, the script returns **Using default Log File name (Default is DeletionCleanup.LOG).** before prompting **Enter Sybase User:**.

13 Type **sdsrv_role**, and then press the **Return/Enter** key.

- The script prompts **Enter Sybase User Password:**.

14 Type **<*password*>**, where **<*password*>** is the Sybase password (***Note***: This step may require action by the Database Administrator).

- The script prompts **Enter Sybase SQL Server Name:**.

15 Type **<*x*>0acg<*nn*>_srvr** (**e0acg11_srvr** at EDC, **g0acg01_srvr** at GSFC, **l0acg02_srvr** at LaRC, or **n0acg01_srvr** at NSIDC) and then press the **Return/Enter** key.

- The script prompts **Enter SDSRV's database name:**.

16 Type **EcDsScienceDataServer1_<*MODE*>**, where **<*MODE*>** is the mode in which you are making the deletion (typically **OPS**, **TS1**, or **TS2**) and then press the **Return/Enter** key.

- The script prompts **Enter STMGT's database name:**.

17 Type **stmgtdb1_<*MODE*>**, where **<*MODE*>** is the mode in which you are making the deletion (typically **OPS**, **TS1**, or **TS2**) and then press the **Return/Enter** key.

- The script prompts **Enter Batch Size (10000):**.

18 Type **1** and then press the **Return/Enter** key.

- The Deletion Cleanup Utility script displays a list of actions as they are completed, and then displays the number of granules to be deleted from the archive (DFA) and physically deleted, with a confirmation prompt **Do you wish to continue deleting these granules? [y/n]**. All granules in the DeletedGranules table are displayed because the entered lag time of 0 specifies deletion of all granules tagged for deletion.

19 Type **y** and then press the **Return/Enter** key.

- Execution of the Deletion Cleanup Utility script completes.
- ***Note***: In the SDSRV database, the SDSRV Staging table (DsMdStagingTable) can be observed for transfer of data to the STMGT database (in increments of the specified batch size, in this case **1**); when the transfer is complete, the table is empty. In the STMGT database, the STMGT Pending Delete table (DsStPendingDelete) can be observed for receipt of the data; all granules specified in the delete request are received. The Deletion Cleanup log displays messages about the actions, indicating that information is placed in the STMGT database in increments of the specified batch size, in this case **1**.

20 On the STMGT GUI, to view the ESDTs with granules targeted for deletion, follow menu path **Delete→Batch Delete**.

- The **Batch Delete** window is displayed, listing the number of files for each ESDT/Version pair tagged for deletion in the **Granule Deletion Information** field.

21 To select data for deletion from the archive, click on an ESDT/Version pair (in this case, **MOD29.001**).

- The selected ESDT/Version pair is highlighted.

22 Click the **Delete** button.

- A confirmation Delete Warning prompt asks **Are you sure you want to delete the selected files?**

23 To confirm the deletion, click the **OK** button.

- The delete request continues to completion. If you close the **Batch Delete** window (by clicking on the **Close** button) and then re-launch the window (by following menu path **Delete→Batch Delete**), the ESDT/Version pair no longer appears in the **Granule Deletion Information** field of the **Batch Delete** window.
- ***Note***: The delete actions can be tracked via messages in the Archive Server log files (EcDsStArchiveServer.ALOG, EcDsStArchiveServerDebug.log)

This page intentionally left blank.

Loading Archive Media

Automatically Loading Archive Media

For the STK storage facility, each Powderhorn is equipped with a 21-tape Cartridge Access Port (CAP). In automatic mode, tapes may be placed in the CAP for automatic loading. Tapes are also ejected through the CAP when identified for ejection using a command at the host for the STK Automated Cartridge System Library Software (ACSLS).

The following procedure addresses media loading.

Automatically Loading STK Powderhorn Archive Media

1 To log in, type **amass** or **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.
- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

3 Write down or note the bar code number(s) on the label(s) of the cartridge(s), open the recessed latch on the Cartridge Access Port (CAP) door and insert the tape(s), solid black side up, with the bar code label facing you, and close the door.

- The robot scans all the volumes.

4 At the AMASS host, type **/usr/amass/bin/bulkinlet SP** and then press the **Return/Enter** key.

- Data for the newly inserted media are displayed, including bar codes, associated volume numbers, and, in the **flag** column, the letters **IUO**, indicating that the volumes are inactive (**I**), unformatted (**U**), and offline (**O**).
- *Note*: If you have removed an existing volume and are re-inserting it, do not use the **SP** option, which puts the volume in the general space pool. Instead type **/usr/amass/bin/bulkinlet <*volgrp*>**, where **<*volgrp*>** is the volume group from which the volume was removed. This will put the volume back where it was before removal.

5 For each volume, type **tapelength *###* 2**, where *###* is the volume number.

- A message is displayed indicating the tape length variable has been changed to **2**. (STK may use any of three tape lengths; the **tapelength** command specifies the 50-gigabyte D-3 tapes used in ECS.)

6 For any newly inserted media, it is necessary to issue a formatting command. For the new D-3 tapes, type **volformat -b 256k *###***, where ***###*** is the volume number. You can enter more than one, separating each number from the preceding one with a space.

- A message requests confirmation that you wish to continue.

7 Type **y** and then press the **Return/Enter** key.

- A message is displayed requesting further confirmation, stating that **The following volumes will be formatted:** and listing volume numbers, followed by **(Y-N)**.

8 Type **y** and then press the **Return/Enter** key.

- After a few minutes, a message **Completed formatting all volumes** is displayed.

9 To verify that the volume(s) are inserted, type **/usr/amass/bin/vollist** and then press the **Return/Enter** key.

- Data for the media are displayed; the **flag** column shows that the newly formatted volumes are inactive (**I**).

10 To activate the media for use, type **volstat**.

- Data for the media are displayed; the **flag** column shows that the volumes are now active (**A**).

Manually Loading Archive Media

With the **bulkload** command, you bypass the CAP and manually load media directly into the library bins. Typically, this will only be done at the initial load of the system with large numbers of media volumes. The **bulkload** command enables AMASS to determine what type of media have been placed in the library and to convey this information to the AMASS database. The following procedures are applicable.

Manually Loading STK Powderhorn Archive Media Procedure

1 To manually insert a tape into the Powderhorn, login to the control software (ACSLS) using the acssa account.

2 Type **enter 0,0,0** and then press the **Return/Enter** key.

- The Cartridge Access Port (CAP) door unlocks (audible unlatching sound).

3 Write down or note the bar code number(s) on the label(s) of the cartridge(s), open the recessed latch on the Cartridge Access Port (CAP) door and insert the tape(s), solid black side up, with the bar code label facing you, and close the door.

- The robot scans all the volumes.

4 At the AMASS host, type **bulkload -s SP** and then press the **Return/Enter** key.

- The AMASS database is populated with data for the volumes in the library, including bar codes, associated volume numbers, and status -- inactive (**I**), unformatted (**U**), and offline (**O**). The data may be reviewed using the **vollist** command.
- *Note*: If you are loading a very large number of volumes, such as at initial load, and choose to bypass the CAP and place the volumes directly in the LSM slots, data about the volumes will not be immediately available to ACSLS for communication to AMASS. You will first have to use the ACSLS **audit** command to initiate an audit of the LSM, a process that may take several hours.

5 To view a list of media in the library, type **medialist -3**, and then press the **Return/Enter** key.

- The **-3** option indicates the STK Powderhorn.
- The utility reads the library element status stored in the library, and information about the library contents, including the status (**FULL** or **EMPTY**) of the elements.

Remove Media

To remove media from the archive, use the following procedures.

Remove Media from STK Powderhorn

1 Determine which volumes you want to remove by utilizing the volume number. If necessary to review volume numbers and other information, log into the AMASS host, type **/usr/amass/bin/vollist** and then press the **Return/Enter** key.

2 If there are only a few volumes to remove, from AMASS, for each volume to be removed type **/usr/amass/bin/voloutlet *###***, where ***###*** is the volume number, and then press the **Return/Enter** key.

- AMASS marks the volume off-line and the volume is transferred to the CAP.

3 For the STK Powderhorn, open the recessed latch on the Cartridge Access Port (CAP) door and remove the tape(s)

This page intentionally left blank.

Backup Archived Data

The ECS archive design incorporates programmed backups of archived data. System requirements specify that a percentage of archived data be duplicated for local and off-site storage to provide for data safety. However, the large volume of ECS archived data merits finding alternatives to complete backup of all volumes in the libraries. Selection of data for backup is based on assessment of the feasibility of recovery in the event of data loss.

It is imperative to backup data that would be irretrievable if lost. Such data are saved to the archive, saved to local backup, and saved to offsite backup. Many data elements that will be archived, however, could be retrieved in the event of loss. For example, in the event of loss of a higher level product that is an output of processing a lower level product, it would be possible to restore the higher level product by reprocessing the lower level product. As another example, ECS will often archive a lower level product from a data provider, but that product may also be retained in the archives of the data provider. If the product were lost from the ECS archive, it would be possible to ingest it again from the data provider, using appropriate Ingest procedures.

Thus, when data are inserted into the archive (e.g., through Ingest, from Processing), up to three copies of the data may be created, reflecting different types of data use:

- the active archive copy, available for distribution or other use (volume group is specified in the *Archive ID*).
- a copy to be retained for local backup (volume group is specified in the *Backup ID*).
- a copy to be sent to offsite backup storage (volume group is specified in the *Offsite ID*).

Creating Offsite Backups

The paths for creation of the data copies are specified for each ESDT when it is loaded (see Figure 15). The Archive ID (for the archive copy) and the Backup ID (for the local backup copy) should reflect different archives if possible (i.e., different AMLs or LSMs), to spread the risk of loss. Because ECS does not support multi-cell DCE, the Offsite ID will not be a remote site path, but rather a local path for making copies to be sent for offsite storage. The requirements to implement creation of offsite backups (see Document 611-CD-600-001, *Mission Operation Procedures for the ECS Project*, section 17.7.3.3) include:

- creating a subdirectory and volume group for offsite backups.
- using the **Storage Config.** tab of the Storage Management GUIs to add the volume group to the appropriate archive server and set the offsite ID to be the three-character specification for the local site (e.g., EDC, GSF, LAR, NSC).

- updating the STMGT database offsite table with the volume group name created for offsite storage (may require assistance of system administrator).
- adding volumes to the volume group as needed.

Each site is responsible for arranging its own secure offsite storage. The offsite backup cartridges are removed from the archive storage facility using procedures already described. For local and/or offsite storage of specific archive data, the DAAC Archive Manager (DAM) generates or directs the generation of a list of selected data. At the time the files are archived, they are written to specific volume groups that correspond to the three data usage types identified in the preceding paragraph. Only files belonging to the data usage type are written to the tapes in a specific volume group. Hence, the DAM can determine the tapes that should be stored for local backup and those for offsite storage. This can be accomplished using the AMASS administration **vollist** command.

vollist - this command lists all volumes and their current status information. It will optionally accept a specific volume number. Information displayed includes: volume number, volume group, jukebox number, slot position, volume label/bar code, current volume status, amount of used space on the volume, amount of available space on volume, percentage of space no longer referenced, and number of read or write errors on volume.

If there are other files designated for local and offsite backup which have not been written to a specific volume group, the DAM can use the appropriate AMASS administration commands, **dirfilelist** and/or **volfilelist**, to locate the appropriate archive volume that contains the designated archived files.

dirfilelist: this command lists the files under a directory. One directory or file is displayed on a line. Information displayed includes: file name, volume number, starting block number, file size, file permissions, number of hard links, numeric user id, numeric group id, last time file was accessed, and last time file was modified.

volfilelist: this command lists all of the files on a volume and accepts as input a volume number. One file is displayed on a line. Information displayed includes: file name, volume number, starting block number, file size, file permissions, number of hard links, numeric user id, numeric group id, last time file was accessed, and last time file was modified.

For more information about these AMASS commands, refer to the *AMASS System Administrator's Guide*.

Creating a Backup for AMASS

The DAM should periodically create a backup to guard against loss of the AMASS database and functioning. The archive storage format used by AMASS is a proprietary format designed to optimize storage and retrieval speed. The command **vgexport -q** can be used to create a text file, storable on magnetic media, which can be used with the AMASS format archive tapes and the command **vgimport** to recover from the loss. This command exports the AMASS database for a specified volume group to standard out (**stdout**), a file containing

the directory structure and media attributes (e.g., media type, ownership, timestamp) for the volume group. The file is located in **/usr/amass/filesysdb** and is exported as standard ASCII text. Use the following procedure.

Create a Backup for AMASS

1 To log in, type **amass** or **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.
- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

3 Type **vgexport -q**.

- A file named **stdout** is created in **/usr/amass/filesysdb**.
- *Note*: The **stdout** file is useful only with the archive volumes represented in the AMASS database.

Replacing the AMASS Database Backup Volume (Volume 1)

The AMASS database backup is stored in the archive on Volume 1. "Volume 1," hard coded to be the backup volume, actually designates one of the last volumes in the StorageTek LSM, to prevent its inadvertent use as a data volume. Whenever **amassbackup** is run, AMASS issues an e-mail message with information on volume capacity and usage. It is also possible to issue the command **vollist 1** to display how much space is left on the volume, or **volprint 1** for still more detail. If the volume becomes full *during* a backup attempt, the backup will fail and it is necessary to initialize a new backup volume and perform a full backup as described in the following procedure.

Replace a Full Backup Volume (Volume 1)

1 To log in, type **amass** or **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.
- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

3 Type **voloutlet 1** and then press the **Return/Enter** key.

- The LSM robot places the Backup Volume in the CAP.

4 Open the recessed latch on the CAP door; remove the Backup Volume tape and store it in a safe place.

5 Physically designate the new Backup Volume tape so that it can be easily discriminated from other volumes (e.g., write “Backup Volume” on the tape, color code the tape, or make and display a note of its home storage slot or preprinted barcode.

6 Note the pre-printed number on the volume label (e.g., 112102), insert the new Backup Volume in the CAP, and close the door.

- The robot scans the volume.

7 At the AMASS host, type **/usr/amass/bin/bulkinlet -u** and then press the **Return/Enter** key.

- AMASS assigns the Backup Volume a unique volume number.
- AMASS marks the volume **ONLINE** in the AMASS database.
- AMASS assigns the Backup Volume to the last barcode position in the library.
- AMASS gives the volume a **BACKUP VOLUME** label.

8 Type **vollist**, and then press the **Return/Enter** key.

- AMASS displays the following:

```
VOL   VOL   JUKE   POS   VOL          FLAGS   USED   AVAIL   DEAD   ERRS
NUM   GRP   NUM         LABEL                (MB)   (MB)    (%)
1     0     1      BACKUP-VOLUME     I        0      20000   0        0
```

9 To change the Volume Label field from **BACKUP-VOLUME** to the preprinted media number (e.g., 112102), type **vollabel 1 112102** and then press the **Return/Enter** key.

10 Type **vollist**, and then press the **Return/Enter** key.

- AMASS displays the following:

```
VOL   VOL   JUKE   POS   VOL       FLAGS   USED   AVAIL   DEAD   ERRS
NUM   GRP   NUM         LABEL              (MB)   (MB)    (%)
1     0     1          112102      I        0      20000   0        0
```

11 Type **volformat -u** and then press the **Return/Enter** key.

- A message requests confirmation that you wish to continue.

12 Type **y** and then press the **Return/Enter** key.

- A message is displayed requesting further confirmation, stating that **The following volumes will be formatted: 1 (Y-N)**.

13 Type **y** and then press the **Return/Enter** key.

- After a few minutes, a message **Completed formatting all volumes** is displayed.

14 To verify that the volume is inserted, type **/usr/amass/bin/vollist 1** and then press the **Return/Enter** key.

- Data for the media are displayed; the **flag** column shows that the newly formatted volume is inactive (**I**).

15 Type **amassbackup -fv** and then press the **Return/Enter** key.

- AMASS performs a full backup with the verbose option of the AMASS database and transaction logs.

Create Replacement Backups Manually from Existing Archives

If loss of data necessitates obtaining and inserting backup data from local or off-site storage, it is necessary to create replacement data to be returned to backup storage. Use the following procedure.

Create Replacement Backups

1 To log in, type **amass** or **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.

3 You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

4 Type **volcopy -c <*source*> < *destination* >** (where **<*destination*>** is the volume number of the destination volume and **<*source*>** is the volume number of the source volume), and then press the **Return/Enter** key.

- The **-c** option specifies copy of the source to the destination.
- A bit for bit copy of the source (the cartridge to be copied) is made at the destination (an available, unused cartridge). Because the copy procedure depends on the amount of data on the source cartridge, the process can take as long as an hour to complete.
- *Note*: After starting a **volcopy** procedure, do not attempt to kill the process with the **kill -9** command.

5 A hardcopy/softcopy list of the files backed up should be created and kept for future file restoration operations.

6 Remove the backup volume(s) and send to local or off-site storage area, as appropriate.

This page intentionally left blank.

Restore Archive Data

Although Archive hardware has been selected for high reliability, there may be an occasional tape failure or drive error. In the event that such errors cause loss or corruption of the primary copy of Archive data, it will be necessary to attempt data recovery or to re-archive equivalent data. There are a number of potential means for restoring lost or corrupted data.

Use of Backup Data for Recovery

Depending upon the circumstances and nature of the loss, restoration of archive data may take the form of:

- copying from a local backup to the original or a new primary copy.
- reprocessing.
- obtaining replacement data from an external data provider.
- restoring the AMASS database and/or the ACSLS database.

In the event of catastrophic loss of the archive and local backup cartridges, it will be necessary to retrieve backups from off-site storage. A different process required to recover from a failed attempt at archive storage is addressed in a subsequent section on archive monitoring and fault notification.

Manual Data Recovery from Local or Offsite Backup Tapes

If a backup volume is available and contains the data that were lost or corrupted on the primary copy, the data can be copied using standard UNIX commands. Detailed procedures are available in sections 17.9.4.1 and 17.4.9.2 of Document 611-CD-600-001, *Mission Operation Procedures for the ECS Project*. If the backup volume must be obtained from offsite storage, it must then be inserted into the archive and brought on line. The procedures for loading archive media were addressed under a preceding topic. The requirements then entail:

- using the **Storage Config.** tab of the Storage Management GUIs to view the volume groups of the appropriate archive server and to find the files in the primary and backup volume groups.
- using the UNIX copy command (**cp** or **dd**) to cpy the lost or corrupted file from the backup version to the primary version.
- as appropriate (i.e., if the recovery is one of a set of files to be restored, for example, because they were lost from a damaged tape, removing the names of the files recovered from the list of files to be recovered by other means.

If an entire volume is to be copied, perform the procedure to create replacement backups as addressed under a previous topic; if recovery is from offsite, send the backup back to secure offsite storage.

Reprocessing

If it is possible to produce a lost data product by running a Product Generation Executive (PGE) on other data available in the archive, recovery of the lost product may be achieved by this reprocessing. The reprocessing will be a case of on-demand processing, for which procedures are addressed in a separate lesson on Production Planning and Processing. In this case, the resultant recovered file will have a new Universal Reference (UR) and a new Production Date and Time. As part of the input to this process, the operator needs the following information for each file to be recovered:

- the Archive unique filename for the file.
- the Archive IDs of the primary archive and backup archive.
- the file checksum if available.

Requesting Replacement Data from Provider

Where the archived data that are lost are not available in local or off-site backups, but were originally acquired from an external data provider who retains a copy of the data in the archives of the data provider, recovery may be achieved by re-ingesting the data. Some data providers (e.g., Landsat-7) have decided not to support data re-supply; consult appropriate Interface Control Documents to determine suppliers able to re-supply data. The re-ingest entails ingest procedures that are addressed in a separate lesson on Ingest. As with re-processed data, the resultant recovered file will have a new UR.

Restoring the AMASS Database

The AMASS database is restored manually by the System Administrator or the Archive Manager using the AMASS command **amassrestore**. This command restores the last full backup, the last partial backup, and all journal transactions that have occurred since the last backup. It creates a sub-directory under filesysdb called **journal**. All restored files are copied to the **journal** directory. The following restore procedure uses a backup volume or tape device.

Restore AMASS Database

1 To log in, type **amass** or **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Type the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.
- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

Caution

Do not use the **amassrestore** command when AMASS is running. To shutdown AMASS, refer to the Special Shutdown Procedures in the AMASS technical documentation *Installing AMASS*.

3 To inactivate the AMASS file system, type **amassstat -i**.

- The AMASS file system is inactivated.

4 Make sure the Backup Volume is in the correct drive in the library.

- If there is another volume in the drive, return it to its home slot by typing **/usr/amass/daemons/amassrecovery -s** (the option **-s** prevents system startup and performs file recovery).

5 Type **amassrestore -v**.

- The AMASS database is restored.

Restoring the ACSLS Database

ACSLS provides the **rdb.acsss** utility to restore the database in case of severe disk or data problems. If you have made regular backups, it should be possible to restore the database with little or no loss of data. Restoring the database is likely to be necessary if there has been a system crash, or if the database can not be started or has a physical or logical error. The following procedure is applicable.

Restore the ACSLS Database

1 To log in, type **acsss** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Type the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.
- You are authenticated (as **acsss**) and returned to the UNIX command line prompt.

3 Load the restore tape into the backup drive.

4 Type **rdb.acsss**, and then press the **Return/Enter** key.

- If you enter **rdb.acsss** with no options, the backup utility defaults to the default tape device attached and configured to the ACSLS server.
- The rdb.acsss utility restores the ACSLS database and miscellaneous library resource files.

This page intentionally left blank.

AMASS Graphical User Interface

AMASS offers a Graphical User Interface (GUI) called the AMASS Administration Window (AAWin) through which operators can administer volumes and volume groups that are managed by AMASS. AAWin provides a point-and-click interface for identifying volumes their groups, and their configurable parameters. Figure 23 shows the AAWin main window, which is composed of a menu bar, a large middle section called the *workroom*, a utility bar at the right with icons for a trash can, a volume group, and a volume, and a status bar at the bottom with indicator "lights" that represent the current status of AMASS. The figure shows how the window looks when the volume icon on the utility bar has been selected to populate the workroom with icons for volumes, and illustrates the type of volume-related information that appears in a pop-up display as the cursor is moved over one of the icons.

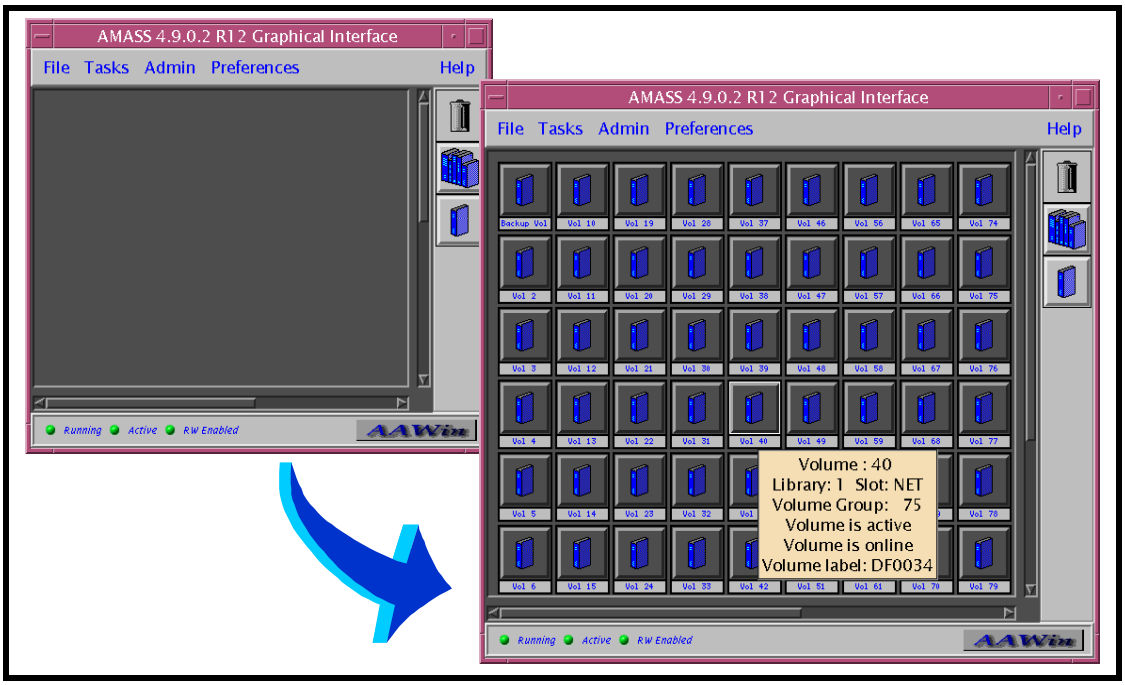


Figure 23. AMASS AAWin Main Window

Use the following procedure to launch the AMASS GUI and view information about volume groups and volumes in the archive.

Using the AMASS GUI to View Volume Group and Volume Information

1 Access the command shell.

- The command shell prompt is displayed.

NOTE: Commands in Steps 2 through 6 are typed at a UNIX system prompt.

2 Type **setenv DISPLAY *clientname*:0.0** and then press the **Return/Enter** key.

- Use the terminal/workstation IP address or the machine-name for ***clientname***.

3 Start the log-in to the FSMS client server by typing **/tools/bin/ssh -l amass *hostname*** (e.g., **n0drg01**) and then press the **Return/Enter** key.

- If you receive the message, **Host key not found from the list of known hosts. Are you sure you want to continue connecting (yes/no)?** type **yes** ("**y**" alone does not work).
- If you have previously set up a secure shell passphrase for **amass** and executed **sshremote**, a prompt to **Enter passphrase for RSA key '<amass@*localhost*>'** appears; continue with Step 4.
- If you have not previously set up a secure shell passphrase; go to Step 5.

4 If a prompt to **Enter passphrase for RSA key '<amass@*localhost*>'** appears, type the ***Passphrase*** and then press the **Return/Enter** key. Go to Step 6.

5 At the **<amass@*remotehost*>'s password:** prompt, type the ***Password*** and then press the **Return/Enter** key.

6 Type **/usr/amass/bin/aawin** and then press the **Return/Enter** key.

- The AMASS GUI main window is displayed.

7 Click on the **View by Volume Groups** button (middle button at the right of the *workroom*).

- The *workroom* is populated by icons for volume groups.
- The **Block List** window is displayed; it is a vertically scrolled list of blocks of items (in this case, volume groups). The *workroom* can display up to 256 icons; the **Block List** window provides access to additional items in blocks of 256.

8 Move the cursor over one of the icons for a volume group.

- A pop-up display shows data for the volume group (**Volume Group**, **Volumes in Group**, **Free Space**, **Dead Space**, **Error Count**).

9 Click on the **View by Volumes** button (at the bottom right side of the *workroom*).

- The *workroom* is populated by icons for volumes.
- The **Block List** window is also displayed; it is a vertically scrolled list of blocks of items (in this case, volumes).

10 Move the cursor over one of the icons for a volume.

- A pop-up display shows data for the volume group (**Volume**, **Library**, **Slot**, **Volume Group**, **Volume Status**, **Volume Label**).

Modify a Volume Group

Figure 24 shows the *Modify a VG* window. This window is opened by selecting *Modify a Volume Group* from the *Tasks* menu. The window is used to modify the characteristics of a volume group. The top portion of the window (not modifiable) lists root directories already configured for a volume group. The middle portion of the window permits adding directories to the list of root directories for the specified volume group. The third major portion of the window, near the bottom, contains indicators of the status of the volume group and buttons for selecting a volume group, as well as buttons across the very bottom of the window for accepting or canceling the modifications. (**Note**: The *Modify a VG* window also is opened if you have the *workroom* populated with volume group icons and you click on one of them. However, in this case you may only modify the volume group on which you clicked; the bottom of the window will not display buttons for selecting a volume group.)

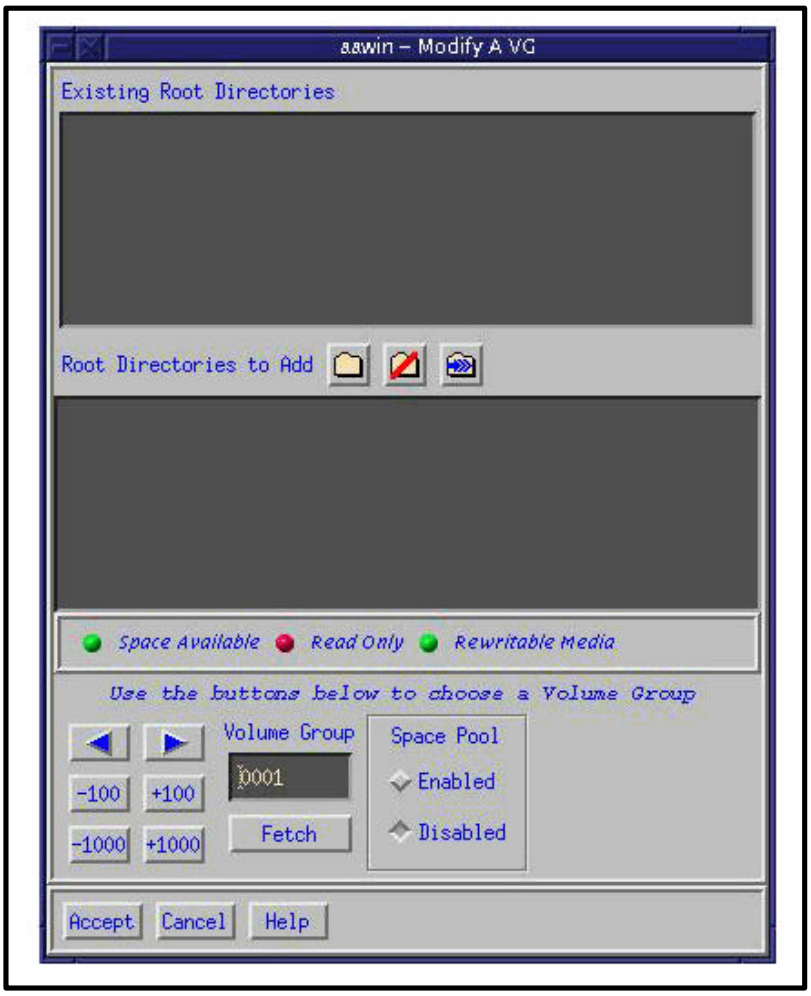


Figure 24. Modify a VG Screen of the AMASS GUI

To see how a volume group can be modified, lets examine how you might assign a new root directory in the AMASS file system to a volume group. Use the following procedure to create the directory and then modify a volume group.

Modify a Volume Group

1 Open a second terminal window.

- **NOTE:** This procedure assumes that the AMASS GUI is open after previously being launched from a terminal window.

2 Start the log-in to the FSMS client server by typing **/tools/bin/ssh -l amass *hostname*** (e.g., **n0drg01**) and then press the **Return/Enter** key.

- If you receive the message, **Host key not found from the list of known hosts. Are you sure you want to continue connecting (yes/no)?** type **yes** ("**y**" alone does not work).
- If you have previously set up a secure shell passphrase for **amass** and executed **sshremote**, a prompt to **Enter passphrase for RSA key '<amass@*localhost*>'** appears; continue with Step 3.
- If you have not previously set up a secure shell passphrase; go to Step 4.

3 If a prompt to **Enter passphrase for RSA key '<amass@*localhost*>'** appears, type the ***Passphrase*** and then press the **Return/Enter** key. Go to Step 5.

4 At the **<amass@*remotehost*>'s password:** prompt, type the ***Password*** and then press the **Return/Enter** key.

5 To change to the **dss_amass** directory, type **cd /dss_amass**, and then press the **Return/Enter** key.

6 To create an empty directory with path **/dss_amass/training/** to assign to the volume group, type **mkdir training**, and then press the **Return/Enter** key.

7 On the AMASS GUI main window, click on the **View by Volume Groups** button (middle button at the right of the *workroom*).

- The *workroom* is populated by icons for volume groups.
- The **Block List** window is also displayed; it is a vertically scrolled list of blocks of items (in this case, volume groups).

8 Follow menu path **Tasks→Modify a Volume Group**.

- The **Modify a VG** window is displayed, showing data for Volume Group 0001.

9 In the area for choosing a volume group, near the bottom of the window, use the buttons to set the number displayed in the **Volume Group** field to the desired volume group.

- A click on the right-pointing arrow button or the left-pointing arrow button respectively increases or decreases the number by one. Buttons below the arrow

buttons may be used to increase or decrease the number in multiples of 100 or 1000, as indicated on the buttons.

10 When the **Volume Group** field displays the number of the desired volume group, click on the **Fetch** button.

- The list of root directories already configured for the selected volume group is displayed in the **Existing Root Directories** field.
- The status indicators show the status of the selected volume group.

11 Click on the **File/Directory Selection** button (leftmost button after the label **Root Directories to Add**, with folder icon).

- A **File Selection** filter window is displayed.

12 In the **File Selection** filter window, click on the **Filter** button.

- The **Filter** field displays **/usr/amass/***, and directories and files are displayed in the **Directories** and **Files** windows, respectively.

13 Use the **Filter** button and selection of directories in the **Directories** window to display **/dss_amass/training/** in the **Selection** field.

- The **Selection** field displays **/dss_amass/training/**.

14 In the **File Selection** filter window, click the **OK** button.

- The **Root Directories to Add** field of the **Modify a VG** window displays **/dss_amass/training/**.

15 To examine the capability to edit the list of Directories to Add, click on the entry **/dss_amass/training/** to highlight it in the **Root Directories to Add**, then click on the **Remove a File/Directory from List** button (middle button after the label **Root Directories to Add**, with folder icon crossed out with a red line).

- The entry **/dss_amass/training/** is removed from the **Root Directories to Add** field.

16 Repeat steps 12 - 14 to restore the entry **/dss_amass/training/** to the **Root Directories to Add** field.

- The **Root Directories to Add** field of the **Modify a VG** window displays **/dss_amass/training/**.

17 In the **Modify a VG** window, click on the **Accept** button at the bottom of the window.

- The entry **/dss_amass/training/** is removed from the **Root Directories to Add** field and appears in the **Existing Root Directories** field.
- The **Modify a VG** window is closed.

Modify a Volume

Figure 25 shows the *Modify a Volume* window. This window is opened by selecting *Modify a Volume* from the *Tasks* menu. The window is used to modify the characteristics of a volume. The right side of the window shows the current set of statistics and configuration information (not modifiable) for the volume listed in the **Volume** field on the left side of the window (the **Volume** field looks like a button, but if you click on it, a "spinbox" is displayed, with arrow buttons permitting increases or decreases to the volume number, and buttons at the bottom to **Accept** or **Cancel** the change; accepting the change closes the spinbox, displays the new number in the **Volume** field, and displays data for that volume). The left side of the *Modify a Volume* window provides access to modifiable characteristics of the volume. Changes made to the buttons and fields in the window do not take effect until the **Accept** button at the bottom of the window is clicked. (**Note**: The *Modify a Volume* window also is opened if you have the *workroom* populated with volume icons and you click on one of them. However, in this case you may only modify the volume on which you clicked; the **Volume** field does not look like a button and may not be changed.)

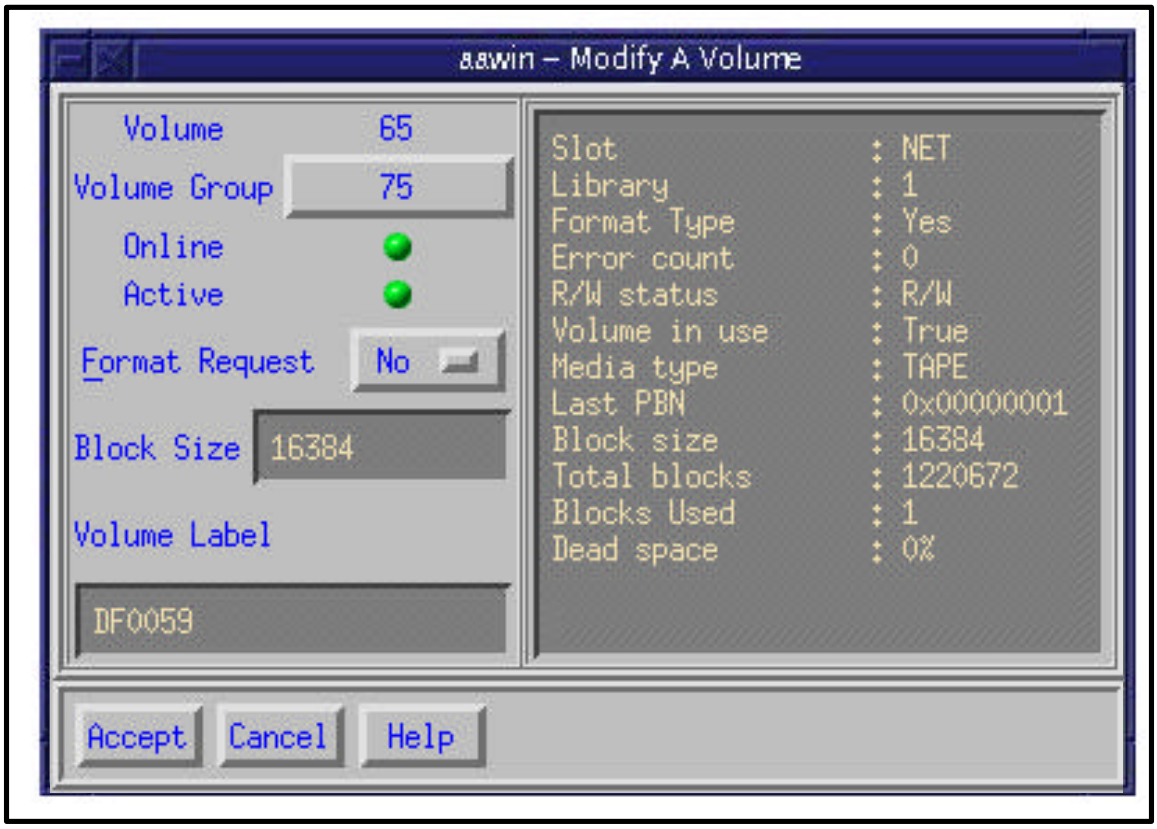


Figure 25. Modify a Volume Window of the AMASS GUI

There are six fields that can be edited for a given volume:

1. The first is a button for setting the **Volume Group**. Clicking the button opens a spinbox for selecting the volume group to which the volume is to be assigned.
2. Below the Volume Group button is an **Online/Offline** indicator light with label. Clicking on the indicator toggles its state and updates the text field (label) next to it.
3. Below the Online/Offline indicator is an **Active/Inactive** indicator light with label. Clicking on the indicator toggles its state and updates the text field (label) next to it.
4. Next is a **Format Request** option button permitting selection of a formatting option for the volume.
5. Next is the **Block Size** field, applicable only to tape libraries when a format is requested to be done on the volume. This field requires a numeric value, which should be a multiple of 16384.
6. The last modifiable field is a text field for specifying the volume label.

To examine the functioning of the *Modify a Volume* window, use the following procedure.

Modify a Volume

1 On the AMASS GUI main window, click on the **View by Volume Group** button (middle button at the right of the *workroom*).

- The *workroom* is populated by icons for volume groups.
- The **Block List** window is also displayed; it is a vertically scrolled list of blocks of items (in this case, volume groups).

2 Click on the icon for a high-numbered volume group with several volumes in it.

- The *workroom* is populated with icons for the volumes in the selected volume group, and the **Modify a VG** window is displayed, showing data for the selected volume group.

3 Click on the icon for one of the volumes.

- The **Modify a VG** window is closed and the **Modify a Volume** window is displayed, showing data for the selected volume.

4 To change the volume group to which the volume is to be assigned, note the **Volume Group** number indicated on the **Volume Group** button, and then click on the button..

- A spinbox is displayed showing the **Volume Group** number, with right-pointing and left-pointing arrow buttons respectively to increase or decrease the number.

5 Use the arrow buttons to change the **Volume Group** number, and then click on the **Accept** button in the spinbox.

- The spinbox is closed and the new number appears in the **Modify a Volume** window as the **Volume Group** number.

6 Return the **Volume Group** number to its original value by repeat steps 4 and 5, using the spinbox to set the number to that which you noted originally.

- The spinbox is closed and the original number appears in the **Modify a Volume** window as the **Volume Group** number.

7 Experiment with the **Online/Offline** and **Active/Inactive** indicators.

- When the volume is indicated to be **Online**, clicks on the **Active/Inactive** indicator toggle the color and label for the indicator.
- When the volume is indicated to be **Inactive**, clicks on the **Online/Offline** indicator toggle the color and label for the indicator.

8 Click on the **Format Request** option button.

- A pop-up option menu is displayed for selection of **Yes** or **No**, and when one of those options is clicked, the indicated choice is displayed on the option button.

9 Use the mouse to move the cursor to the **Block Size** field.

- A blinking cursor appears in the **Block Size** field.

10 Use the keyboard to enter or change the value in the **Block Size** field.

- The entered data appear in the **Block Size** field.

11 Use the mouse to move the cursor to the **Volume Label** field.

- A blinking cursor appears in the **Volume Label** field.

12 Use the keyboard to enter or change the value in the **Volume Label** field.

- The entered data appear in the **Volume Label** field.

13 If you wish to cancel any request for changes to the volume, click on the **Cancel** button at the bottom of the window. If you wish to accept the changes, click on the **Accept** button at the bottom of the window.

- When you click the **Accept** button, *AAWin* attempts to make the requested changes. For most changes, specifically changes to **Online/Offline** and **Active/Inactive** status, the requested **Volume Group** for the volume, and the **Volume Label**, the changes can be made immediately. But if a format has been requested, then the **Online/Offline** and **Active/Inactive** status changes are not applied immediately. Instead, the requests for these status changes and the format changes are passed to the *AAWin* **Scheduler** daemon for processing. Changes made by the **Scheduler** occur when the job is processed, which depends on how many other jobs are currently scheduled.

Archive Monitoring and Troubleshooting

Previous sections of this lesson have addressed the use of tools that can assist you in monitoring the Archive. Specifically, the System Requests tab of the Science Data Server Operator GUI provides a view into archive request processes, the Data Distribution GUI provides information on distribution requests, and the AMASS GUI offers ready access to information about the status of archive volumes and volume groups. If archive problems arise, there are additional resources that can provide more detailed monitoring and assistance in troubleshooting. Troubleshooting is a process of identifying the source of problems on the basis of observed symptoms. Because the Archive is at the heart of ECS and its Data Server interacts with so many subsystems, problems with Archive functions may be traced to the Data Server subsystem (DSS) or one of many other ECS subsystems, including (but not limited to) the following:

- Ingest Subsystem (INS).
- Planning Subsystem (PLS).
- Data Processing Subsystem (DPS).
- Interoperability Subsystem (IOS).
- Communications Subsystem (CSS).
- Data Management Subsystem (DMS).

Table 4 summarizes actions to be taken in response to some common Archive problems. If the problem cannot be identified and fixed without help within a reasonable period of time, the appropriate response is to call the Help Desk and submit a trouble ticket in accordance with site Problem Management policy.

Table 4. Troubleshooting Archive Problems

Symptom/Problem	Response
Unable to log in to the FSMS host (e.g., *x*0drg01)	Check with the Operations Controller/System Administrator to ensure that the host is "up."
AMASS is not running	Have the System Administrator restart AMASS.
A volume is inactivated by AMASS	Check for AMASS errors and, unless there are many errors, use the command **/usr/amass/bin/volstat -a <*vol_number*>** to re-activate the volume. [For detailed instructions, refer to the procedure **Use the *amass_log* script to Display AMASS Errors** (subsequent section of this lesson).]
A storage system robot gets out of synchrony with AMASS concerning the location of media.	Re-establish synchrony. [For detailed instructions, follow the procedure **Use *mediamove* to Establish Synchrony Between *quedisplay* and *medialist*** (subsequent section of this lesson).]

Table 4. Troubleshooting Archive Problems (Cont.)

Symptom/Problem	Response
An Ingest or Data Processing action cannot complete because of failure to store data (reflected as failure on Ingest or Processing GUIs).	Check to ensure AMASS is on line; check for file copy errors, network problems, mount point problems. [For detailed instructions, refer to the procedure for **Recovery from Failure to Store Data** (subsequent section of this lesson).]

Although there are no custom ECS reports of archive events, the Storage Management GUIs provide a **Storage Events** tab, as shown in Figure 26. This tab allows an operator to review events in the storage management Event Log. The Event Log Search Parameters box permits specification of constraints to limit the event log search that is executed when the **Search** button is clicked. This box enables an operator to select a date interval for the search, and it provides option buttons to specify the type and level of events to be displayed. Options on the **Event Type** option button are: **Any**, **Device**, **Cache**, **Software**, **COTS**, **Sybase**, **Pulldisk**, and **Unknown**. Options on the **Event Level** option button are: **Any**, **Information**, **Warning**, **Error**, **Severe**, **Fatal**, and **Unknown**. The resulting events are then displayed in the **Event Log** field. A **Purge Selected** button at the bottom of the window permits deletion of entries in the Event Log that have been selected, or highlighted, by clicking on them in the **Event Log** field.

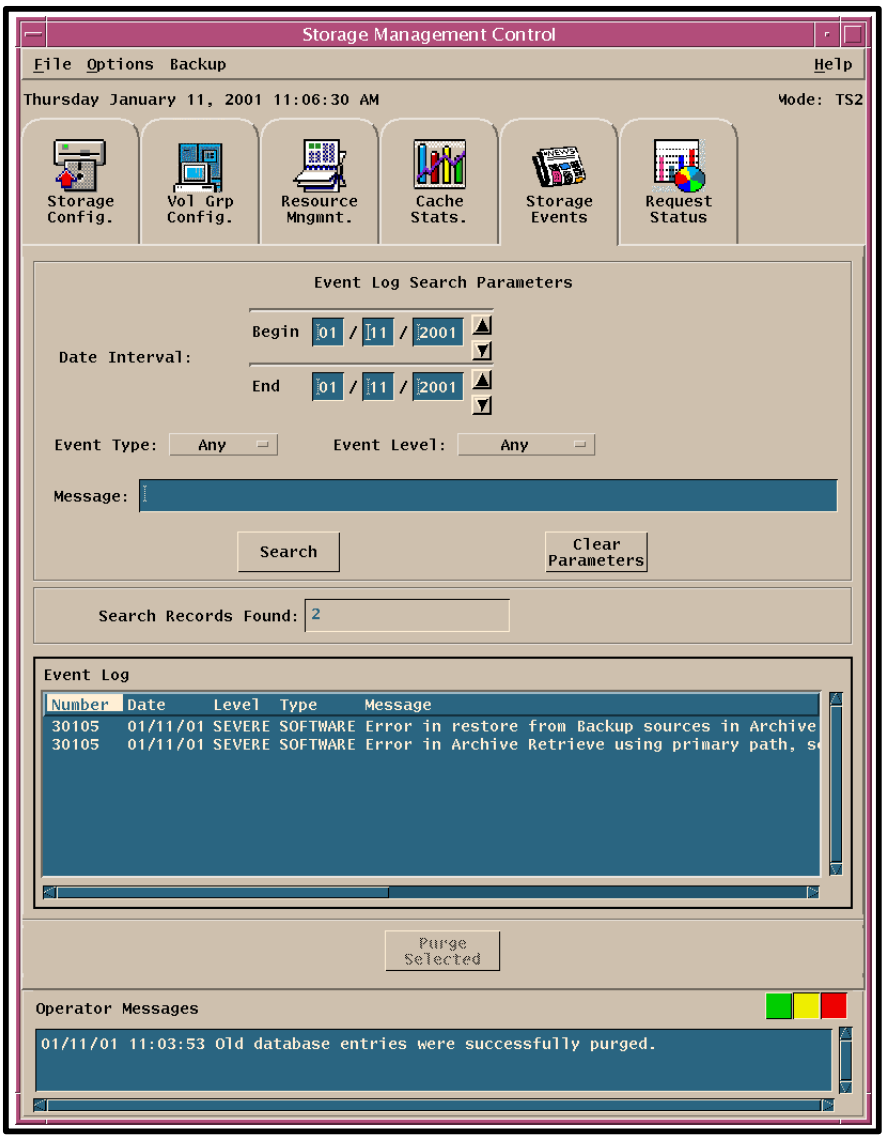


Figure 26. Storage Management, Storage Events Tab.

There are also several troubleshooting tools provided with AMASS that can assist you in monitoring archive activity and in responding to fault notifications. The AMASS *System Administrator's Guide* includes instructions on using these tools. Some of the most useful ones are addressed here.

AMASS Commands, Utilities, and Scripts for Monitoring and Fault Response

A command provided to display the status of the AMASS I/O activity is **sysperf**. This command returns several items:

- the number of reads and writes that are outstanding.
- the number of volumes (for reads) or volume groups (for writes) that are going to be used by those reads and writes.
- the current volumes in the drives.
- the I/O rate in Kb per second since the last update. This value first appears as a zero. Then AMASS continues to update the information at intervals based on a value for *updateinterval* entered by the operator.

Sysperf can often show the first sign of trouble. For example, if there are reads and writes in process but throughput is always 0, a problem is indicated. The most common problems are volumes and drives that go off line and/or inactive.

To run **sysperf**, use the following procedure.

Use *sysperf* to Display the Status of AMASS I/O Activity

1 To log in, type **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.
- You are authenticated (as **root**) and returned to the UNIX prompt.

3 Type **/usr/amass/bin/sysperf -k 5**.

- The screen will update every 5 seconds and display information on the amass kernel (**-k**).

4 To break out of the command, use <**Control-C**> (while holding down the **Control Key**, press **C**).

Volumes are monitored using the **vollist** command. For example, to show data on a particular volume (e.g., volume 100) use the following procedure.

Use *vollist* to Display Volume Data

1 To log in, type **amass** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password*** for amass, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.
- You are authenticated (as **amass**) and returned to the UNIX prompt.

3 Type **/usr/amass/bin/vollist 100** (for this example, to specify volume 100).

- AMASS displays the following:

```
VOL   VOL   JUKE POS   VOL      FLAGS  USED   AVAIL   DEAD   ERRS
NUM   GRP   NUM        LABEL             (MB)  (MB)    (%)
100   500   3    NET   SD0060    O      99213  3167     0      0
```

- Note: In this example, the **O** in the **FLAGS** column indicates that the volume is offline.

4 To put volume 100 back on line, type **/usr/amass/bin/volloc -n 100**.

5 Type **/usr/amass/bin/vollist 100**.

- AMASS displays the following:

```
VOL   VOL   JUKE POS   VOL      FLAGS  USED   AVAIL   DEAD   ERRS
NUM   GRP   NUM        LABEL             (MB)  (MB)    (%)
100   500   3    NET   SD0060    A      99213  3167     0      0
```

- Note: In this example, the **A** in the **FLAGS** column indicates that the volume is now on line and Active.

If the output of **vollist** indicates that the volume is inactivated (i.e., there is an **I** in the **FLAGS** column), use the **amass_log** script to determine the nature of the problem. The **amass_log** script displays AMASS messages from the system log file. This script can provide helpful information under several circumstances, such as when a command gives unexpected results or when AMASS appears not to be functioning properly in other ways. Use the following procedure to run **amass_log**.

Use the *amass_log* script to Display AMASS Errors

1 To log in, type **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.

3 You are authenticated (as **root**) and returned to the UNIX prompt.

4 To change to the AMASS tools directory, type **cd /usr/amass/tools**, and then press the **Return/Enter** key.

5 Type **./amass_log *logfilepath***, where ***logfilepath*** is the pathname of the system log file to scan for AMASS messages, and then press the **Return/Enter** key.

- On a Sun, the ***logfilepath*** is likely to be **/var/adm/messages**; on an SGI, the ***logfilepath*** is likely to be **/var/adm/SYSLOG**. Any AMASS error messages in the scanned log file are displayed.

6 Perform the action recommended in the log.

- The AMASS *System Administrator's Guide* provides detailed information concerning error messages. An error message informs of critical problems that prevent AMASS from functioning. An error message is usually followed by a correction message, which provides instructions for correcting the situation. Sometimes, there is a previous warning message that may provide an accompanying correction message. Other messages may be identified by number only; the *System Administrator's Guide* provides a reference list, with accompanying corrective actions.

Unless use of the **amass_log** script shows that there are many errors on a volume that has been inactivated, you can reactivate the volume using the command:

/usr/amass/bin/volstat -a 100

(for this example, to reactivate volume 100).

Just as **vollist** provides information on the status of volumes, the command **drivelist** displays the status of drives available to AMASS. Active drives are noted by an **A**, and inactive drives are noted by an **I**. The command is **/usr/amass/bin/drivelist**. If AMASS inactivates a drive, use the **amass_log** script as described previously. Unless there is a hardware problem and several attempts have been made to ready the drive, it is usually appropriate to reactivate the drive using the **drivestat** command. For example, to reactivate drive 1 in jukebox 1, type the command **/usr/amass/bin/drivestat -a 1 1**.

A useful library utility included with AMASS is **quedisplay**. This utility permits the operator to see what is in the queue, and to diagnose problems such as the following:

- During an attempt to write to a file, the drive light does not illuminate.
- The system is slowing down.
- An AMASS command does not complete.

Figure 27 shows an example of the form of the output of the **quedisplay** utility. The output shows the queue, which consists of read and write requests, AMASS administration commands, and a list of libraries, drives, and what volumes they manage.

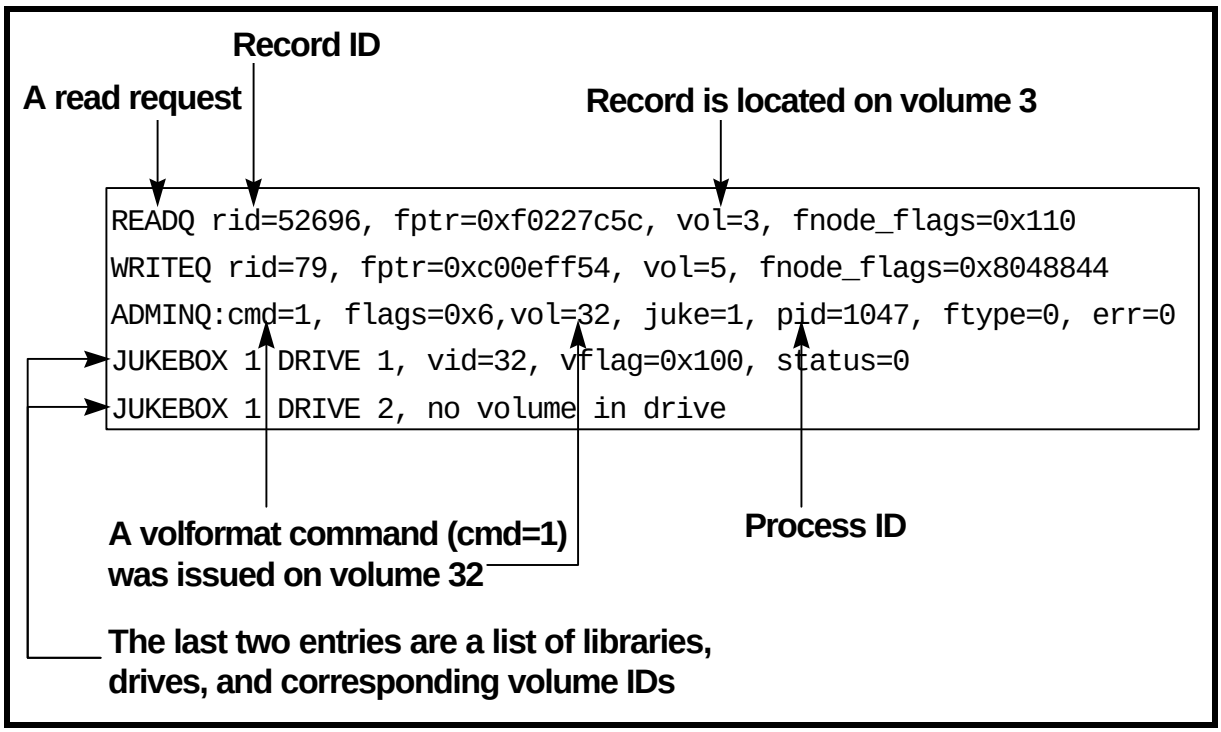


Figure 27. Sample output from AMASS* quedisplay *utility

Use the following procedure to monitor what is in the queue.

Use *quedisplay* to View What is in the AMASS Queue

1 To log in, type **root** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password***, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.

3 You are authenticated (as **root**) and returned to the UNIX prompt.

4 To change to the utilities directory, type **cd /usr/amass/utils**, and then press the **Return/Enter** key.

5 Type **quedisplay**, and then press the **Return/Enter** key.

- The AMASS queue is displayed.

If there are **READQ** or **WRITEQ** entries, the name(s) of the file(s) being processed can be determined by using the **filepath** command and the first number in the entry. For example, type **/usr/amass/utils/filepath 52696** for the first file number in the sample output shown previously in Figure 27.

Occasionally, a robot may lose synchrony with AMASS as to the location of media. The best way to verify this is to compare **quedisplay** and **medialist**. The **medialist** utility is a standalone program that communicates with the robot (AML or Powderhorn) controller to determine the robot's view of media and their slot locations. If the two programs disagree, you can bring the two programs into synchrony using **mediamove**. Use the following procedure.

Use *mediamove* to Establish Synchrony Between *quedisplay* and *medialist*

1 To log in, type **amass** and then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter the ***Password*** for amass, then press the **Return/Enter** key.

- Remember that ***Password*** is case sensitive.

3 You are authenticated (as **amass**) and returned to the UNIX prompt.

4 Type **/usr/amass/utils/quedisplay** and then press the **Return/Enter** key.

- AMASS displays the following information.

```
JUKEBOX 1 DRIVE 1, no volume in drive
JUKEBOX 1 DRIVE 2, vid=50, vflags-0x4, status=0
```

5 Type **/usr/amass/utils/medialist** and then press the **Return/Enter** key.

- AMASS displays the following information.

```
. . .
SLOT VSD0098 FULL
DRIVE 1 FULL FROM VSD0096
DRIVE 2 FULL FROM VSD0097
```

- Note that the **medialist** result shows that drive 1 actually is occupied, although **quedisplay** registers that drive 1 is empty.

6 Type **/usr/amass/utils/mediamove 1 VSD0096 1** and then press the **Return/Enter** key.

Recovery from Failure to Store Data

When a storage failure occurs, the request is put on an Operator Intervention List and appropriate operations personnel are notified. Storage Management GUIs permit the operator (e.g., Data Ingest Technician) to review error messages. There may also be relevant information available through AMASS commands and utilities. Once the problem is resolved, it should be possible to resume the request. Another means of tracking storage activity is to monitor system tail logs in UNIX windows.

For AMASS-based archives, the most likely cause of a failure will be file copy errors due to network problems, mount point problems, AMASS being off line or otherwise unavailable, or failure to associate a volume group with a directory in the AMASS cache. AMASS does not report write errors, even if all of the drives are off line. Only when there are no media available in AMASS is a write error reported. Sections 17.6.6.1 and 17.6.6.2 of Document 611-CD-600-001 *Mission Operation Procedures for the ECS Project* discuss diagnosis and investigation of several types of read and write errors. The following procedure is applicable to recover from a failure to store data.

Recovery from Failure to Store Data

1 Log into the **data server** using your user identifier and password by typing ***YourUserID***, then press the **Return/Enter** key.

- A password prompt is displayed.

2 Enter ***YourPassword***, then press the **Return/Enter** key.

- Remember that ***YourPassword*** is case sensitive.
- You are authenticated as yourself and your desktop is configured with many icons including the data server icon.

3 Use the **amass_log** script to display AMASS errors, as described in a previous procedure.

4 Each AMASS entry in the system log file has a date and time stamp. Several days' worth of messages may exist in the log. When reviewing the output to determine if any of these messages might indicate the cause of the problem, make sure that the messages being looked at are for the correct date and time.

5 See the "Error Messages" in the appendix of the *AMASS System Administrator's Guide,* for probable causes and possible solution to the problem.

- After the corrective action has been performed, see if the problem is corrected.
- If the problem persists, contact the appropriate personnel.

Checksum De-activation

The system design incorporates calculation of a checksum when a granule is inserted into the archive. If such a checksum is calculated, it can then be used as an indicator to determine if there is data corruption within the archive. Comparison of the original checksum with one calculated, for example, when the granule is retrieved (e.g., for processing or distribution) can detect whether the inserted file and the retrieved file are the same. If the checksums do not match, then the operator can investigate (e.g., by using the **Storage Events** tab of the Storage Management GUI). The checksums are set with the variable CHECKSUMSTATUS in the configuration for the archive server (for calculation on granule insert) and the configuration for the staging monitor server (for calculation on retrieval). The Storage Management GUIs provide an easy way to set these configuration parameters. The settings are available from the **Storage Config.** tab, by highlighting the Archive Server and clicking on the **Modify Server** button. This opens the **Archive Server Configuration** window, as illustrated in Figure 28. As the figure shows, the window includes option buttons to **Enable Checksumming On Store:** and **Enable Checksumming On Retrieve:**.

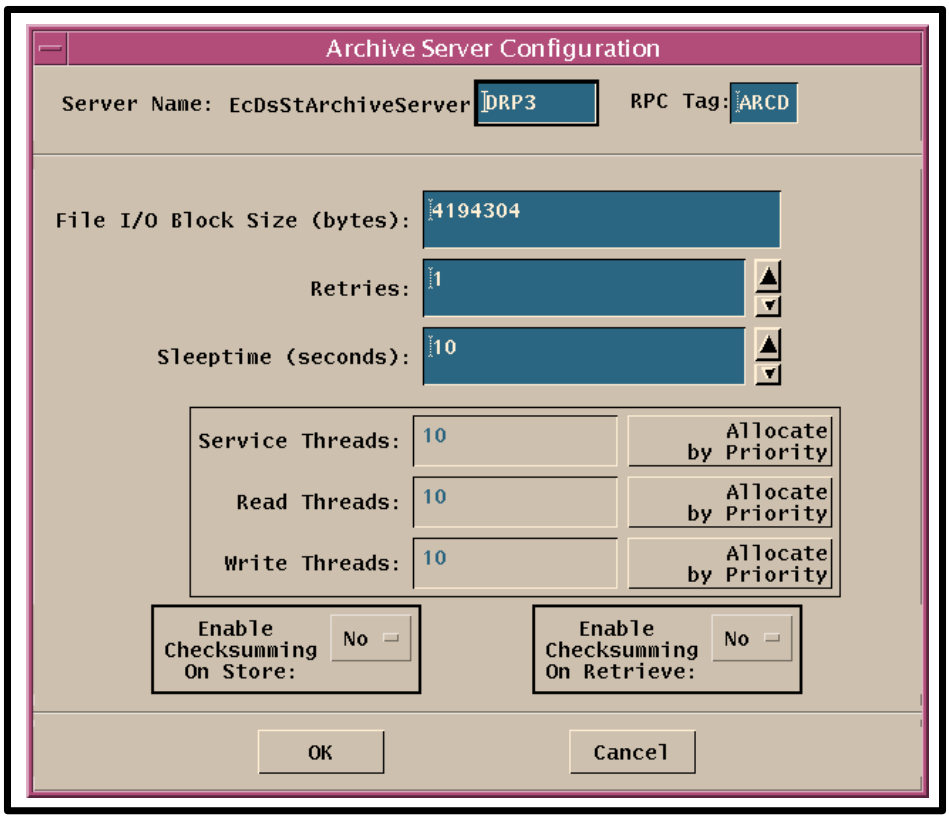


Figure 28. Archive Server Configuration (from Storage Management GUI)

Calculation of checksums can be time consuming. System throughput may be significantly improved if checksum calculation on granule insert is turned off, and therefore the default reflects checksum calculation turned off. Unfortunately, turning checksums off compromises the ability to detect data corruption in the archive. This problem may be alleviated somewhat by calculating a checksum when a granule is first retrieved from the archive and storing that checksum to be compared with one calculated upon a later retrieval. However, this approach will not guard against the possibility of data corruption on initial insertion (e.g., through I/O read errors).

This page intentionally left blank.

Practical Exercises

Introduction

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

Equipment and Materials

One ECS workstation, the STK Powderhorn storage facility, a copy of 609-CD-600-001 *Release 6A Operations Tools Manual*, and a copy of 611-CD-600-001 *Mission Operation Procedures for the ECS Project*.

Perform Activities Related to Archive Processing

1. Locate the STK Powderhorn storage facility and the AMASS host. Point out the elements and sequence involved in starting AMASS.
2. At the STK Powderhorn, locate the control panels necessary for power up (or down) and identify all Power Switches.
3. Following all safety precautions, vary the STK Powderhorn offline and enter the unit; leave the unit and restore it to online status.
4. Launch the Data Distribution Graphical User Interface (GUI); examine the list of distribution requests. Then filter the list to examine only those requests that are staging.
5. Insert several granules that can be used to exercise the granule deletion capability, and then use that capability to delete the granules from the inventory and archive, specifying a lag time other than 0 in the Deletion Cleanup Utility script.
6. Use automatic loading procedures to load a tape into the STK Powderhorn, use automatic loading procedures to load a D-3 tape into it. Then use automatic unloading procedures to remove the media you just loaded.
7. Experiment with the **vollist**, **dirfilelist**, and **volfilelist** commands for AMASS. Describe for yourself how the commands can be used to help you manage the archive.
8. Use the **vgexport -q** command to create a backup for the AMASS database.
9. Look at the AMASS queue by using the **quedisplay** command.
10. Run the **amass_log** script to display AMASS messages in **/var/adm/SYSLOG** system log file (on SGI machines) or in **/var/adm/messages** (on Sun machines).

This page intentionally left blank.

Slide Presentation

Slide Presentation Description

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

This page intentionally left blank.