Current State of the Mass Storage System Reference Model

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IEEE P1244

Storage System Standards Working Group

- IEEE SSSWG was chartered in May 1990 to abstract the hardware and software components of existing and emerging storage systems and to define the software interfaces between these components

- The immediate goal is the decomposition of a storage system into interoperable functional modules which vendors can offer as separate commercial products

- The ultimate goal is to develop interoperable standards which define the software interfaces, and in the distributed case, the associated protocols to each of the architectural modules in the model

IEEE SSSWG Organization

- Chair - Bob Coyne, IBM Federal Systems Company

- Technical Editor - Dave Isaac, Mitre

- Secretary - Charles Antonelli, University of Michigan

- Treasurer - Thomas Jefferson, Sandia National Laboratory

- Archivist - Dave Tweten, NASA Ames

- POSIX Liaison - Kurt Everson, IBM Federal Systems Company

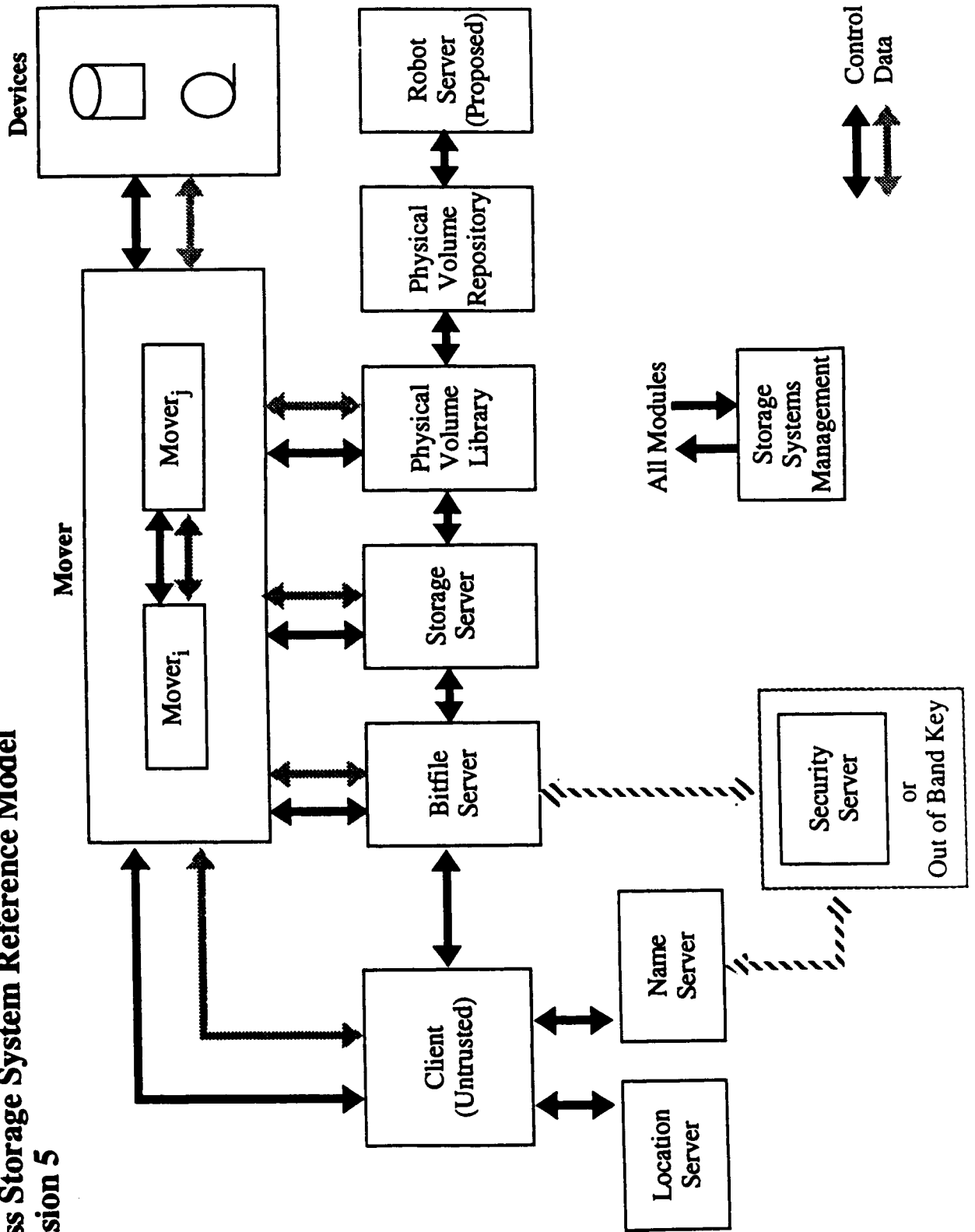- Architecture Steering Committee Chair - Mike Milillo, E-Systems, Inc.

IEEE SSSWG Subcommittees & Chairs

- Mapping Services - Andy Hanushevsky, Cornell University

- Bitfile Server - Dave Tweten, NASA Ames

- Storage Server - Lester Buck, IBM Federal Systems Company

- Physical Volume Library - Rich Wrenn, Digital Equipment Corporation

- Physical Volume Repository - Joseph Wishner, Storage Technology Corporation

- Mover - Bob Hyer, IBM Federal Systems Company

- Storage Systems Management - Steve Louis, National Energy Research Supercomputer Center
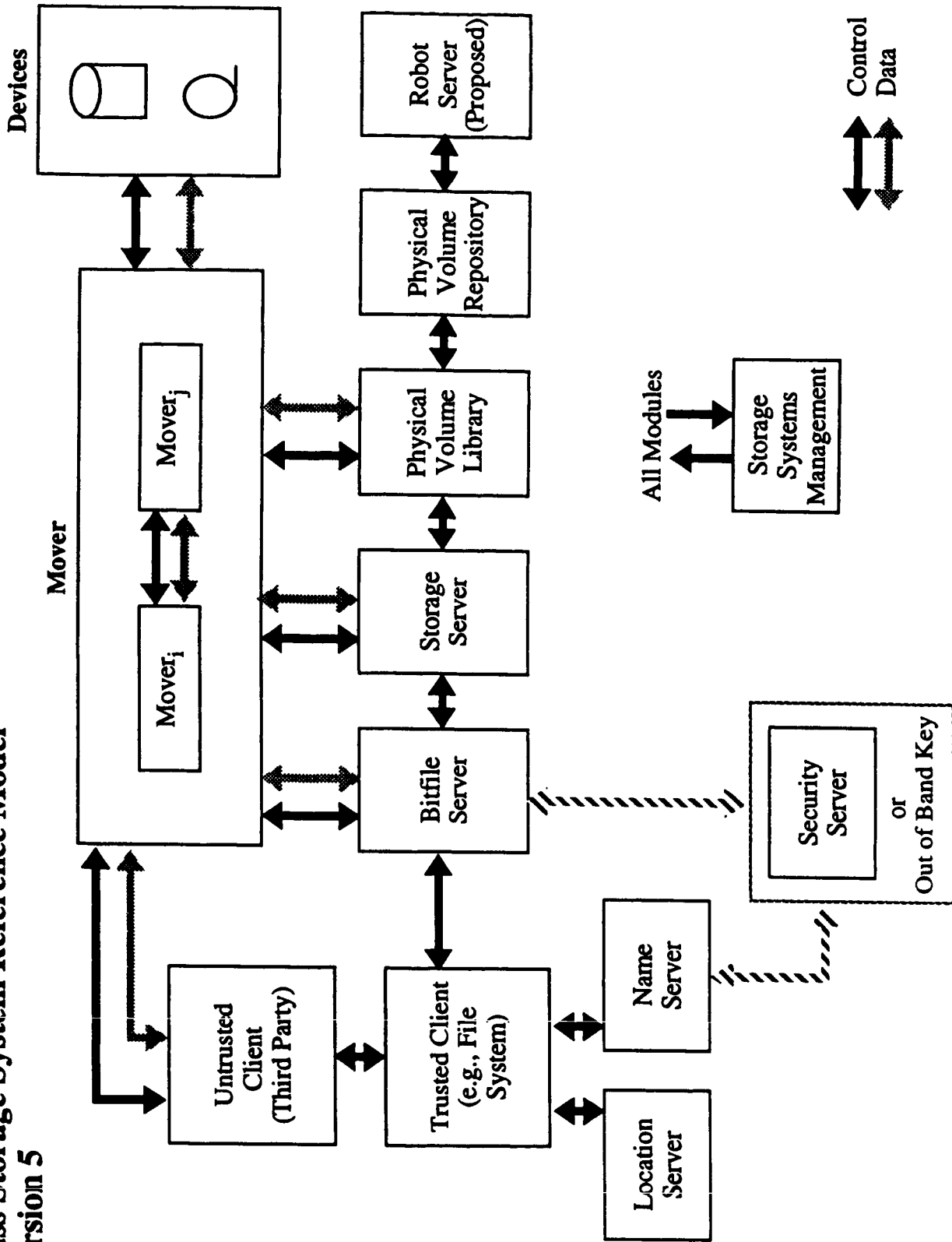
IEEE Standards Activity Board

- The IEEE SSSWG formally reported to the IEEE Mass Storage Systems and Technology Technical Committee (MSS&TC)

- The IEEE SSSWG now reports directly to the IEEE Standards Activity Board (SAB)

- The IEEE SAB sponsor for P1244 is Patric Savage, Shell Development Corporation

DRAFT Example
Mass Storage System Reference Model
Version 5

Devices

Robot
Server
(Proposed)

Physical
Volume
Repository

Mover

Mover_j

Mover_i

Physical
Volume
Library

Storage
Server

Bitfile
Server

Client
(Untrusted)

Name
Server

Location
Server

All Modules

Storage
Systems
Management

Security
Server

or

Out of Band Key

Control

Data

DRAFT Example
Mass Storage System Reference Model
Version 5

Devices

Mover

Mover$_j$

Mover$_i$

Robot Server (Proposed)

Physical Volume Repository

Physical Volume Library

Storage Server

Bitfile Server

Untrusted Client (Third Party)

Trusted Client (e.g., File System)

Name Server

Location Server

Security Server

or
Out of Band Key

All Modules

Storage Systems Management

Control

Data

Layered View of the Reference Model

	Clients

	Name Server
	Bitfile Server
	Storage Server
	Physical Volume Library
	Physical Volume Repository
	Devices & Robotics

Data Mover Function

Control Path

ALB1.CDR   ABCD35J   06-26-92

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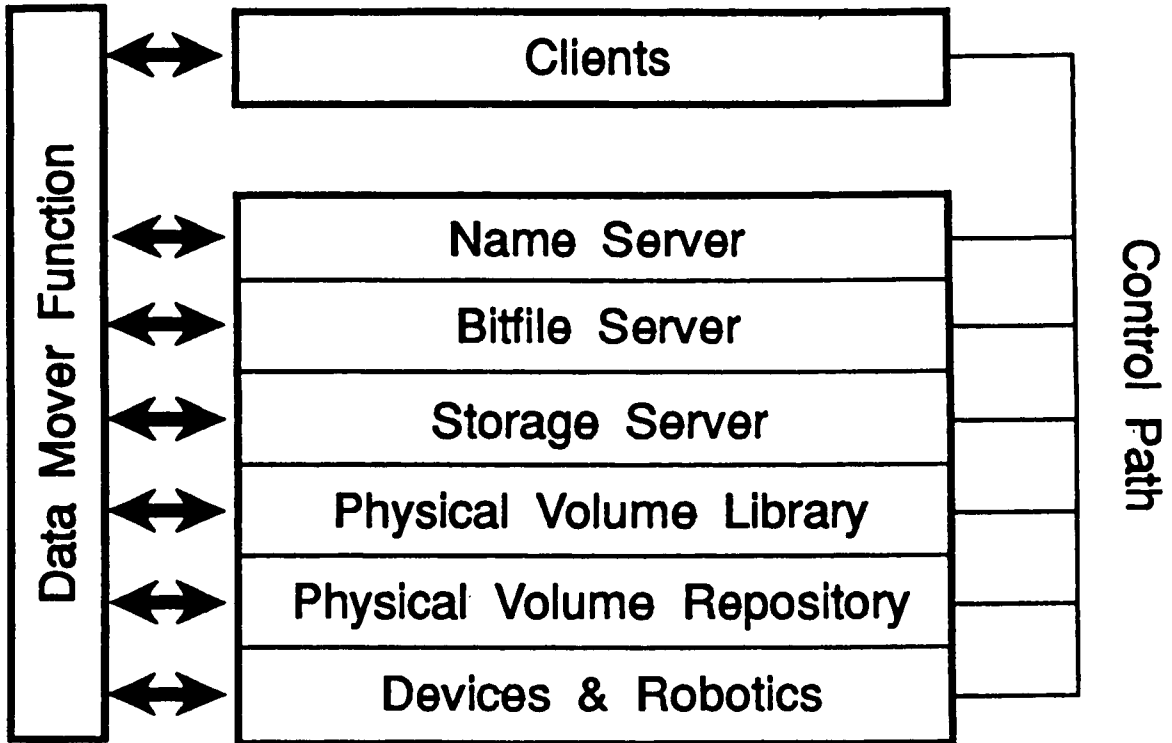
Layered Access to Storage Services

User

Data Management

File System Services

Bitfile Service

Storage System Service

Physical Volume Library Service

Physical Volume Repository Service

Devices and Robots
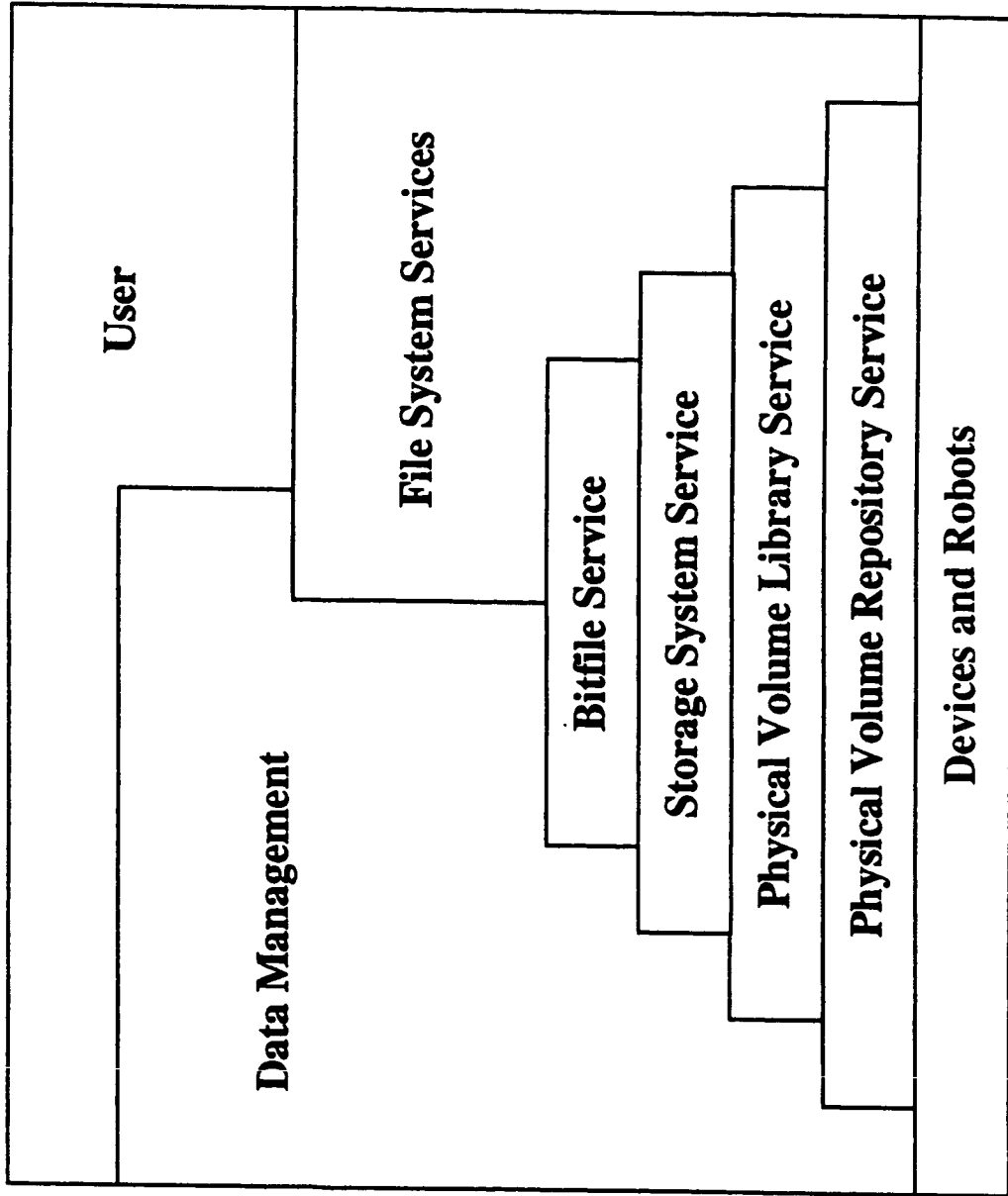
IEEE SSSWG Emphasis

- We are focused on decomposing storage systems into interoperable functional modules which vendors may offer as separate commercial products

- Our emphasis is on providing clients direct access to appropriate storage system services through standard interfaces

- We plan to distribute the IEEE MSSRM Version 5 at the IEEE Twelfth Symposium on Mass Storage, April 25, 1993

- We plan to assign IEEE project numbers (e.g., P1244.PVR) to each functional module interface to allow timely standards development and approval for well defined components (e.g., PVR, PVL, SSOID)

Features for MSSRM Version 5

- A generic format for unique identifier, termed Storage System Object Identifier (SSOID), has been proposed and a new PAR has been submitted to allow separate standardization of the format of these identifiers

- A division between location and name services has been established

  - protocol defined for location services

  - minimum functions defined for a compliant name server

Features for MSSRM Version 5

- A general security architecture has been established that recognizes that security is very site dependent and enables the implementation of a broad range of security options

  - each functional module interfaces with security services provided by a vendor or installation

  - general architecture provides for distributed security

- Security is divided into three separate implementation components:

  - Authentication establishes the identity of a client/server

  - Authorization calculates the access rights of a principal to a service

  - Enforcement applies the result of the authorization calculation at the point where access is actually requested

Features for MSSRM Version 5

- The Mover, formerly Bitfile Mover, transfers data between any source and sink (e.g., client, device, and/or functional module)

- Devices are no longer encapsulated by the storage server; the minimum software necessary to operate a device is the Mover

- Migration and replication of storage system objects (e.g., Bitfile Containers, Bitfiles and Virtual Volumes) are supported by the appropriate functional module with migration and replication policy administered by the Storage Systems Management

Features for MSSRM Version 5

- The Physical Volume Library has been established which is a generalization of an enterprise-wide, removable media management system (e.g., tape management system) which tracks the current locations and status of all removable volumes across multiple distributed PVRs

    - controls the actual mounting and dismounting of volumes

    - maintains mount queues

    - verifies internal volume labels

    - globally optimizes the use of drives

    - tracks the life cycle state of removable media

    - maintains scratch pools

- Robotic Services are proposed as a network interface to the basic robot operation, essentially mount/dismount physical volume in Slot X onto Drive Y and inject/eject volume into/from robot

Features for MSSRM Version 5

- The Physical Volume Repository (PVR) maintains the mapping of volume identifiers to slots and drives, optimizes apparent mount times by staging, and enforces various management and security attributes

- Each PVR manages a single repository or set of connected repositories

Features for MSSRM Version 5

- Storage system management information is structured in terms of managed objects, which encapsulate attributes, management operations, and notifications

- Several storage system management functions have been identified, including

  - migration of storage objects to a cheaper level in a storage hierarchy

  - defragmentation and repacking of Bitfiles and volumes

  - initialization, addition, and deletion of new storage resources

  - logging of relevant storage events, errors, and alarms

  - backup

  - Bitfile recovery

  - system recovery

  - capacity planning

Storage System Domain

- The Mapping Services Subcommittee has proposed that the location and name server(s) operate within a storage system domain which is the intersection of security and administrative domains

- A storage system domain contains one logical location server, a common authentication mechanism and security policy, and a common administration policy

- Name services remain an optional portion of the model because the universe of entities which can act as name servers, from hierarchical file systems through associative databases, prevent standardization of the naming semantics

IEEE SSSWG Plans

- Publish MSSRM Version 5 in 2q93

- Revise PAR 1244 to develop a Recommended Practice instead of Guide

- Identify components for Full Standards and develop them as independent standards

  - SSOID (PAR submitted to SAB 3q92)

  - PVR

  - PVL

- Hold election for IEEE SSSWG Chair at the Feb '93 meeting

Help, Help, Help !

- The IEEE SSSWG needs additional participants, especially in the areas of technical writing and editing. While our membership is growing, we need additional members to work in our subcommittees

- We need participation from the data management, database, and file system development and user communities. This group is not represented. We are not adequately addressing this important area

- If you are interested in actively participating in the IEEE SSSWG, please contact Bob Coyne (713-282-7274, coyne@houvmscc.vnet.ibm.com)

New IEEE MSS&TC Specialist Workshops

- The IEEE MSS&TC has authorized a series a Specialist Workshops on Data Management. We are looking for program committee members to plan the workshop series and coordinate with the organizations that will host the workshops.

- Michael Farrell, Director of the Center for Global Environment Studies at Oak Ridge National Laboratory, has submitted a proposal for a science data management workshop addressing interpretation, integration and interrogation of very large data bases

- Los Alamos National Laboratory, the National Security Agency, and Lawrence Livermore National Laboratory plan to submit workshop proposals.

- If you are interested in participating in an IEEE MSS&TC Specialist Workshops on Data Management, please contact Bob Coyne (713-282-7274, coyne@houvmscc.vnet.ibm.com)