# Revitalizing the Effort to Guide Storage System Development

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***http://www.arl.mil/IEEE***

**THIC Meeting, DoubleTree Hotel at Tysons Corner**
**Falls Church VA 22043**

# SSSWG Background

- "Storage Systems Standards Working Group"
- IEEE Project 1244
- Began July 1990
- Developed Well Known "Mass Storage Systems Reference Model" (MSSRM)
- Leadership: LLNL, IBM/MITRE, Fujitsu/Redcape, NASA/SES, ARL
- Heavy Contribution from DoE, IBM, DEC, NASA, and *many* others
- 10 to 40 Attendees, Core Group of 15

# SSSWG Charter

- To Model Generic Systems
- Create "Guide and Reference Model"
- Develop Recommended Practices Both for Standalone and Distributed Systems
- Emphasize Distributed Systems
- Without Favor Include Storage Systems of Every Scale in its Studies
- Use an Object Oriented Approach

# SSSWG Activities

- Explore OpenVault Ideas
- Develop MCS API
- Revise, Renew IEEE Project Authorizations
- Attempt to Submit Proposal to NIST ATP
- Begin Model Revision
- Coordinate with other Groups
- Proselytizing ‘Storage’
- Move Things to Ballot
- Attract & Retain Participants
- Overcome ‘Prejudice’ Against Storage



# Background of Interest In OpenVault

- SSSWG Membership Recognized the Need for a Fresh Approach, Fresh Ideas
- The MSSRM Is Robust, But Attempted Too Much
- SSSWG Needs to Progress More Rapidly Toward Timely Standards, Guides
- SGI Participants Joined the WG In Conjunction With Beginning of MCS Work
- SGI Participants Leveraging SSSWG Expertise To Develop OpenVault
- SSSWG Gets to Influence OpenVault Design
- SSSWG Gets Ideas for Revision of MSSRM



# Desirable Aspects of OpenVault

- Generally Satisfies MSSRM Requirements for PVL, PVR, and partially for MVR
- It is a Current Implementation, Tested To A Degree and Demonstrated to the SSSWG
- It is in its Infancy and Will Develop In A Give-and-Take Process
- Available to Anyone at Nominal Fees, And No Fees to Non-commercial Endusers
- Does Not Require Component Software Which Is Not Similarly Available
- It Is Designed to be Platform Independent

# OpenVault Departures from MSSRM

- **Implemented as a Command Language, Application Layer Protocol over TCP/IP as Opposed to a C Language API over DCE**

- **It Approaches Design from a Minimalist View**
  **--- Minimum Features Which Should Work Must Work, Features Are Added As Needed**
  **--- MSSRM Identified All Possible Features And Attempted to Throw A Net Over These**



# SSSWG Resolution

- **Recognize the Need to Change Direction And Assimilate Outside Ideas**
- **Develop Standard Command Language for PVL, PVR, MVR**
- **Develop Standard Data Structures Along the Lines of Objects in Current OpenVault**
- **Determine Time to Ballot, Reognizing That OpenVault is Only a Starting Point**

# Work Areas

- **Terminology Differs Between MSSRM and OpenVault**
- **Question of When to Quit Exchanging Ideas And Commit to Generic Standard**

# Key Aspects of the Process

- SSSWG Holds *Open* Meetings to All
- Direction Taken Depends on Consensus of Participants
- IEEE Standards Do Not Incorporate Intellectual Property Which Is Not Available at Nominal Costs to All
- SSSWG Not Endorsing One Product Over Others (Nor Does the WG Determine "Compliance")
- Value of MSSRM Not Diminished
- Otherwise No Restriction in Direction of SSSWG
- Most Viable Standards Arise from Broadest Participation, Greatest Diversity of Opinion

# Model Revision

- **Incorporate New Ideas from OpenVault**
- **IEEE Imposed Lifetimes**
- **Model Must Reflect "Real World"**
  **Which is Always Changing**
- **Model Should Lead Real World**
  **To A Degree**
- **Provide Common Perspective,**
  **Framework for Standards,**
  **Practices, Interoperability**

# MCS API

- Medium Changer Service Standard
- Changers: Automated Tape Libraries, Optical Jukeboxes, etc
- Will remove OS and Software App Dependence
- Embrace Existing Practices, Works in Progress
- SCSI-II Based, But is OS Independent (SCSI Medium Changer Interface only describes communication)
- Plug & Play, New Products Available More Quickly



# Next Meeting & URLs

**Next Meeting -**

**May 13-15, SGI Facilities, Mountain View, CA**

**URLs-**

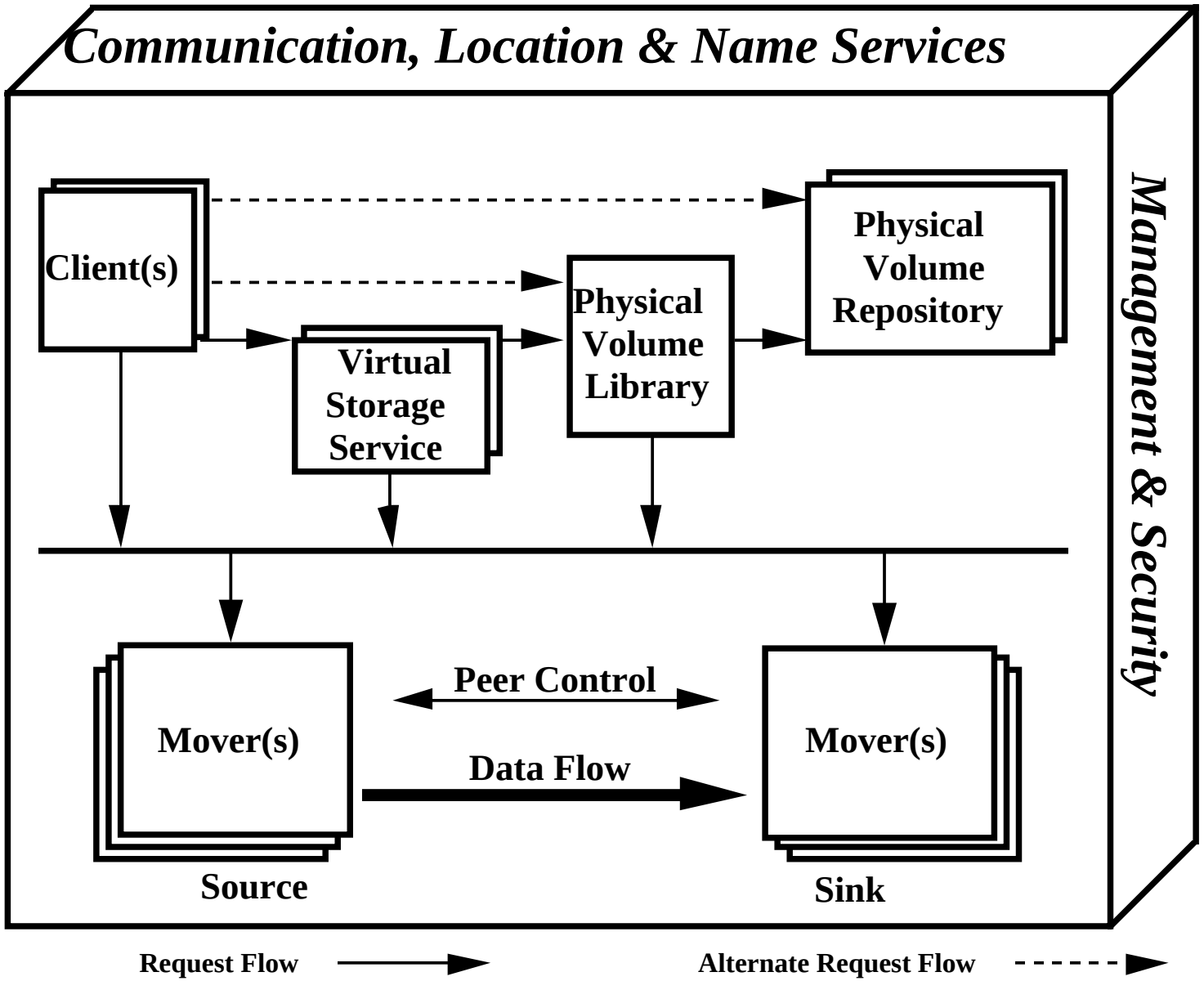
**http://www.arl.mil/IEEE**

**http://www.arl.mil/IEEE/OpenVault/overview.html**

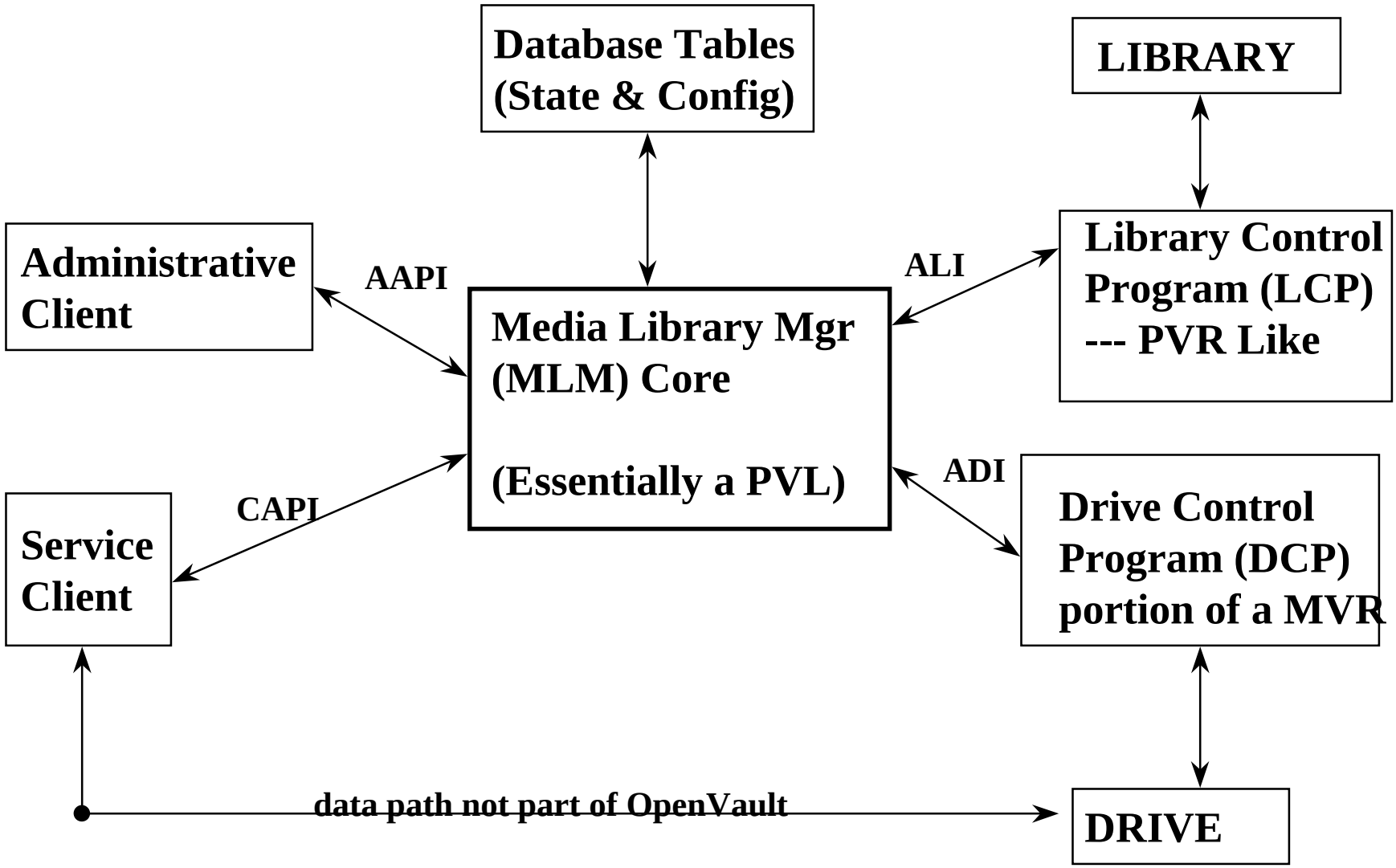
**http://www.arl.mil/IEEE/OpenVault_PPT**

# IEEE Mass Storage Systems Reference Model
# MSSRM Architecture & One Slide of OpenVault




Communication, Location & Name Services
Management & Security
Client(s)
Virtual Storage Service
Physical Volume Library
Physical Volume Repository
Peer Control
Data Flow
Mover(s)
Mover(s)
Source
Sink
Request Flow
Alternate Request Flow

# OpenVault Model



# Some Characteristics of The Model

- Vital, Influential At Numerous Sites
- Provides Common Perspective
- Defines Domain of Standards for Open Storage Systems
- Two Or More Systems Using OSSI Standards Will Be Able To Inter-Operate Openly

# Components - Parfait Cake

| | |
|---|---|
| AEP | Application Environment Profile |
| MGT | Storage System Management |
| VSS | Virtual Storage Service |
| PVL | Physical Volume Library |
| PVR | Physical Volume Repository |
| MVR | Data Mover |



# Some Key Concepts of Model

- **Abstraction**

- **Transparency (Device, Location, Replication)**

- **Separations of**
  **- Policy, Mechanisms to Effect Policies**
  **- Control and Data Flows**
  **(implied net attached storage)**

- **Unrestricted Scalability and Distributed Storage**

# Model Components

"Lower Level"

**Physical Volume Library (PVL)**

- Manages Removable Media, Optimizes Drive Use
- Makes Volume to Cartridge Mapping
- Causes PVR to Mount Cartridges
- Major operation: Mount Physical Volumes

**Physical Volume Repository (PVR)**

- Human And Software Interfaces That Stow And Selectively Mount Removable Media
  - Protein PVR ;-)
- "Sees" cartridges and drive mount points
- Major operation is to mount cartridges.

# Model Components

**"Higher Level"**
**Programmatic Interfaces & Environment**

**Application Environment Profile (AEP)**

- **Includes Implementor Declaration of Transfer Agent (e.g., DCE), Policy Modules, ...**

**Storage Object Identifiers & Generators (SOID)**

- **Namespace Issues**
- **World Wide Removable Media Identifier Debate**



# Model Components

**"Higher Level"**

**Storage System Management (MGT)**

- **Services To Monitor And Control Resources As Dictated By Site-Specific Policies**

**Virtual Storage Service (VSS)**

- **Access And Organization Of Persistent Storage Presented As Single Virtual Storage Image**
- **Create and Manage Virtual Stores**
- **Store to Volume Mapping**

# Model Components

**"Lower Level"**

## Mover (MVR)

**Transfer Of Data Between Two Endpoints**

**Manages Data Transfer**
**Designed for High Speed Data Transfer**
**Loads Media to Media Access Points,Transfer Data**