

# Revitalizing the Effort to Guide Storage System Development

Jack Cole  
Chair, SSSWG

Army Research Laboratory, AMSRL-SC-C  
Aberdeen Proving Ground, MD 21005-5067  
cole@ARL.MIL

***<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**
- **SIG Participants Joined the WG In Conjunction With Beginning of MCS Work**
- **SIG 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>**

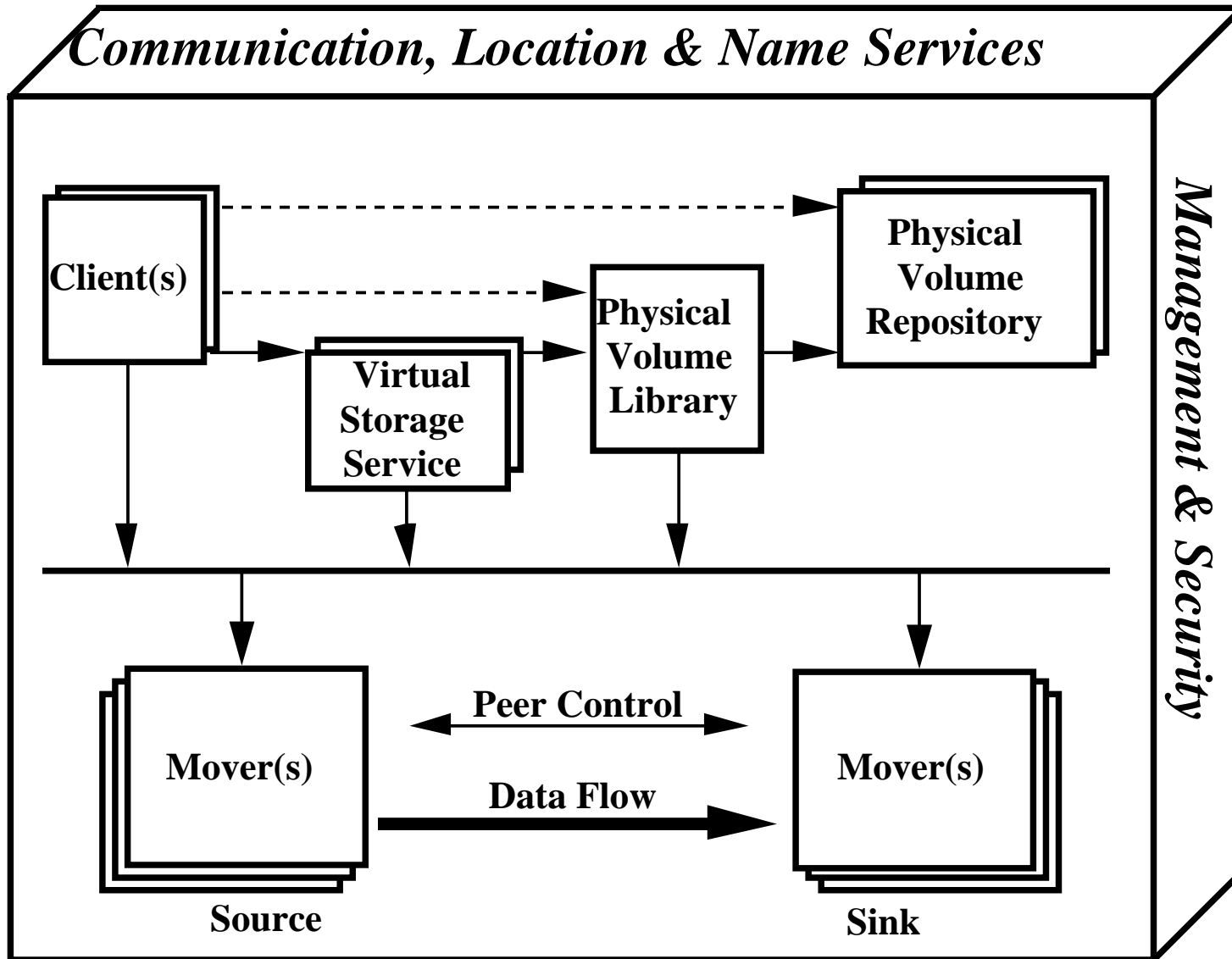
**[http://www.arl.mil/IEEE/OpenVault\\_PPT](http://www.arl.mil/IEEE/OpenVault_PPT)**



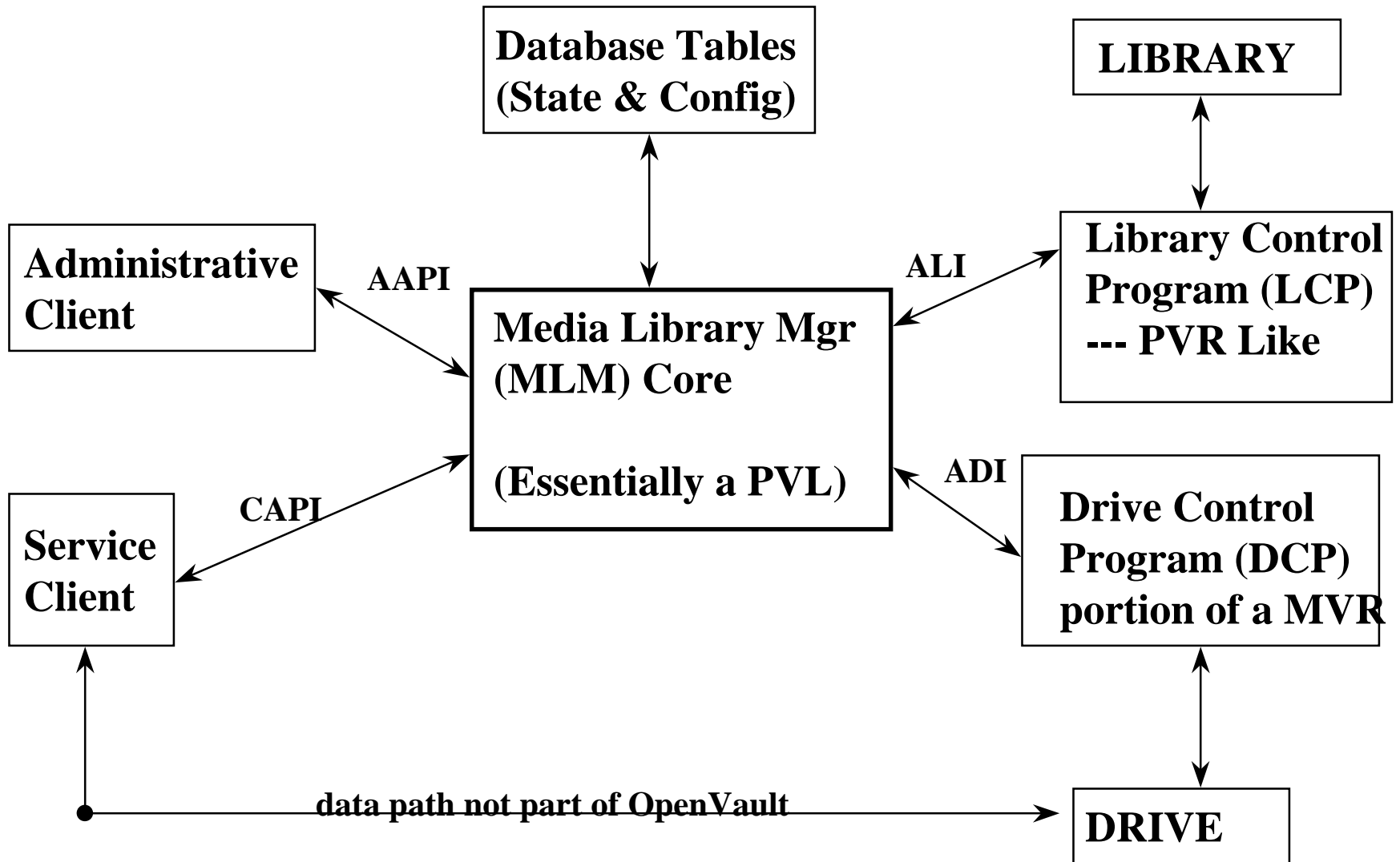
IEEE Mass Storage Systems Reference Model  
MSSRM Architecture & One Slide of OpenVault



# Communication, Location & Name Services



# Open Vault Model



# **Some Characteristics of The Model**

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- **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**

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**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**

