IEEE Standards
Storage Systems

Jack Cole

**Sponsor
Storage System Standards
Working Group**

**Army Research Laboratory
Aberdeen Proving Ground, MD**

GOAL

Today

    Inform About

        IEEE Standards Efforts

        Status of IEEE MMS Standards

Generally

    Hasten Convergence
    of Competing Technologies

    Foster Transparent Information Access
    In Distributed, Heterogeneous
    Computing Environments

Sponsor Message

- **Army Research Lab (ARL)**

- **Aberdeen Proving Ground, MD
  105 km Northeast of College Park**

- **Formerly BRL … ENIAC … BUMP (DMF)
  … "ping" … Army's First
  Supercomputer**

- **DoD HPCMP MSRC**

IEEE Computer Society

- **Technical Activities Board (TAB)**
     Mass Storage Systems
     Technical Committee
     http://computer.org/tab/tcms/

- **Standards Activity Board (SAB)**
     Storage Systems
     Standards Committee (SSSC)
          Storage System Standards
          Working Group (SSSWG)

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Background

- **SSSWG Beginnings, Charter**

- **Guide for Storage System Design, Mass Storage System Reference Model (MSSRM)**

- **Change of Direction from MSSRM**

- **2000: Tenth Anniversary of SSSWG**

"Guide" and MSSRM

- **The "Guide" Updated, Re-Approved IEEE Project this Year**

- **1994 MSSRM is valuable Un-Balloted "Guide" viewable at *http://www.ssswg.org***

- **Components - PVL, PVR, MVR, VSS**

The MSSRM

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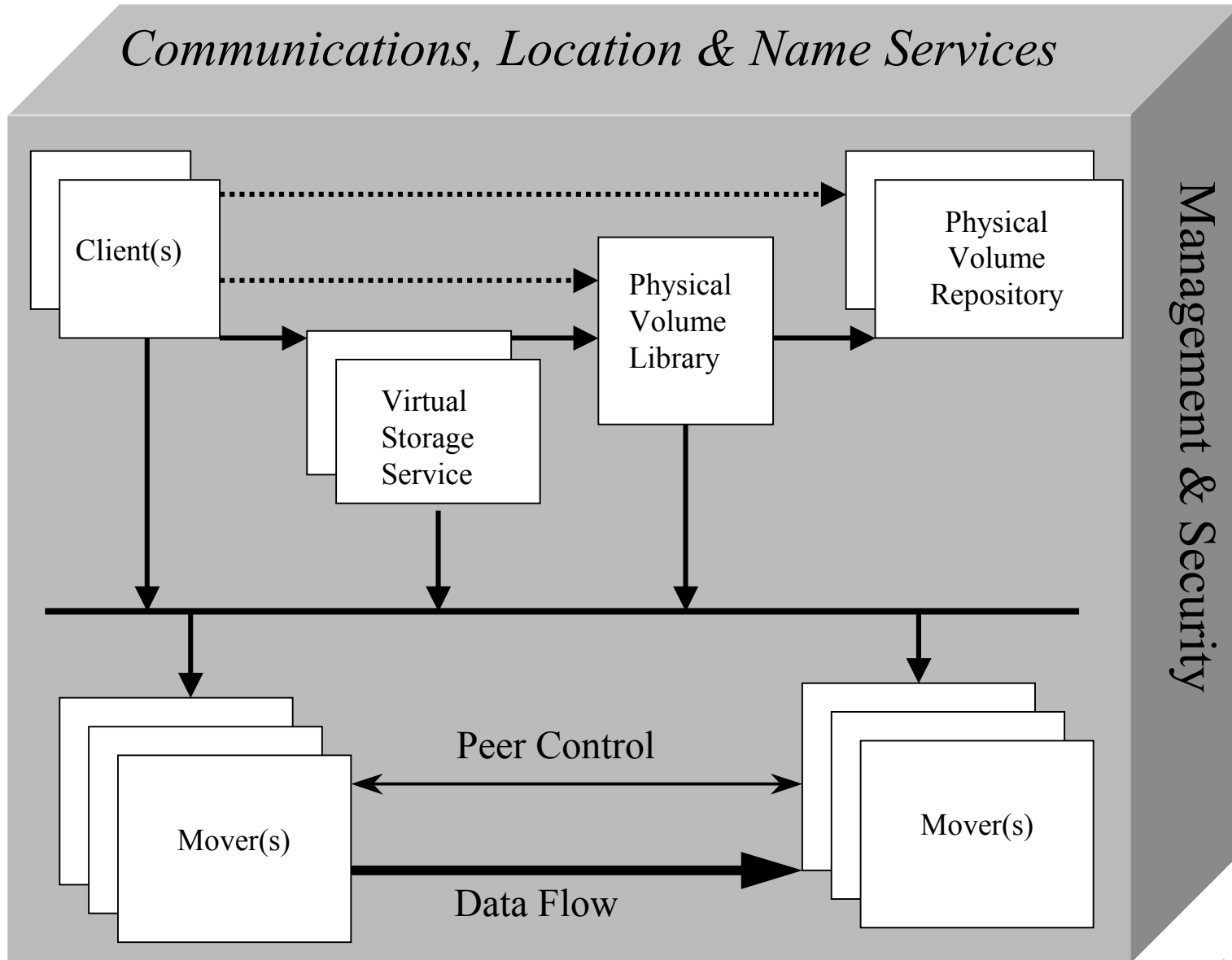
Standardizing PVL, PVR

- **MSSRM**
  - **Wealth of Ideas**
  - **Basis of Present Systems**
  - **Retains Active Interest**

- **SGI OpenVault ™ Base for IEEE Media Management System (MMS)**
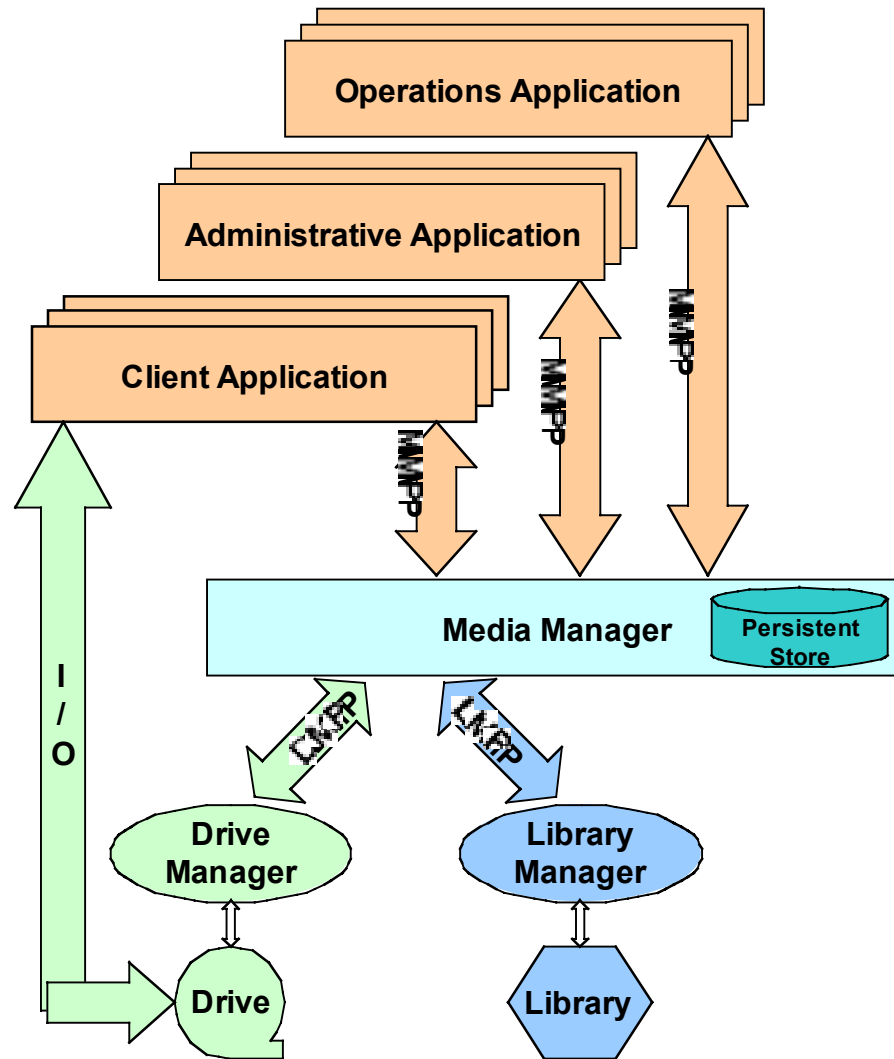
- **Update MSSRM based on MMS**

MMS Described

Tutorial March 1999, April 2001?

- **MMS Characteristics**

- **MMS Suite of Standards**

- **Distributability of MMS**

MMS Components

MMS Characteristics (1)

- **Based on
  Open Source Implementation**

- **Defines Basic Functionality of MM**

- **Protocol, not API Based**

- **Neutral WRT
  Media Type and Content
  Platform and OS
  Language of Implementation**

MMS Characteristics (2)

- **Fully Scalable, Modular**

- **Distributed**

- **Secure**

- **Application Independent**

- **Multiple Vendor Implementations Interoperable**

MMS Suite of Ten Standards

- **Architecture (and Data Model)**

- **Session Security, Authentication, Initialization Protocol (SSAIP)**

- **Media Management Protocol**

- **Drive Management Protocol (DMP)**

- **Library Management Protocol (LMP)**
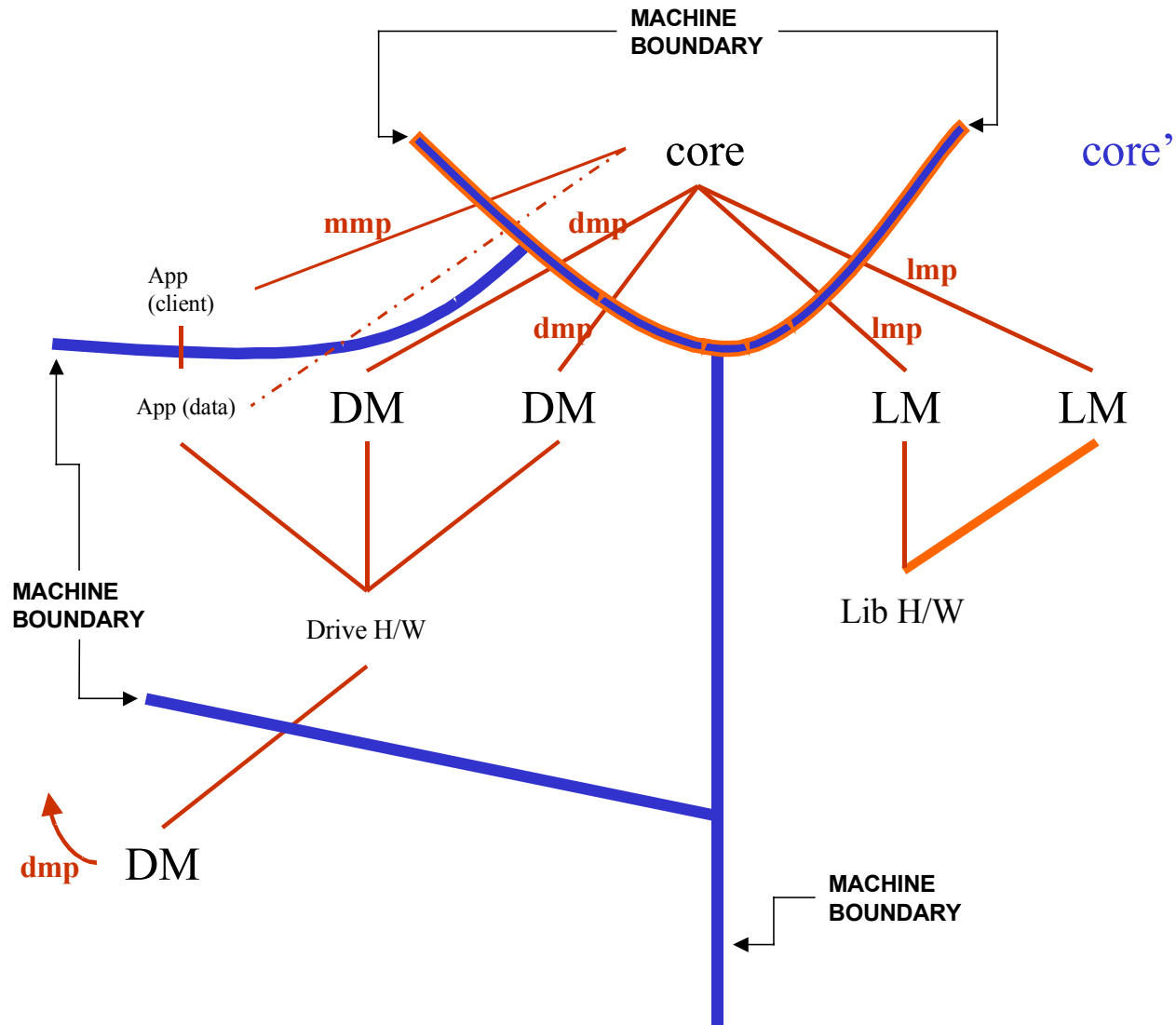
First Five Balloted

MMS Suite of Ten Standards

Interoperability

- **MM Interchange Protocol (MMIP) ****
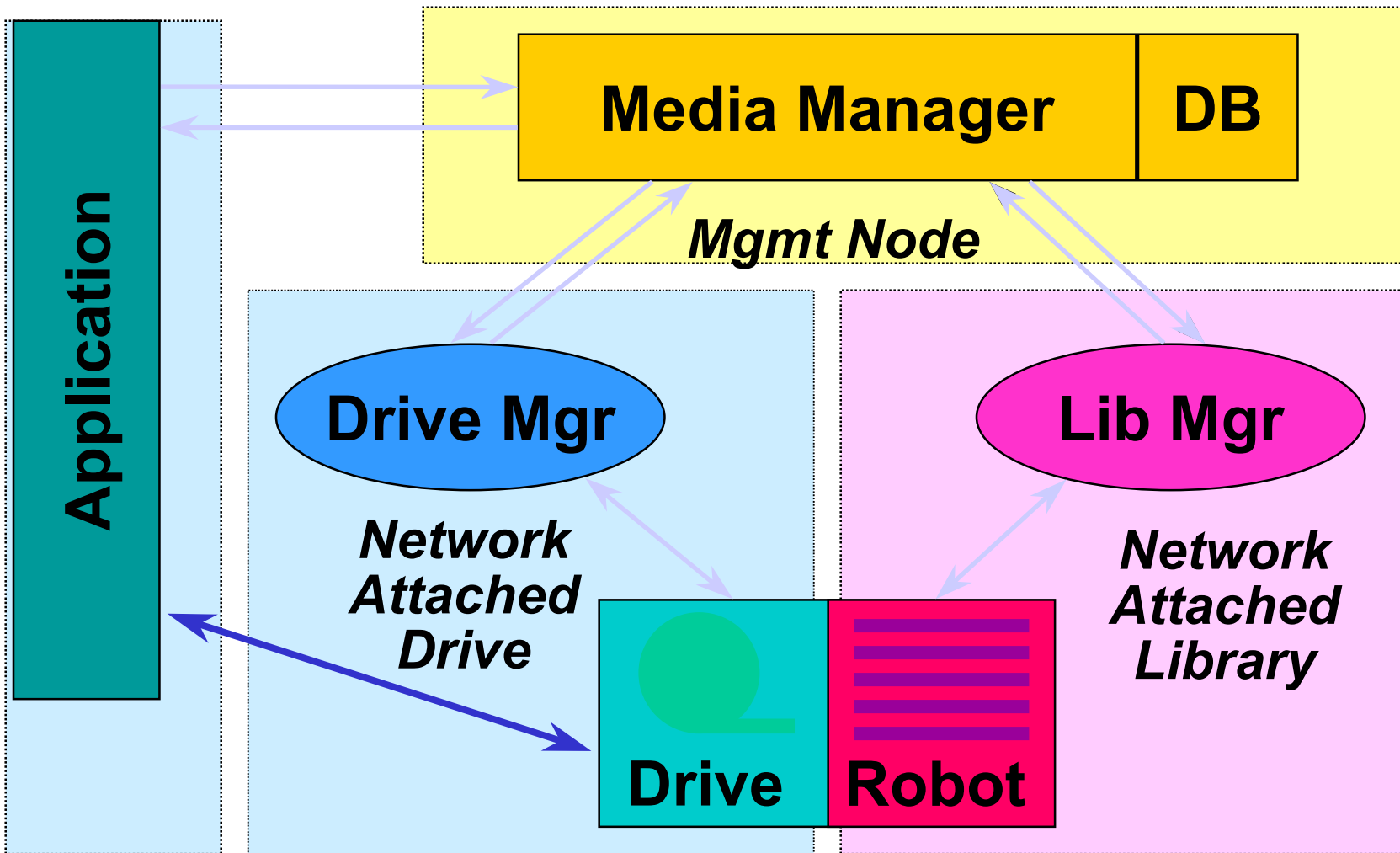
- **MM Control Interface Protocol (MMCIP)**

Programming and CLI (Trial Use?)

- **C Language Procedural Interface ****

- **MMS User Mount Commands (UNIX only, permit scripting)**

- **MMS Standard Administrative Interface and Operational Commands**

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Distribution of MMS Components
Across Machine Boundaries

MACHINE BOUNDARY

core

core'

mmp

dmp

lmp

App (client)

dmp

lmp

App (data)

DM

DM

LM

LM

MACHINE BOUNDARY

Drive H/W

Lib H/W

dmp

DM

MACHINE BOUNDARY

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MMS in a Storage Area Network

Application

Media Manager | DB

Mgmt Node

Drive Mgr

Lib Mgr

Network Attached Drive

Network Attached Library

Drive | Robot

Courtesy of Geoff Peck, March 1999 Tutorial

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Balloting First Five MMS Standards

- **Balloting Took Place Dec 15, 1999 – Jan 14, 2000**

- **Total of ~ 300 Pages**

- **Received ~ 200 Comments, Predominantly Editorial from 36 "Balloters"**

Balloters ...Thanks!

- **Balloting Pool ~53 , Group ~36**

- **Balloters Joined IEEE SA**
  some as out of pocket expense

- **Balloter Effort Significant**
  over holidays and through Y2K

- **Sensitivity of Balloters**

- **Internal IEEE "Coordination"**

Balloting Results

Draft Standard	No. Of Ballots	Balloting Results		
		Affirm	Neg	Abstain
P1244.1/Architecture	36	92%	8%	3%
P1244.2/SSAIP	35	91%	9%	7%
P1244.3/MMP	35	91%	9%	7%
P1244.4/DMP	35	100%	0%	16%
P1244.5/LMP	35	100%	0%	16%

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Kinds of Comments

- **Editorial (predominant kind)**
- **Technical**
- **Technical Required**
- **Coordination Committee**
- **Many Easily Answered Regarding Objects, BNF, Oversights, ...**

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Kinds of Responses

- ## Adopted
  majority response

- ## Next Version

- ## Already Met

- ## No Plan to Address

Sample Comments (1)

- **Data Model Needs Common Means of Counting Device Errors**

- **Could apply to Non-Removable Media**

- **Conformance Levels Needed**

- **Distributed Atomic Mounts Needed**

Sample Comments (2)

- **Allow Client to
  Specify Drive to Mount**

- **Manual Libraries
  Not Addressed Optimally**

- **Policy for Deferred Dismount Needed**

- **Cleaning Cartridges "Invisible"**

- **No Error State in Media Life Cycle**

Sample Comments (3)

- **No Default Task Queue Priority**

- **Static Configuration File Should Not Be Required**

- **Need to Distinguish Disabled Online/Offline for Drives, Libraries**

- **Unload and Unmount Should Be Optional**

- **Asynchronous Notification Needed**

Work Ahead for MMS

- **Form Responses
Make Modifications**

- **Re-Circulate to Balloters**
explain

- **SGI OpenVault™ Patent Release**

- **Wrestle with Token Registry**

- **Submit May 5th, 2000 for Approval**

Plans

- **Finish MMS Standards**

- **Data Mover**

- **Guide for Storage System Design**

- **Tape Standards (P1563)**

- **SNIA Collaboration**

- **Collaboration with Metacomputing Community?**

Tape Standards (P1563)

- **Portable Tape Driver Architecture**

- **Common Tape Drive Semantics**

- **Common Format for Data on Tape**

Contact Curtis Anderson if you want to get involved.
canderson@turbolinux.com

Standards Not A Lock

- **Living Documents**

- **Development Continual, Iterative**

- **Does Not Stop With Publication**

- **Non-Balloter Comments Important**

- **Goal $\rightarrow$ Widely Accepted Standards**

- **Balance Time Demands "Feature Creep"**

General Observations, Motivations

- **"Software is a Mess", Jim Gray**
  (hardware and media doing fine)

- **Real Focus**
  $\rightarrow$ **Transparent Information Access**

- **Transparency is hard to sell.**

- **Non-Traditional Approaches Needed**
  (capacity 100x/decade, throughput 10x/decade)

Summary

- **The First Storage System Standards in the World Are Nearing Publication.**

- **"Standards" Are Labor Intensive, But Bring Consistency Needed for Inter-operability, Distributability**

- **Collaborations Are Important: the Path to Technological Development Is a 'Many Splintered' Thing.**

Thanks

- **Balloters**

- **NASA**

- **WG Members**

Contact

Jack Cole

jack.cole@ieee.org

(410) 278 - 9276

http://www.ssswg.org