



# Activities of the Storage Systems Standards Working Group and Trends in Storage

**Jack Cole**

**Army Research Laboratory High Performance Computing**

**Aberdeen Proving Ground MD 21005-5067**

**Phone: +1-410-278-9276 FAX: +1-410-278-2694**

**e-mail: Cole@arl.mil**

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# Talk Is About

- Self Introduction, Giving Thanks
- Nutshell Information To You About SSSWG
- Broad Brush, Hopefully Thought Provoking Quick Take on Storage Trends, Needs
- Not A Tutorial on Anything



# Self Introduction, Jack Cole

- ARL Computer Technologist
- DoD HPCMP & Storage Standards
- HPCMP 4 MSRCs, 100 DCs
- HPCMP MSAS WG, RWG
- IEEE SSSWG Chair
- Aberdeen Proving Ground, MD



# Thanks

- For THIC Allowing Me To Talk
- Suggest THIC Meeting at APG
- NCAR for Hosting SSSWG Meetings



# SSSWG News

- Collecting Contact Information for Balloters, Invitations Out Mid August
- Balloting MMS Standards Mid Sept
- Submit Balloted Draft Standards Dec 99
- SSSWG Actively Meeting With SNIA To Agree On MMS and CIM Data Models



# Storage Trends

- NAS
- Longer-Term: Storage Objects, Less Emphasis on Removable Media (Maybe)
- Highly-Distributed, Intelligent Storage Devices
- Improvement in Interoperability of Software
- Move To Open Source Software, Away from Proprietary Solutions



# Storage Needs

- Need Easy, Secure Transparent Information Access in High-Distributed, Heterogeneous Environment :-)



# What Is Media Management?

## (In Case You Didn't Know)

- Small Part of Storage System Picture!
- Keeping track of physical media
- Managing access to media
- Operating drives and library devices
- Handling media life-cycle
- Working with people





# History of SSSWG

- IEEE Storage Systems Standards Working Group (SSSWG) started as IEEE project 1244 in July, 1990
- Mass Storage Reference Model work defined the playing field – efforts concluded with version 5 of the Model in 1994
  - ◆ PVL, PVR (Physical Volume Library and Repository) significantly influenced design of many systems
- Many commercial products on market, most integrated as part of other storage offerings



# MMS History

- MMS & OpenVault Have Evolved In Parallel Paths Since 1997
- A Number of SGI OpenVault Developers Former SSSWG Members
- OpenVault Used Ideas From MSSRM
- SSSWG decided to Use Ideas From OpenVault in January 1997
- OpenVault Attempts To Remain MMS Compliant



# Remarks About SSSWG

- MMS Does Not Equate To Open Vault
- SSSWG Is Much More Than MM
- Short Term Focus in SSSWG on MMS As PVR, PVL Replacement



# IEEE MMS Standards: P1244.*n*

## Current

- .1 Architecture and Data Model
- .2 Session Security, Authentication, and Initialization Protocol (SSAIP)
- .3 Media Management Protocol (MMP)
- .4 Drive Management Protocol (DMP)
- .5 Library Management Protocol (LMP)

## Future

- .6 Media Mgr Interchange Protocol (MMIP)
- .7 Media Mgr Control Interface Protocol (MMCIP)
- .8 C Language Procedural Interface
- .9 User Mount Commands
- .10 Administrative and Operational Commands
- .11 Media Data Mover



# P1244 Group: Current Tasks

- Collect Balloter Contact Information
- Balloting P1244.1 through .5 standards
- Submit standards for approval Dec 99
- Achieve Common Data Model  
for Storage between MMS and CIM



# P1244 Group: Future Work

- Additional P1244 standards .6 - .11
- Track industry needs and update existing standards, update MSSRM
  - ◆ Integration with network storage devices
- Registry of keywords
- Reformulation of interface languages in XML



# IEEE P1244 Group Information

- IEEE Storage System Standards Working Group (SSSWG)
  - ◆ <http://www.ssswg.org>
  - ◆ Drafts userid "member" password "p1244"
  - ◆ Working group meets every other month in various locations – see web site for info



# Contact Information

Chair, P1244

Jack Cole

<cole@arl.mil>





# A Little History from ARL Perspective

- ◆ ARL BUMP
- ◆ SSSWG MSSRM
- ◆ MMS Evolution
- ◆ MMS PARs



# Net-attached Storage (part I)

- ◆ Many Great Papers Online, This list does not do justice to even just the topics
- ◆ Many NSF and other Govt Funded Development
- ◆ MSSRM (1990) implied NAS
- ◆ Major trend: SAD -> SAN -> NAS
- ◆ SANs are variation on SAD
- ◆ i-RAM, i-Disk



## Net-attached Storage (part II)

- ◆ Computationally-rich storage devices, Distributed Intelligence
- ◆ Move computation closer to the data that it process
- ◆ (Data locality violation?)
- ◆ Storage Objects (MSSRM, UUIDs & Something Like A Structure)
- ◆ Networking: Mobile Agents, Intelligent Networks



# MMS Characteristics, Properties

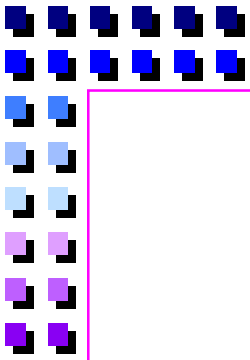
(*Best Description in Draft Architecture*)

- ◆ Software System for Managing Removable, Physical Media
- ◆ Neutrality: Content, Media, Platform, OS
- ◆ Distributed, Scalable
- ◆ Reasonable Security, Protection for Content
- ◆ Application Independent
- ◆ Language Independent
- ◆ Modular



# Deaths of...

- ◆ Tape?
- ◆ Removable Media?
- ◆ Filesystems?
- ◆ Short Life for SANs?



# Many Organizations, But One Common Answer Needed

- ◆ SNIA
- ◆ NSIC
- ◆ SSSWG
- ◆ DMTF
- ◆ IETF
- ◆ NASD
- ◆ NSF
- ◆ etc



# Scorecard Needed

- ◆ DMTF working CIM, WBEM
- ◆ SNIA blessed by DMTF to work storage part of CIM
- ◆ SNIA and SSSWG working on common storage database elements
- ◆ ISO -> ANSI -> {AIIM, IEEE, ...} -> IEEE/CS -> SSSC -> SSSWG
- ◆ DMTF, SNIA, NSIC, etc Industry Consortia
- ◆ SSSWG open meetings, direction driven by participants, charter



# SSSWG CHARTER

- ◆ model generic mass storage systems
- ◆ readily implemented with minimal licensing
- ◆ interoperable, full range of scalability
- ◆ use of the best current technologies
- ◆ distributed storage system design
- ◆ object oriented approach
- ◆ net-attached storage
- ◆ open meetings





# Another Overall Slide

- ◆ Software Is the Problem
- ◆ Positive Movement In Storage Software
- ◆ Revolutionary Changes In Architecture
- ◆ Net-Attached Storage Beginning To Blossom
- ◆ First Ever Storage System Standards This Year!
- ◆ IEEE MMS, CIM Data Models Coordinated
- ◆ The Community of ‘Storage People’ Must Act Together Because We Are In The Minority



# Characteristics of Need

- ◆ Key Problems
- ◆ Scope of Problem



# KEY PROBLEMS

- ◆ Multiplicity of efforts
- ◆ Need for performance (are tapes dying ala Gray)
- ◆ Need for performance to take more equal footing with security
- ◆ Need for distributed, secure, transparent access in hetero environ (4 MSRCs, 100 DCs)
- ◆ Need transparency like banking
- ◆ Need disaster recovery in same environ



# SCOPE OF STORAGE, Sizing

- ◆ Digitizing Analogue World (2k x 2k x 48 bits for 35mm, 3x4x48 for higher end)
- ◆ Billion Transistor Processors by 2012? (Need TCOS doc)
- ◆ 100M-200M Processor Soon (2005)
- ◆  $10^{**3}$  to  $10^{**4}$  bytes/flop
- ◆ 1 TF needs 1 PB to 10 PB
- ◆ Observation: When Buying Fast Machines, Storage not scaled to processor speed (Surprise!!)



# Broadcast Industry Need

- ◆ 2k x 2k x 48 bits for 35mm
- ◆ 3x4x48 for higher end
- ◆ Equates to 200Mb to 600 Mb/Frame
- ◆ Convert to Bytes
- ◆ 30 Frames/Second
- ◆ 3600 Seconds/Hour
- ◆ Two-Hour Movie ... 10-20 TB?



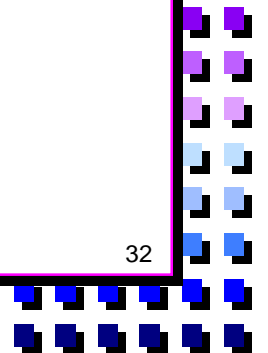
# Similar Problems in Managing Information (Accessible Data)?

- ◆ Memory
- ◆ Disk
- ◆ Removable Media



# Hardware Getting Better Faster Than Software Getting Worse

- ◆ Developments in Processors Moore's Law (Or Better?)
- ◆ Developments in Network Capacity 10x in 4 years
- ◆ Developments in Software Poor Rates By Comparison





# Jim Gray On Cost of Removable Media Access

- ◆ 1998 ACM Turing Award for Database Work
- ◆ MS BARC Director
- ◆ Suggested New Storage Metrics (e.g., Kaps – Kilobyte Access/Second)
- ◆ Scan – time to sequentially R or W all data on a device
- ◆ “As disk and tape capacity approach infinity ... the cost/GB goes to zero and the cost/access becomes the dominant performance metric.”





# Information Access

- ◆ Main Thought
- ◆ Storage Irrelevant
- ◆ Metadata
- ◆ Datamining
- ◆ KDD
- ◆ Argue: Before all of these the mechanics of access data must be assured