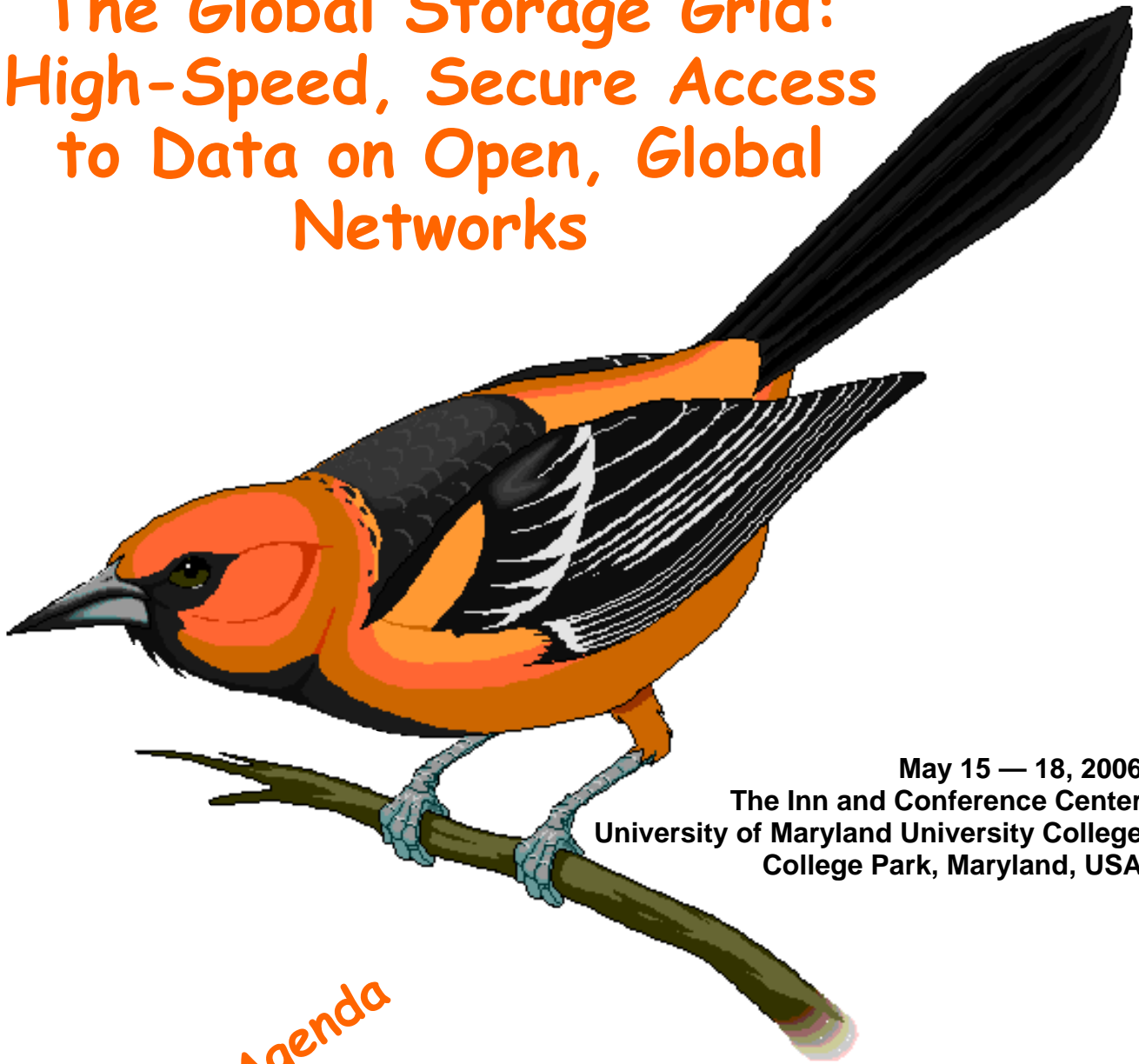**NASA / IEEE MSST2006**
**Fourteenth NASA Goddard / Twenty-Third IEEE**
**Conference on Mass Storage Systems and Technologies**

# The Global Storage Grid: High-Speed, Secure Access to Data on Open, Global Networks



**May 15 — 18, 2006**
**The Inn and Conference Center**
**University of Maryland University College**
**College Park, Maryland, USA**

*Final Agenda*

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http://storageconference.org/2006

# The Global Storage Grid: High-Speed, Secure Access to Data on Open, Global Networks

The NASA Goddard Space Flight Center will hold its *14th Conference on Mass Storage Systems and Technologies* in cooperation with the IEEE Mass Storage Systems Technical Committee's *23rd Conference*. The conference, May 15 — 18, 2006 in College Park, Maryland, combines technical papers, posters, and a vendor exposition in a unique forum tailored for users, designers, managers, and vendors of large-scale storage systems and technologies.

**At MSST2006,** we will build on previous conferences, and research and developments in access, scalability, inter-operability, and long term stewardship of globally distributed storage, to investigate the concept of the Global Storage Grid. The Global Storage Grid will provide high speed secure access to data on open global networks, with access and performance characteristics of local data, while also providing redundancy, backup, and reliability. The Global Storage Grid will emerge from developments in storage technologies, high speed global networks, and data management and access software. MSST2006 will feature three invited experts to speak on the topics of the global storage grid, high speed global storage networks, and quantum information storage. Two tutorials, on Monday May 15th, will discuss object -based cluster storage systems and global data services. Three days of paper presentations will be supplemented on Tuesday, May 16th, with short-paper and poster sessions. Wednesday, May 17th, will feature a work-in-progress session to highlight late-breaking research and developments, and an extemporaneous forum for presentations of last-minute thoughts and ideas. Thursday May 18th will include a vendor-solutions session and a round table on emerging technologies—a hallmark of these conferences, where a panel of experts will discuss promising new technologies. A Vendor Expo will be held Tuesday through Thursday, offering additional opportunities for informal information exchange. Additional details can be obtained at:

http://storageconference.org/2006

## — Agenda —

## Monday, May 15

> Breakfast 7:30 am — 9:00 am

### Tutorials

**9:00 am – 12:00 pm**
Chair, Jim Hughes

**Object-based Cluster Storage Systems**
David Nagle, Brent Welch, *Panasas*

**12:00 pm – 1:30 pm — Lunch**

**1:30 pm – 4:30 pm**
Chair, Ben Kobler

**Global Data Services: Developing Data-Intensive Applications Using Globus Software**
Ian Foster, *University of Chicago*

## Tuesday, May 16

> **Exhibits Open — 12:00 pm – 7:00 pm**
> Breakfast 7:30 am — 9:00 am

**9:00 am – 10:00 am — Welcome and Invited Talk**
Chair, Ben Kobler

**The Global Storage Grid: High-Speed, Secure Access to Data on Open Global Networks**
Ian Foster, *University of Chicago*

**10:30 am – 12:00 pm — Data Management and Access —**
Chair, Ethan Miller **Global Data Access: User Experiences**

**Experiences in Building an Object-Based Storage System based on the OSD T-10 Standard**
David Du, Dingshan He, Changjin Hong, Jaehoon Jeong, Vishal Kher, Yongdae Kim, Yingping Lu, Aravindan Raghuveer, Sarah Sharafkandi, *University of Minnesota*

***Design, Implementation, and Production Experiences of a Global Storage Grid***
Phil Andrews, Chris Jordan, Herman Lederer, *San Diego Supercomputer Center*

**Storage Resource Broker Global Data Grids**
Reagan W. Moore, Arcot Rajasekar, Michael Wan, *San Diego Supercomputer Center*

**12:00 pm – 1:30 pm — Lunch**

**1:30 pm – 3:00 pm — Data Management and Access — Global File**
Chair, Jean-Jacques Bedet **Systems: data preservation and integrity**

**CIS: Content Immutable Storage for Trustworthy Electronic Record Keeping**
Lan Huang, Windsor Hsu, IBM, Fengzhou Zheng, *Princeton University*

**Implementation and Performance Evaluation of Two Snapshot Methods on iSCSI Target Storages**
Weijun Xiao, Yinan Liu, Qing (Ken) Yang, *University of Rhode Island,* Jin Ren, Changsheng Xie, *Huazhong Univeristy*

**LiFS: An Attribute-Rich File System for Storage Class Memories**
Sasha Ames, Nikhil Bobb, Kevin M. Greenan, Owen S. Hofmann, Mark W. Storer, Carlos Maltzahn, Ethan L. Miller, Scott A. Brandt, *University of California*

# Tuesday (continued)

**3:30 pm – 5:00 pm — Short Papers**
Chair, Robert Chadduck

**Adaptive Replica Management for Large-scale Object-based Storage Devices**
Qingsong Wei, Wujuan Lin, Yong Khai Leong,
*Data Storage Institute*

**A Bit-Window based Algorithm for Balanced and Efficient Object Placement and Lookup in Large-Scale Object based Storage Cluster**
Renuga Kanagavelu, Yong Khai Leong,
*A*STAR Data Storage Institute*

**An Out-of-band Approach to SAN-level Cache Management**
Da Xiao, Jiwu Shu, Wei Xue, Jiwu Shu, Weimin Zheng,
*Tsinghua University*

**OSDsim -- a Simulation and Design Platform of an Object-based Storage Device**
Weiya Xi, Wei-Khing For, Donghong Wang,
Renuga Kalagavelu, Wei-Kit Goh, *Data Storage Institute*

**Adaptive Extents-Based File System for Object-Based Storage Devices**
Wei-Khing For, Weiya Xi, *Data Storage Institute*

**Implementation of Offloading the iSCSI and TCP/IP Protocol onto Host Bus Adapter**
Han-Chiang Chen, Zheng-Ji Wu, Zhong-Zhen Wu,
*Industrial Technology Research Institute*

**Relational Database Active Tablespace Archives Using HSM Technology**
David Boomer, *IBM*

**ACE: Classification for Information Lifecycle Management**
Gauri Shah, Kaladhar Voruganti, IBM, Piyush Shivam,
*Duke University,* Maria del Mar Alvarez Rohena,
*University of California*

**Robust Performance for Distributed Storage Systems**
Huaxia Xia, Andrew A. Chien, *University of California*

**A Classification and Evaluation of Data Movement Technologies for the Delivery of Highly Voluminous Scientific Data Products**
Chris A. Mattmann, Sean Kelly, Daniel J. Crichton, J. Steven Hughes, Sean Hardman, Paul Ramirez, Ron Joyner,
*Jet Propulsion Laboratory*

**SGFS: Secure, Efficient and Policy-based Global File Sharing**
Vishal Kher, Eric Seppanen, Cory Leach, Yongdae Kim,
*University of Minnesota*

**Thermal Attacks on Storage Systems**
Nathanael Paul, Sudhanva Gurumurthi, David Evans,
*University of Virginia*

**Multi-Level RAID for Very Large Disk Arrays**
Alexander Thomasian, *New Jersey Institute of Technology*

**Dynamic Hashing: Adaptive Metadata Management for Petabyte-scale File Systems**
Weijia Li, Wei Xue, Jiwu Shu, Weimin Zheng,
*Tsinghua University*

**Generating a Jump Distance Based Synthetic Disk Access Pattern**
Zachary Kurmas, Jeremy Zito, Lucas Trevino, Ryan
Lush, *Grand Valley State University*

**MRRC: An effective cache for fast memory registration in RDMA**
Li Ou, Xubin He, *Tennessee Technological University,*
Jizhong Han, *Chinese Academy of Science*

**Fingerdiff: Improved Duplicate Elimination in Storage Systems**
Deepak Bobbarjung, Suresh Jagannathan, *Purdue University,*
Cezary Dubnicki, *NEC Laboratories America*

**5:00 pm – 8:00 pm — Reception and Poster Session**

# Wednesday, May 17

> **Exhibits Open — 10:00 am – 5:00 pm**
> Breakfast 7:30 am — 9:00 am

**9:00 am – 10:00 am — Invited Talk**
Chair, Robert Chadduck

Bob Kahn, *Corporation for National Research Initiatives
(2005 Medal of Freedom Recipient)*

**10:30 am – 12:00 am — High-Speed Global Networks —**
Chair, Jim Hughes        **Allocation of Resources**

**OASIS: Self-tuning Storage for Applications**
Kostas Magoutis, Prasenjit Sarkar, Gauri Shah, *IBM*

**A framework for Managing Inter-site Storage Area Networks using Grid Technologies**
Fritz McCall, Mike Smorul, *UMIACS,* Ben Kobler, *NASA*

**The Design and Implementation of AQuA: an Adaptive Quality of Service Aware Object-Based Storage Device**
Joel C. Wu, Scott A. Brandt, *University of California*

**12:00 pm – 1:30 pm — Lunch**

**1:30 pm – 2:30 pm —    High-Speed Global Networks —**
Chair, Julian Satran     **Data Migration and Caching (part 1)**

***Coordinating Parallel Hierarchical Storage Management in Object-based Cluster File Systems***
Dingshan He, Xianbo Zhang, David H.C. Du, *University of Minnesota,* Gary Grider, *Los Alamos National Laboratory*

**Content Based Block Caching**
Charles B. Morrey III, Dirk Grunwald, *University of Colorado*

**3:00 pm – 4:00 pm —    High-Speed Global Networks —**
Chair, Gene Harano       **Data Migration and Caching (part 2)**

**SmartMig: Risk-modulated Proactive Data Migration for Maximizing Storage System Utility**
Li Yin, *University of California*, Sandeep Uttamchandani, *IBM,*
Randy Katz, *University of California*

**Performance Boosting and Workload Isolation in Storage Area Networks with SANCache**
Ismail Ari, Melanie Gottwals, Dick Henze,
*Hewlett Packard Laboratories*

**4:30 pm – 5:30 pm — Work in Progress**
Chair, Randal Burns

Presentations of late-breaking research and developments.

**5:30 pm – 6:30 pm — Extemporaneous**
Chair, Jim Hughes

A forum for short presentations of last-minute thoughts and ideas. Presenters will sign up for speaking slots during the conference.

**6:30 pm** — **Dinner**

**7:30 pm — After Dinner Speaker**
Dr. Simon Szykman, *Director of the National Coordination Office*

# Thursday, May 18

| Exhibits Open — 10:00 am – 3:00 pm |
| Breakfast 7:30 am — 9:00 am |

**9:00 am – 10:00 am — Invited Talk**
Chair, Reagan Moore

**Quantum Information Storage in the Solid State**
David Pappas, *National Institute of Standards & Technology*

**10:30 am – 12:00 am — Round Table on Emerging Technologies**
Chair, Reagan Moore

**Managing data distributed across geographically separated storage repositories.**

**The Storage Virtualization Approach**
Michael Factor, *IBM*
Wayne Karpoff, *Yotta Yotta*
Kent Koeninger, *Hewlett Packard*

**The Data Virtualization Approach**
Reagan Moore, *San Diego Supercomputer Center*
Dave Berry, *UK National e-Science Centre (NeSC)*

**The Global File System Approach**
William Andros Adamson, *University of Michigan*
Micah Beck, *University of Tennessee*

**12:00 pm – 1:30 pm — Lunch**

**1:30 pm – 2:30 pm — Storage Technologies — Tape Solutions**
Chair, Tom Ruwart

**HPTFS: A High Performance Tape File System**
Xianbo Zhang, David Du, *University of Minnesota,*
Jim Hughes, Ravi Kavuri, *Sun Microsystems*

**A Prototype Tape System Using Multi channel Stack Heads and Metal Evaporate Tape**
Hiroaki Ono, Shinichi Fukuda, Yusuke Tamakawa, Masaaki Sekine, Tomoe Iwano, Seiichi Onodera, *Sony*

**3:00 pm – 4:30 pm — Storage Technologies — Vendor Solutions**
Chair, Bruce Rosen

**Cooling Strategies for Ultra High Density Racks and Blade Servers**
Wahid Nawabi, *American Power Conversion*

**The Clustered Storage Revolution**
Sujal Patel, *Isilon Systems*

**Preserving the Last Copy: Building a Long-Term Digital Archiva**
Andrés Rodriguez, *Archivas*

**The Lambda Grid -- Supporting Mass Storage Systems and Technologies over a Dynamic Optical Network**
Abdella Battou, Michael Fox, Leonard Chin, *Lambda Optical Systems*

**Native Infiniband Storage for Clustering**
Randy Kreiser, *DataDirect Networks*

**Data Archiving using Enhanced MAID**
Aloke Guha, *COPAN Systems*

**4:30 pm — Adjourn**

The Baltimore Oriole is the
State Bird of Maryland.

# People

**Conference and Program Committee Chair**
Ben Kobler, *NASA Goddard Space Flight Center*

**Vendor Expo Chair**
Gary Sobol, *StorageTek, Retired*

**Publications Chair**
P C Hariharan, *Stem International, Inc.*

**Work In Progress Chair**
Randal Burns, *Johns Hopkins University*

**Publicity Chairs**
Jack Cole, *US Army Research Laboratory*
Sam Coleman, *Lawrence Livermore National Laboratory, Retired*

**IEEE Computer Society Liaison**
Merritt Jones, *MITRE*

**Program Committee**
Ahmed Amer, *University of Pittsburgh*
Curtis Anderson, *Mendocino Software*
Jean Jacques Bedet, *Science Systems and Applications, Inc.*
Randal Burns, *Johns Hopkins University*
Robert Chadduck, *NARA*
Ann Chervenak, *USC Information Sciences Institute*
Jack Cole, *US Army Research Laboratory*
Bob Coyne, *IBM*
Jim Finlayson, *Department of Defense*
Bruce K. Haddon, *Sun Microsystems, Inc.*
Gene Harano, *NCAR*
P. C. Hariharan, *Stem International, Inc.*
Jim Hughes, *Sun Microsystems, Inc.*
Merritt Jones, *MITRE*
Ann Kerr, *Vice Chair, International Symposia, MSSTC*
Ethan Miller, *University of California, Santa Cruz*
Reagan Moore, *San Diego Supercomputer Center*
Matthew O'Keefe, *Cray Computer*
Bruce Rosen, *NIST*
Tom Ruwart, *I/O Performance, Inc.*
Julian Satran, *IBM Haifa Research Laboratory, Israel*
Rodney Van Meter, *Keio University, Japan*

# Hotel Information

**The Inn and Conference Center**
**University of Maryland University College**
**3501 University Boulevard East**
**College Park, Maryland, 20783**

Limited lodging facilities are available at *The Inn and Conference Center.* A block of sleeping rooms has been reserved under the group name "MASS Storage". The room rate is $187 for single or double occupancy, not including tax. Conference participants may contact the hotel directly at 800-228-9290 or by accessing:

http://www.stayatmarriott.com/MassStorage2006/

To receive the group-discounted rate, reservations must be made by April 24, 2006.

For more hotel information, please access:

http://marriott.com/property/propertypage/wasum

MSST2006

# Program Additions

**14th NASA Goddard, 23rd IEEE**
**Conference on Mass Storage Systems and Technologies**
**May 15-18, 2006, College Park, Maryland, USA**

Wednesday, May 17
4:30 PM -- Work in Progress
Presentations of late-breaking research and development
Chair, Randal Burns

> Mais Nijim, Tao Xie, Ziliang Zong, and Xiao Qin
> An Adaptive Strategy for Secure Distributed Disk Systems

> Peter Weinrich
> Onestop Migration between HSM Systems

> Qing (Ken) Yang, Weijun Xiao, and Jin Ren
> Continuous Data Protection in iSCSI Storages

> Alexander Thomasian and Jun Xu   Data
> Allocation in Disk Array Support Multiple RAID Levels

> Thomas Schwarz,  Mary Baker, Steven Bassi, Bruce Baumgart, Wayne Flagg
> Catherine van Ingen, Kobus Joste, Mark Manasse, and Mehul Shah
> Disk Failure Investigations at the Internet Archive

> Charles B. Morrey, III and Dirk Grunwald
> CIMStore - Content-Aware Integrity Maintaining Storage

> Rob Handlovsky
> Global Data Sharing and the Challenge of Data Locality

> Niels H. Christensen
> A Formal Analysis of Recovery in a Preservational Data Grid

Wednesday, May 17
7:30 PM - After dinner speaker

> Dr. Simon Szykman, Director of the National Coordination Office
> Remarks on the Networking and Information Technology
> Research and Development Program

Thursday, May 18
10:30 Am -- Round Table on Emerging Technologies
Managing the Global Storage Grid: Who is in Control?
Reagan Moore, Chair

A panel of experts will discuss issues in managing data distributed
across geographically separated storage repositories

The Storage Virtualization approach:

Michael Factor, IBM
Wayne Karpoff, Yotta Yotta
Kent Koeninger, Hewlett Packard

The Data Virtualization approach:

Reagan Moore, San Diego Supercomputer Center
Dave Berry, UK National e-Science Centre (NeSC)

The Global File System approach:

William Andros Adamson, University of Michigan
Micah Beck, University of Tennessee