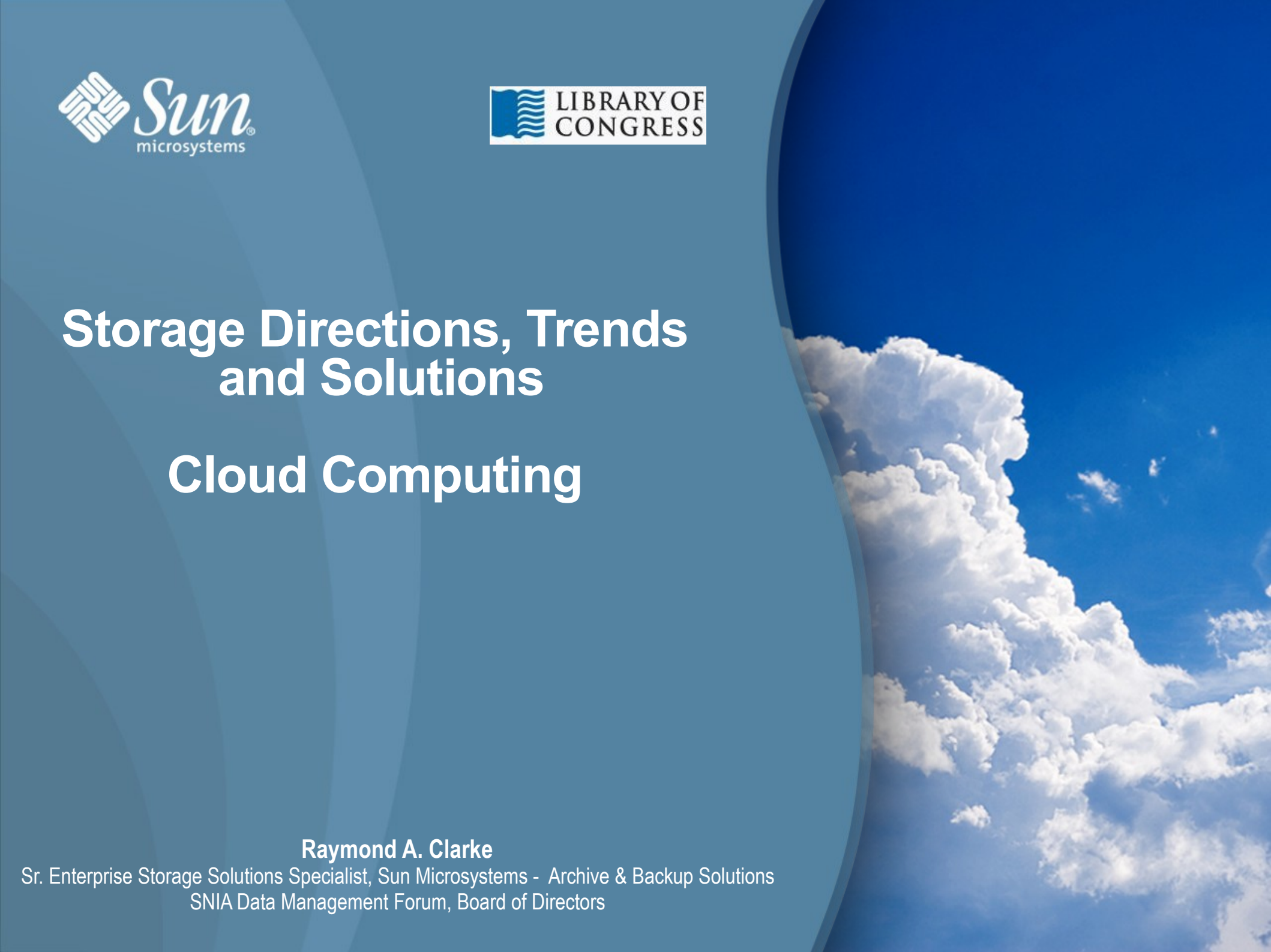


Storage Directions, Trends and Solutions

Cloud Computing

Raymond A. Clarke
Sr. Enterprise Storage Solutions Specialist, Sun Microsystems - Archive & Backup Solutions
SNIA Data Management Forum, Board of Directors

What do end users expect of Cloud Computing?

The illusion of infinite compute resource

The elimination of up-front commitment

The ability to pay-as-you-go

"Above the Clouds: A Berkeley View of Cloud Computing" (February, 2009)

&

Low barriers to entry and exit

Business Models

Public	Private	Hybrid
You don't know who else is on the same server, network or disk that you are	You own the server, network and disk, and decide who gets to run on it with you	You own some parts and are sharing some parts, though in a controlled way

Cloud Computing Layers

Software as a Service

Applications offered on-demand over the network (salesforce.com)

Platform as a Service

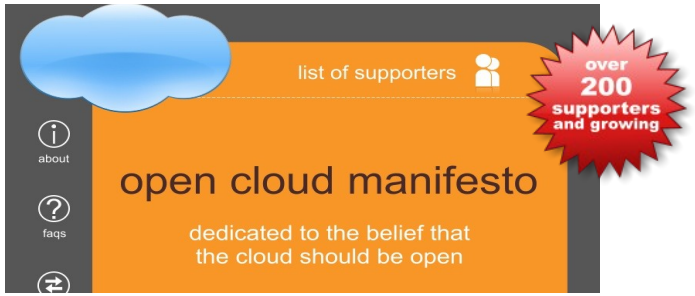
Developer platform with built-in services (Google App Engine, Microsoft Azure Platform)

Infrastructure as a Service

Basic storage and compute capabilities offered as a service (Amazon web services, Microsoft's Cloud Infrastructure Services, Mosso)

Openness Promotes Interoperability

CLOUDCOMPUTINGINTEROPERABILITYFORUM
http://www.cloudforum.org/



http://www.opencloudmanifesto.org

OpenGridForum
OPEN FORUM | OPEN STANDARDS
http://www.ogf.org/

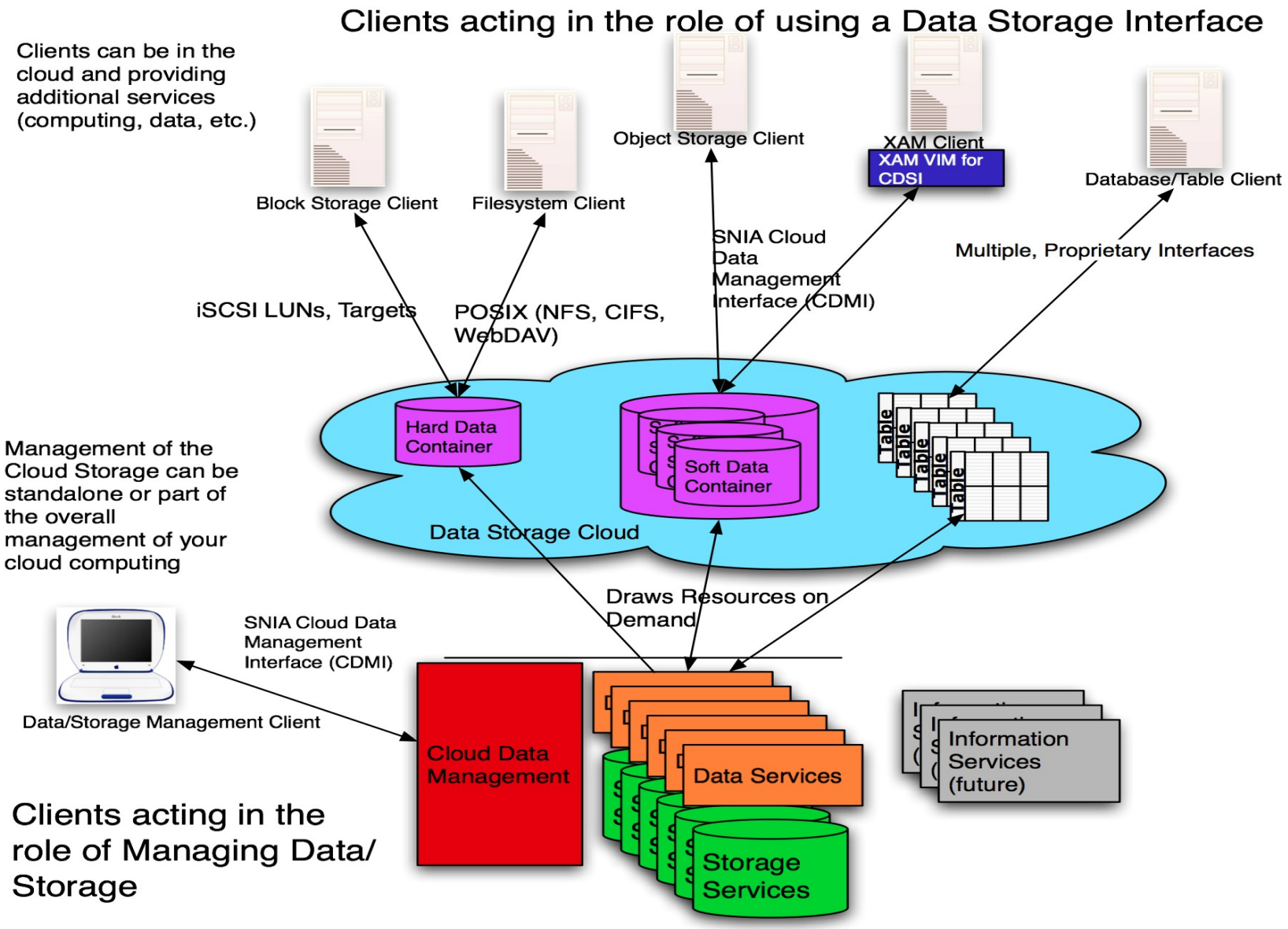
Sun Cloud Computing
http://www.sun.com/cloud

SNIA
Cloud Storage Initiative
http://www.snia.org/forums/csi/

DMTF – Open Cloud Standards Incubator

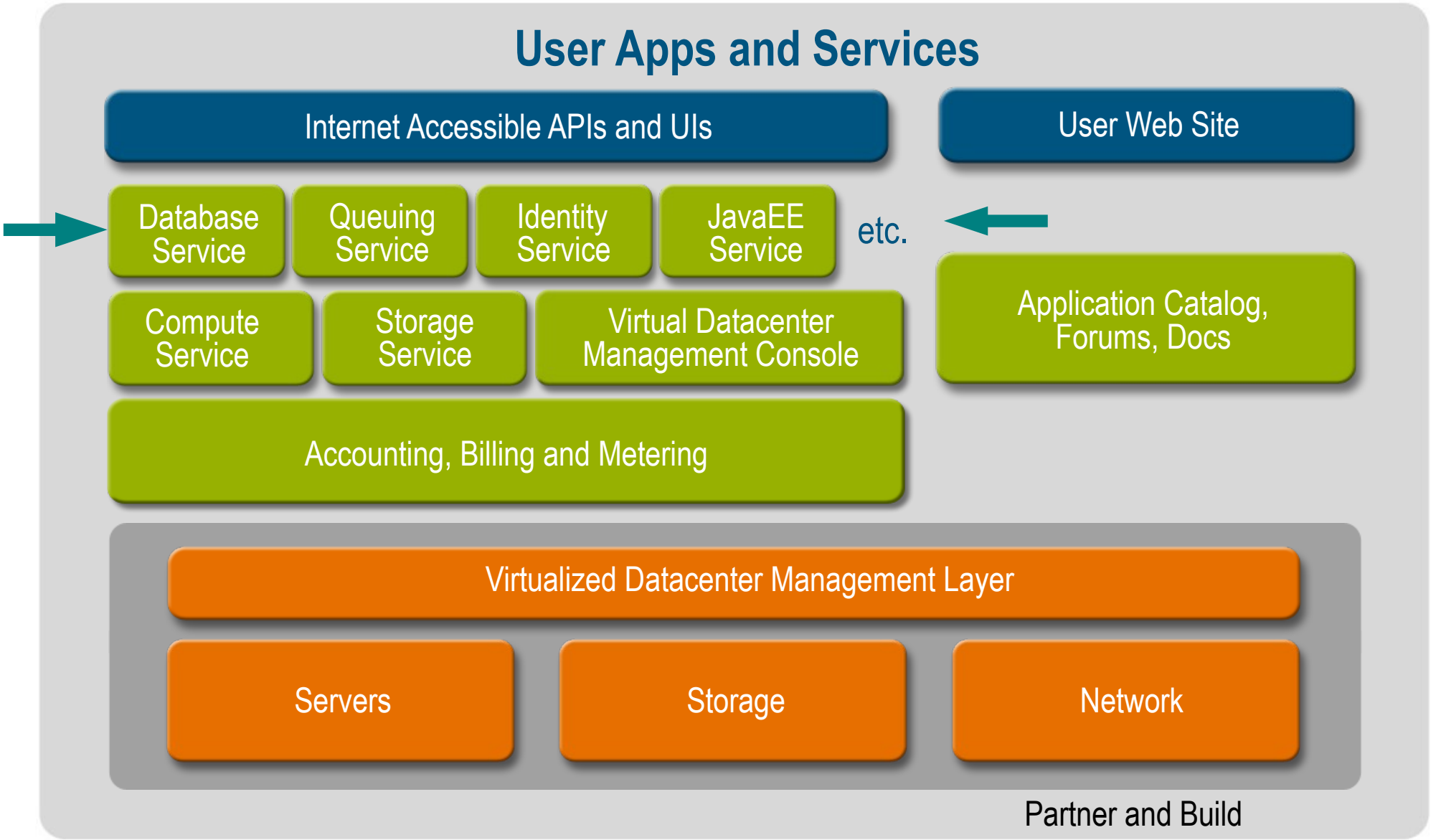
http://www.mikedipetrillo.com/mikedvirtualization/2009/05/dmtf-open-cloud-standards-incubator.html

Cloud Storage Reference Model



Source: SNIA CSI

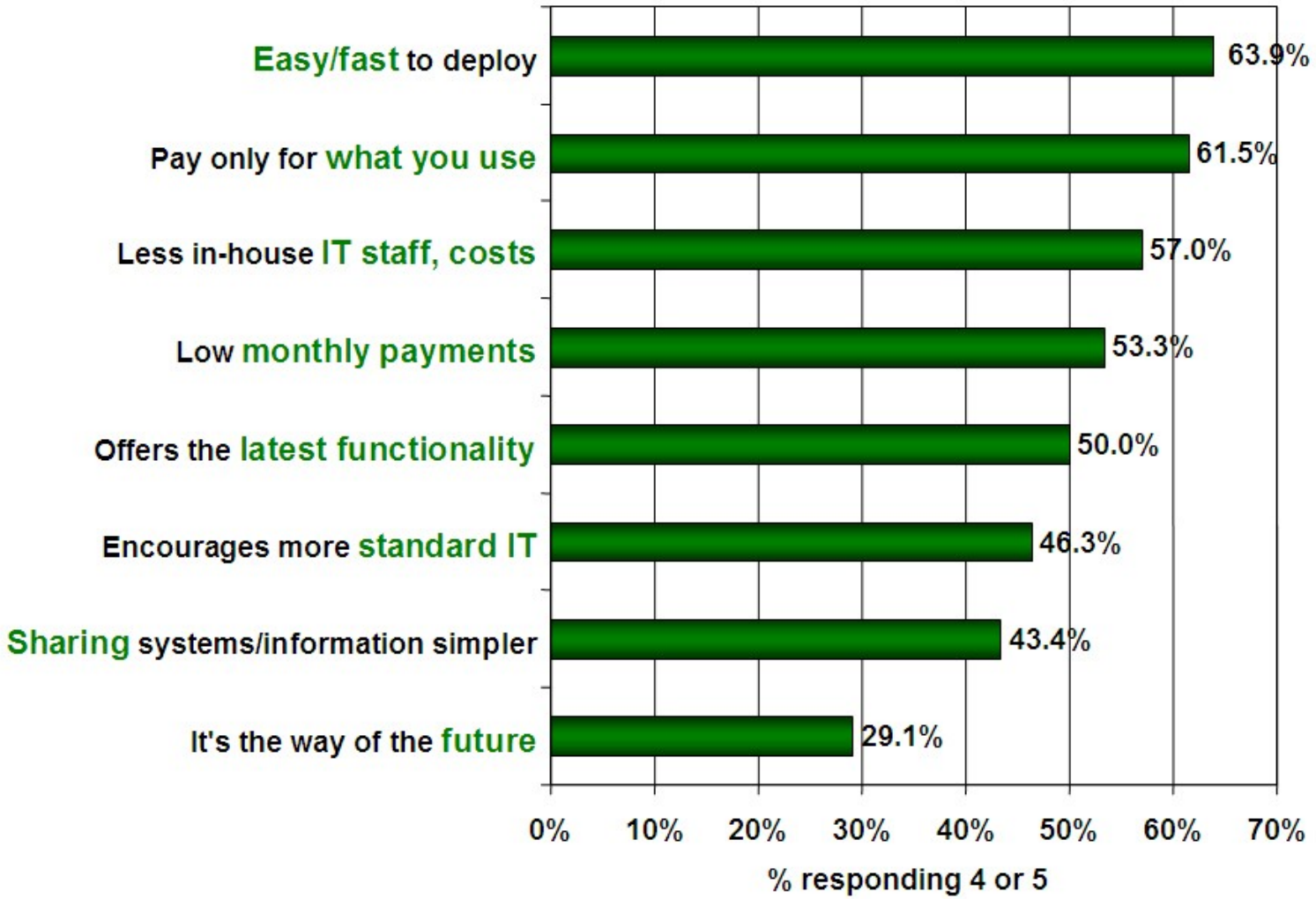
Cloud Architecture – Future



Benefits of Cloud Computing

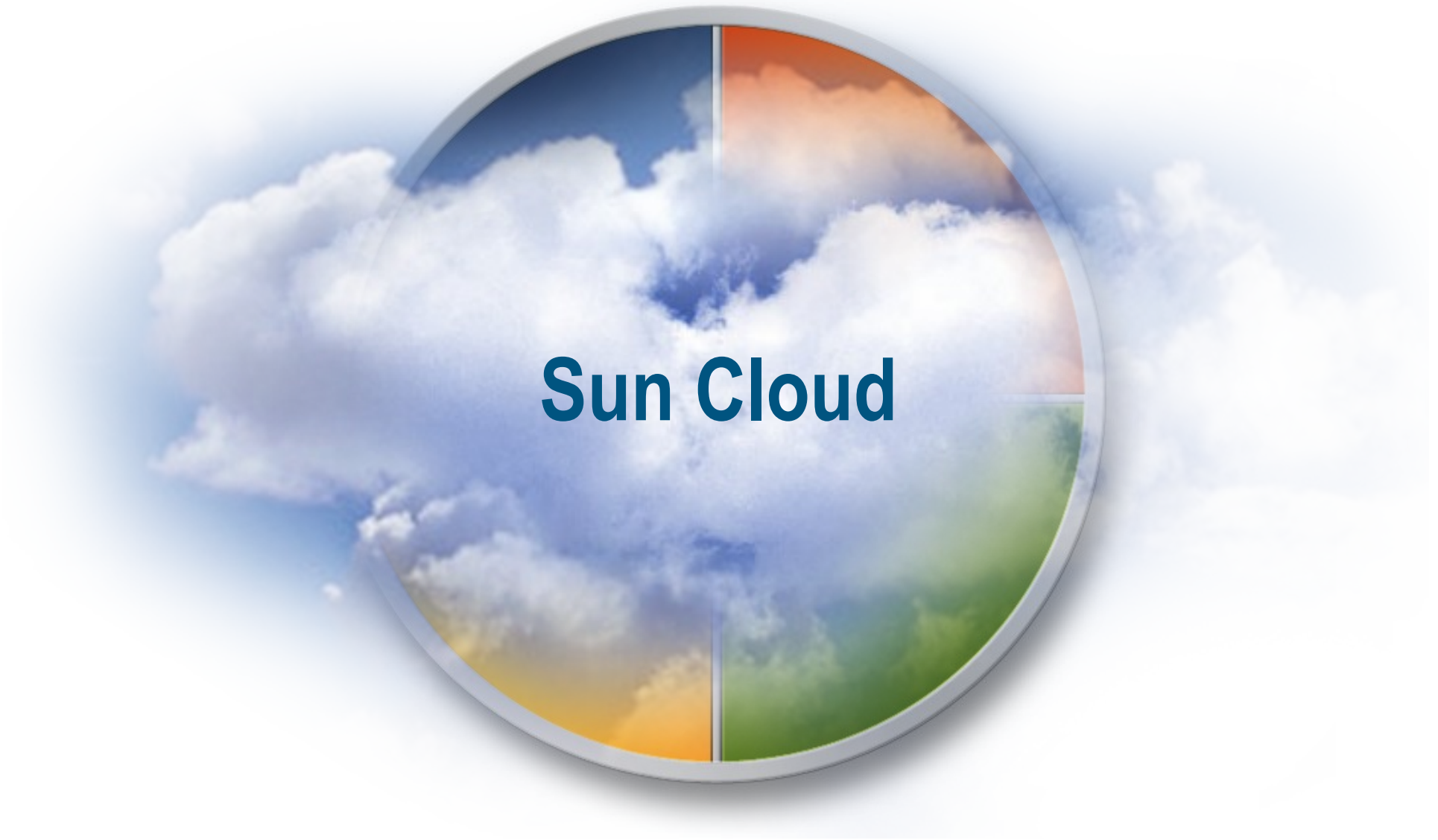
Q: Rate the benefits commonly ascribed to the 'cloud'/on-demand model

(1=not important, 5=very important)



Source: IDC Enterprise Panel, August 2008 n=244

Introducing the Sun Cloud



A Peek Behind the Sun Cloud

VirtualBox

Sun xVM

TACC

Q-layer

MySQL

Products and Technologies

Expertise and Services

Partners

Open Communities

zmanda Open Source Backup

glassfish.dev.java.net

Java

OpenOffice.org

RIGHTSCALE

ZFS The Zettabyte File System

Eucalyptus

KickApps

amazon web services

ORACLE

NetBeans

lustre

Comprehensive OPEN Portfolio Delivering Customer Choice

Open Storage/Open Archive Anatomy

NFS CIFS | FCP | SAS | iSCSI | IB | VTL | OSD | CAS | XAM | Web DAV

eco friendly

Open Storage Appliances

Sun Storage 7110

Sun Storage 7210

Sun Storage 7310

Sun Storage 7410

Storage Servers

SunFire X4240
Sun Fire x4250

SunFire X4540

CMT Servers

Open Storage Arrays

Storage J4200

Storage J4400

Storage J4500

SAS HBA's

Open Storage Flash

F5100 - SSD

File-Systems

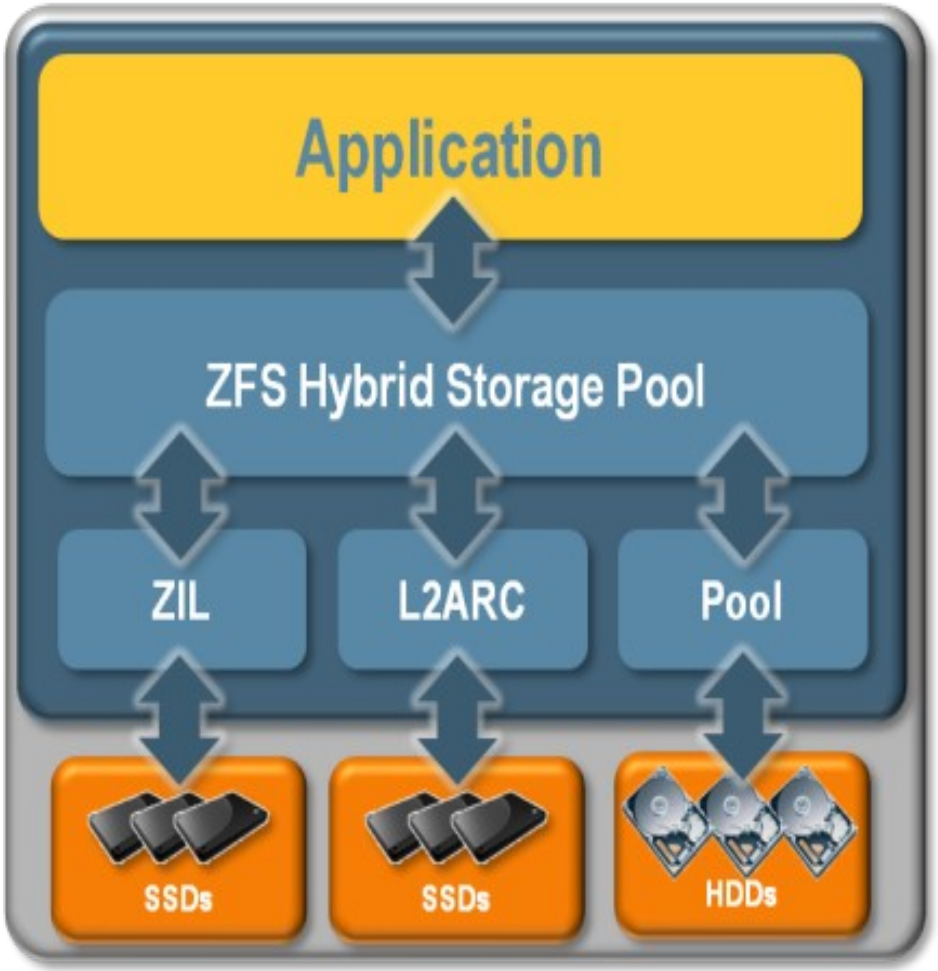
ZFS, Lustre, SAM/QFS, pNFS

ZFS opensolaris SAM-QFS

Replication
Security
Mirror/Snap
Search
Encryption
De-duplication
Migration
Backup
Compliance

ZFS Turbo Charges Applications

The Hybrid Storage Pool Data Management



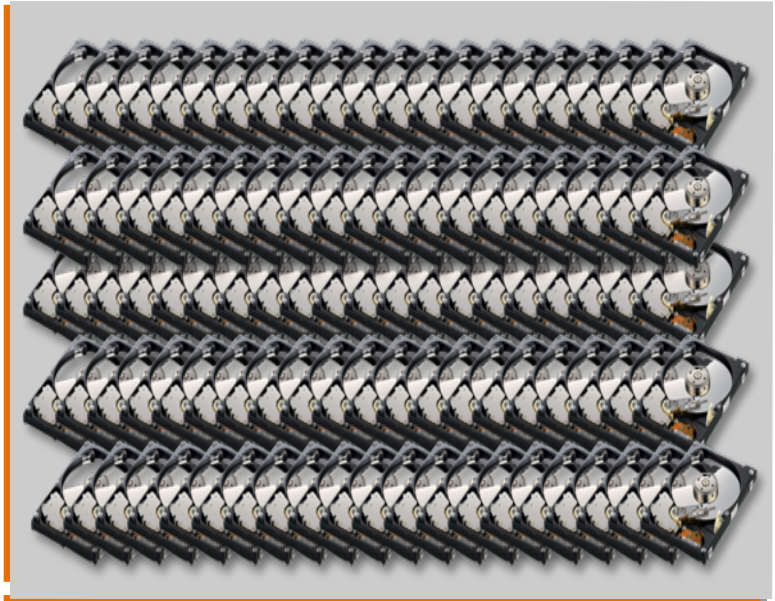
ZFS automatically:

- Writes new data to a very fast SSD pool (ZIL)
- Determines data access patterns and stores frequently accessed data in the L2ARC
- Bundles IO into sequential lazy writes for more efficient use of low cost mechanical disks
- Now shipping in OpenSolaris and coming soon in Solaris 10

ZFS Hybrid Storage Pools

Faster, Cheaper, Less Power

100 Enterprise HDDs



Capacity: 30 Tbytes
Performance: 30K IOPS
Cap/Op-: $55,000 - 1.75kWhr

More IOPS
Lower $GB
Lower Power Consumption
Less Rack Space

Hybrid Storage Pool

Capacity: 30 Tbytes
Performance: 30K IOPS
Cap/Op-: $6.040 - 0.392kWhr

For more on HSPs, see Adam Leventhal's article in the Communications ACM Magazine http://mags.acm.org/communications/200807/

Sun microsystems

Thank You for Your Time and Attention

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