

DataDirect™
NET WOR K S

DataDirect™
NET WOR K S

Web Object Scaler



WOS and IRODS Data Grid

Dave Fellinger
dfellinger@ddn.com

Innovating in Storage

DataDirect
NETWORKS

DataDirectTM N E T W O R K S

DDN Firsts:

- ✓ Streaming ingest from satellite with guaranteed bandwidth
- ✓ Continuous service to air for a major network
- ✓ Guaranteed QOS for Supercomputers
- ✓ 10GB/s Storage Controller
- ✓ Storage Controller to support >1PB of data
- ✓ Controller with embedded application VM

**And the first storage system designed from
The ground up for scientific collaboration – WOS!**



The WOS initiative

DataDirect
NETWORKS

- Understand the data usage model in a collaborative environment where data is shared and studied but not modified.
- Build a simplified data access system with a minimum of layers.
- Completely eliminate the concept of FAT and extent lists.
- Reduce the instruction set to only PUT, GET, and DELETE.
- Add the concept of locality.

Storage should improve collaboration

- ... Not make it harder
- Minutes to install, not hours
- Milliseconds to retrieve data, not seconds
- Replication built in, not added on
- Instantaneous recovery from disk failure, not days
- Built in data integrity, not silent data corruption

A match made in...

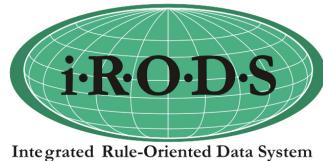
DataDirect
NETWORKS

iRODS

- Ease of Access
 - » 35 clients
- Secure access controls
- Policy based data management

wOS

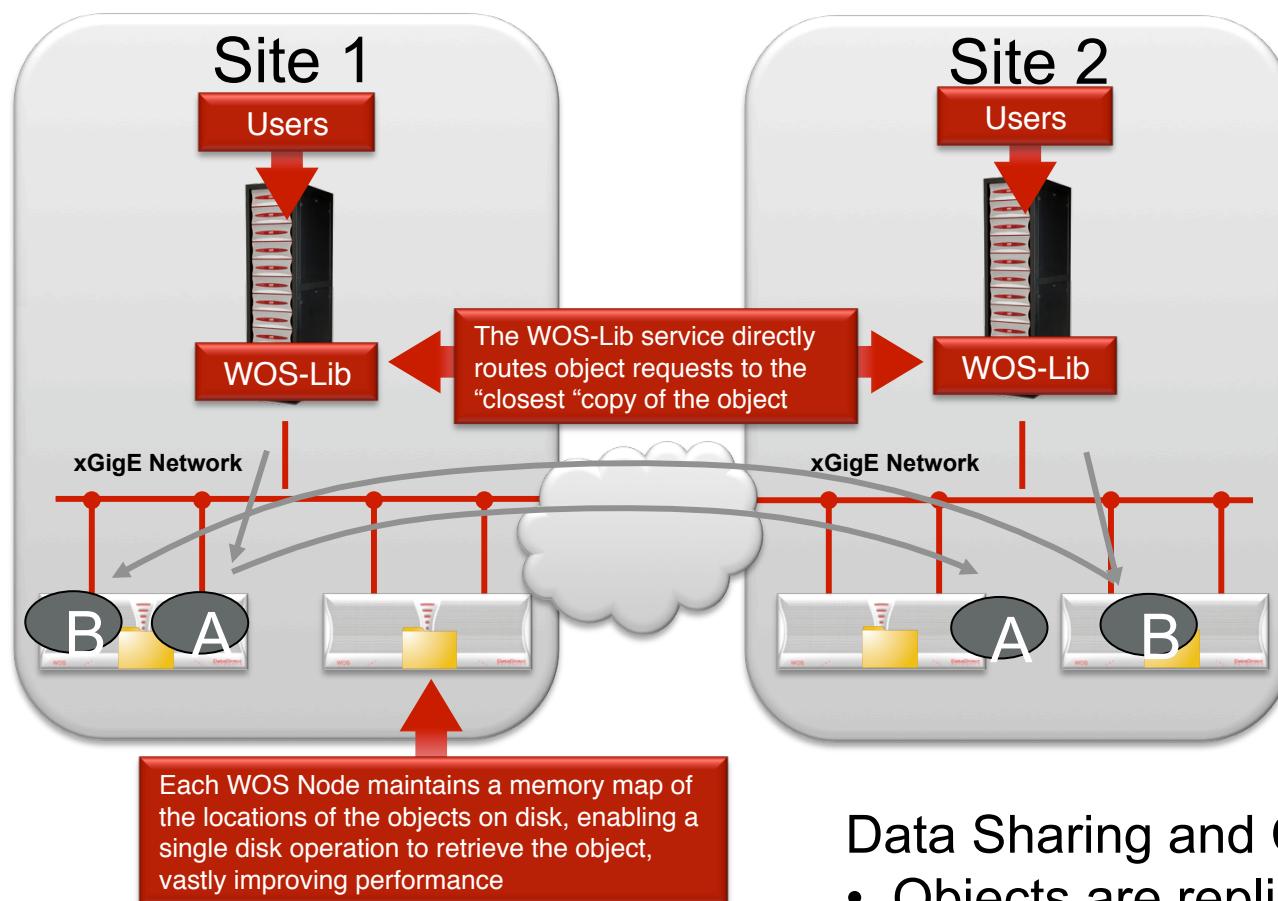
- Simplicity
- Scalability
- Reliability with Replication
- Policy based deterministic data placement and redundancy



Managed
Collaboration

The Power of Intelligent Storage

Data Locality & Collaboration



Key Features

- Up to 4-way replication, local &/or remote
- Disaster protection
- Single namespace across all replicas
- Data locality
- Intelligent data placement

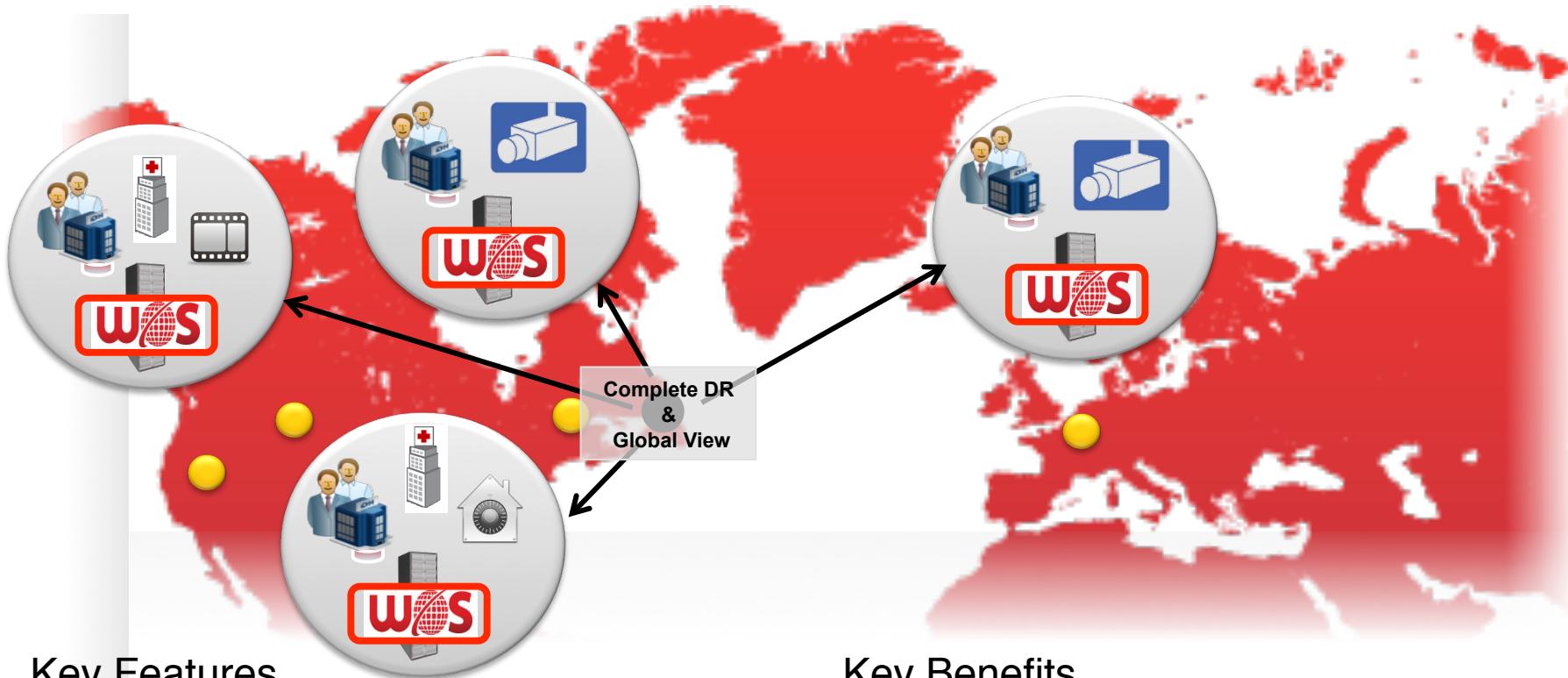
Data Sharing and Collaboration

- Objects are replicated across sites per policy
- All replicas have the same object ID
- Users always access “closest” object⁶

The WOS Scale-Out

Global View, Local Access

DataDirect
NETWORKS



Key Features

- Replication across all 4 sites
- Users have access to data globally
- Users always access closest data

Key Benefits

- Enables global collaboration
- Increases performance & productivity via data locality
- No risk of data loss

**This slide needs to be viewed in
PowerPoint presentation mode.**

Static display such as editing mode or printed slides will not convey anything meaningful due to the interactive nature of this slide.

Superior IRODS performance

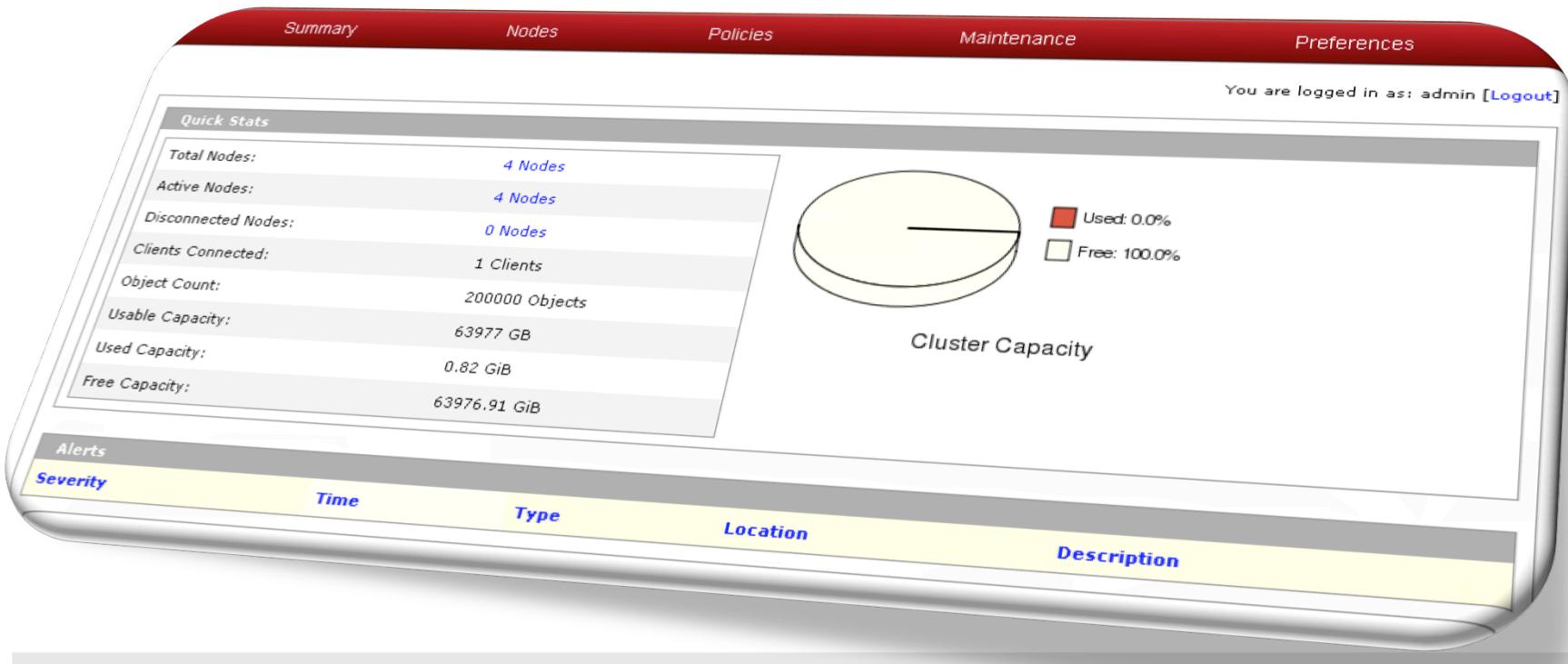
DataDirect
NETWORKWORKS

- Traditional Storage Is Performance-“Expensive”
 - » Expends excess disk operations
 - 5-12 Disk Operations per File Read
 - » Multiple levels of translation and communication
 - metadata lookups and directory travelling
 - extent list fetches
 - RAID & block operations
- WOS Delivers Performance Through Simplicity
 - » None of the constructs of traditional systems
 - » Single-Disk-Operation Reads, Dual-Operation Writes
 - » Reduced latency from SATA Disks since seeks are minimized
 - » Millions of file/ops per second with ¼ of the disks

Simple Interface

DataDirect
NETWORKS

- Designed with a simple, easy-to-use GUI
- **“This feels like an Apple product”**
 - » *Early customer quote during WOS Beta*



Node Performance

DataDirect
NETWORKS

- Read and Write Throughput, WOS6000

File Size	FRPS	Read MB/sec	FWPS	Write MB/sec
64K	10,560 (SAS)	692 (SAS)	4,400 (SAS)	288 (SAS)
	4,400 (SATA)	288 (SATA)	1760 (SATA)	115 (SATA)
1024K	660 (SAS)	692 (SAS)	660 (SAS)	692 (SAS)
	660 (SATA)	692 (SATA)	660 (SATA)	692 (SATA)

- Read and Write Throughput, WOS1600

File Size	FRPS	Read MB/sec	FWPS	Write MB/sec
64K	2933 (SAS)	192 (SAS)	1173 (SAS)	77 (SAS)
	1173 (SATA)	77 (SATA)	469 (SATA)	31 (SATA)
1024K	330 (SAS)	346 (SAS)	330 (SAS)	346 (SAS)
	330 (SATA)	346 (SATA)	330 (SATA)	346 (SATA)

Intelligent WOS Objects

DataDirect
NETWORKS

Sample Object ID (OID): ACuoBKmWW3Uw1W2TmVYthA

wos Signature

A random 64-bit key to prevent unauthorized access to WOS objects

wos Policy

Eg. Replicate Twice; Zone 1 & 3

wos Checksum

Robust 128-bit MD5 checksum to verify data integrity during every read.

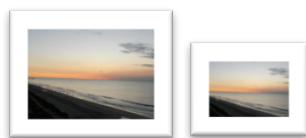
User Metadata

Object = Photo

Key Value or Binary

Tag = Beach

Full File or
Sub-Object



thumbnails

WOS is the simple solution for IRODS environments

- WOS is a flat, addressable, low latency data structure.
- WOS creates a “trusted” environment with automated replication.
- WOS is not an extents based file system with layers of V-nodes and I-nodes.
- IRODS is the ideal complement to WOS allowing multiple client access and an incorporation of an efficient DB for metadata search activities.

A dark red background featuring several DataDirect Networks server units. The units have a perforated metal front panel with the company logo and model number S2A9900 visible. The perspective creates a sense of depth.

DataDirect™
NET W ORKS

DataDirect™
NET W ORKS

S2A9900

Thank You

Dave Fellinger
dfellinger@ddn.com