Best Practices for Object Storage

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The storage industry is going through a big paradigm shift that is caused by drastic changes in how we generate and how we consume data.
Object Storage: Hype or Reality?
Data Generation & Consumption: New IO patterns
## History of Data Storage

### 1980 & 90ies: transactional data rules
- Database Records
- Slow Volume Growth
- High IOPS
- SANs

### 1980 & 90ies: unstructured data
- Office Documents
- Unstructured Data: higher Volume Growth
- Raise of NAS

### 2000s: Big Data
- High variety of sensor-information
- Data Explosion
- Requires New Storage Architectures
Sensor data is everywhere

Smartphones, tablets, photo cameras and scanners are all information-sensing devices that create the vast majority of all unstructured information generated today.

The result of this is a true data explosion of mostly immutable data.

The immutable nature of unstructured data is what DDN leveraged for WOS to solve the scalability problem of traditional file storage.
Data Generation & Consumption: Intelligence, drones, satellites

- Massive volumes of data
- Large files
- Hundreds, thousands of devices
- Geographically distributed
- High Security
- Short active life span
- Archives sometimes not affordable
Data Generation & Consumption: Smart wearable's

- Large volumes of data
- Small files
- Millions of devices
- Geographically distributed
- Privacy!
- Medium active life span
- Users expect data to always be there
Data Generation & Consumption: Smart household appliances

- Growing volumes of data
- Small files
- Fast growing number of devices
- Geographically distributed
- Privacy!
- Life span still to be determined
- Applications still being explored
Data Generation & Consumption: Smart Medical Devices

- Large volumes of data
- Small & large files
- Number of devices growing fast
- Geographically distributed
- Privacy!
- Short active life span
- Archives are key!
File vs. Object Storage

File Storage vs. Object Storage

- Billions of Files
- Amendable Data
- Locking Mechanisms
- File System Hierarchy
- Complex to Scale
- **TCO increases exponentially**

- Trillions of Objects
- Immutable Data
- No Locking Mechanisms
- One Storage Pool, Object ID’s
- Scales Uniformly & Simply
- **TCO decreases at scale**
## Object Storage Benefits

<table>
<thead>
<tr>
<th>For the Provider</th>
<th>For the Admin</th>
<th>For the Developer</th>
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| • Deploy new services  
• Monetize data | • Maintain a single storage infrastructure that scales uniformly & requires less management | • Design applications which interface with data through a simple API |
<table>
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<tr>
<th>For the User</th>
<th>For the Data</th>
<th>For the Application</th>
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| • Access & search data through applications  
• Collaborate with others online  
• Store data in the cloud | • Stored in a flat namespace with searchable metadata  
• Object ID’s instead of file system hierarchy | • Faster Access to the data  
• Leverage object ID’s and metadata |
What to demand from Object Storage

Object storage must deliver highly reliable, infinitely scalable and efficient storage for all Big Data needs.

High-performance and support for legacy applications complete the circle.
Scalability
Objects – Capacity – Sites

Unlimited Scalability

- Architecture enables Exabyte+ storage pool
- Scale capacity by simply adding nodes

Benefits

- Start small, scale as needed
- No forklift upgrades
- Hardware-independent removes migration needs
- Ease of administration
Accessibility
Protocols – Users - Applications

Support Any Application
- Integrates with any application
- Widest choice of protocols
- Integrated gateways
- Support any geographically distributed users
- Support for scale-out file systems

Benefits
- Easy to deploy with integrated applications
- Simple to integrate with custom applications
- Allows legacy applications to use object storage infrastructure
Accessibility Protocols – Users - Applications

Applications

API’s

File Gateways

Tiering

HTTP REST

JAVA

C++

Python

CIFS

NFS

GS-WOS Bridge (GPFS)
Efficiency: Infrastructure – Bandwidth – Management

Optimize Efficiency

- Maximize efficiency for each use case
- Choose low overhead for active archives
- No bandwidth abuse for data rebuilds (Object Assure)
- Lowest management effort

Benefits

- Easy to deploy with integrated applications
- Simple to integrate with custom applications
Efficiency
Object Storage Cost Breakdown

- The TCO breakdown is different for each object storage strategy
- The software cost is more dominant for integrated platforms
- WOS provides much higher HW efficiency and reduced operational costs
- Support and time to market drive the cost for DIY platforms
- Features add Value

- Pay per Use
- Operation
- Software
- Hardware

WOS | DIY | Public Cloud
Reliability: Availability – Durability – Integrity

All-Round Data Protection
• Smart Replication
• Local Erasure Coding
• Replicated Erasure Coding
• Distributed Erasure Coding

Benefits
• Up to Fifteen 9’s Durability
• Provide Availability, Durability & Integrity
• Optimize data protection for your data types, applications
• Tune data protection for data life cycle
Reliability: Availability – Durability – Integrity

**Replication**
- Overhead: 3X
- Performance
- Efficiency
- Reliability
- Scalability

**Local Copy OA**
- Overhead: 1.25X
- Performance
- Efficiency
- Reliability
- Scalability

**Replicated OA**
- Overhead: 2.5X
- Performance
- Efficiency
- Reliability
- Scalability

**Global OA**
- Overhead: 1.9X
- Performance
- Efficiency
- Reliability
- Scalability

**Use Case:**
- Small files
- Low latency, high IOPS

**Use Case:**
- Low cost local centralized storage

**Use Case:**
- High throughput, streaming media, collab

**Use Case:**
- Archives
Extreme Performance Optimization

- Millions of small files processed per second
- Up to terabytes per second of large file throughput
- Lowest network latency

Benefits

- Store high res images + thumbnails
- Mix KB & TB size objects
- Support for partial read of large objects
What is WOS?

- WOS is an object storage platform that enables organizations to build scale-out storage clouds.
- Data is stored as objects, with an object ID and metadata in a flat namespace.
- A WOS storage cloud is built with pre-installed WOS storage nodes; intelligent storage containers.
- It is possible to deploy a fully functional storage cloud with just one WOS7000 appliance, and scale as needed.
- WOS storage nodes can be distributed geographically to build a global storage cloud.
## WOS Architecture

### Applications
- DDN Appliance
- OCP Appliance
- On Your Hardware

### API's
- C++
- Python
- HTTP REST
- JAVA

### File Gateways
- CIFS
- NFS

### Tiering
- GS-WOS Bridge (GPFS)

### WOS Core
- **NoFS™ True Object Storage**
  - Flat namespace
  - No underlying file system
- **WOS Data Protection**
  - WOS Policy engines
  - Replication engine
  - Object Assure Erasure Coding
- **WOS Metadata Management**
  - WOS Search

### Select From a Variety of Hardware Platforms
Broadest Set of Use Cases

WEB APPLICATIONS

WORLDWIDE COLLABORATION

CONTENT DELIVERY

ACTIVE ARCHIVES
Sync & Share

Automated Sync & Share allows users to securely upload documents to the cloud, synchronize files and devices, and easily share information with others.

**Integration:** Pre-integrated solution
**Partners:** Ctera, Owncloud
**Reference Customer:** Bezeq

**Why WOS?**
- Optimized for mixed data sets
- Scale as you grow
- Support geographically distributed users
- Latency-aware
- Low management effort
Enable Video on Demand, Cloud DVR or other video streaming services for residential or corporate end users. Leverage WOS high-throughput, low latency video delivery.

Integration: Pre-integrated & custom solutions
Partners: Arris
Reference Customer: Comcast

Why WOS?
• High throughput, low latency
• Support geographically distributed users
• Low management effort
Leverage WOS to build your own CDN platform for worldwide distribution of massive volumes of data with high throughput and low latency.

**Integration:** WOS CDN Reference Architecture  
**Partners:** Cisco  
**Reference Customer:** Level3®

**Why WOS?**  
• High throughput, low latency  
• WOS CDN Reference Architecture  
• Supports up to 60 sites Low management effort  
• Experienced team  
• Local erasure-coding  
• Lowest WAN cost
Worldwide Collaboration

Store assets in a globally distributed storage cloud to enable collaboration between distributed teams. Integrate with your favorite workflow suites or file sharing clients.

Integration: Pre-integrated solutions
Partners: iRODS
Reference Customer: UCL, SSERCA, NIH

Why WOS?
• GRIDScaler – WOS Bridge
• Integrated file system gateways
• High throughput, low latency
• Supports up to 60 sites
• Low management effort
Integrate WOS with your favorite post-production workflow. Enable collaborative editing for distributed teams.

Integration: Pre-integrated & custom solutions
Partners: DVS

Why WOS?
- Optimized for mixed data sets
- High throughput
- Support geographically distributed teams
- Integration with DVS
- Integrated File System Gateway
Active Archives

Monetize your data with Active Archives: leverage WOS to build a scale-out, cost-efficient archive infrastructure that provides instant access to all your assets.

Integration: Pre-integrated & custom solutions
Partners: ASG Atempo, Commvault, iRODS
Reference Customer: Deluxe

Why WOS?
• Lowest TCO: maximize efficiency without compromising on reliability
• Scale as you grow – no forklift upgrades
• No migrations needed
• Self-healing
• Optional tape integration
• Simple management
Custom Applications

WOS was specifically designed for scale-out web applications. The native REST API provides simple integration with the WOS storage cloud. Tune WOS to meet all your application and storage requirements.

Integration: Custom Solutions
Partners: N/A
Reference Customer: Symantec

Why WOS?
- Optimized for mixed data sets
- Scale as you grow
- Support geographically distributed users
- Latency-aware
- Low management effort

HTTP REST  JAVA  C++  Python