Contents

Storage Opportunity & Trends

Ecosystem of Storage Software Solutions
The Problem for IT

From 2013 to 2020, the digital universe will grow by a factor of 10, from 4.4 ZB to 44 ZB

It more than doubles every two years.

COST CHALLENGES CONTINUE TO GROW

Storage cost structure needs a fundamental shift

Storage Capacity
In TB 62% CAGR

IT Budget 2% CAGR

IT PROS WILL SHOULDER A GREATER STORAGE BURDEN

230 GB PER IT PRO

28 MILLION IT PROS WORLDWIDE 2014

1,231 GB PER IT PRO

36 MILLION IT PROS WORLDWIDE 2020

Data is growing at a rate unsustainable with today’s infrastructure and labor costs

The Problem with Storage Infrastructure

Storage Silos (Traditional):
- Current technology is limiting
- Typically 1:1 Storage HW to Application
- Under utilized storage resources
- Isolated resources
- Policies unique to vertical solutions

Today's Answers:
- Single Massive Storage System
  - High Availability (Failover)
  - Limited Scale
  - Very costly (Cap-ex and Op-ex)
- Scale-Out Storage Systems
  - Pay as you Grow
  - Shareable capacities
  - Limited ability to automate SLA execution
  - Does not address under-utilized resources
  - Does not address all storage needs

"Today's Answers" don’t solve tomorrow’s problems
Software Defined Infrastructure (SDI)

**Orchestration Software**

**PROVISIONING MANAGEMENT**

Orchestration provisions, manages and optimally allocates resources based on the unique requirements of an application.

**SERVICE ASSURANCE**

Policies and intelligent monitoring trigger dynamic provisioning and service assurance as applications are automatically deployed and maintained.

**POOLED RESOURCES**

Network, Storage and Compute elements are abstracted into resource pools.
SDS – A Key Component of SDI

Dynamic, policy-driven storage resource management

- **Abstraction** of SW from HW, provides flexibility and scalability
- **Aggregation** of diverse provider solutions
- **Provisioning** of resources dynamically (pay-as-you-grow)
- **Orchestration** of diverse storage systems through an SLA to enable seamless application access

SDS is a **framework** that delivers a scalable, cost-effective solution to serve the needs of tomorrow’s Data Center
SDS Architecture

**Data Services**
- Application that runs in data plane to optimize storage
- Ex: Predictive Analytics
- Ex: De-Duplication
- Ex: Tiering

**SDS Controller**
- Visibility and Control of ALL storage resources
- Communication between Apps, Orchestrator and Storage Systems
- Allocates storage resources to meet SLA's

**Applications**

**Orchestrator**

**Northbound API**

**Southbound API**

**SDS Controller**

**Data Services**

**Storage System [SAN]**

**Storage System [Capacity]**

**Storage System [Performance]**

**Storage System [NAS]**

Node  JBOD  Node  Node  Node  Node  Node  Node  Node  Node  Node  Node
SDS Vision to Action:

SDS Framework is at an early stage
SDS Controllers are new - no fully functional, open and federated options

So - How to get started with SDS:

• Focus on the Storage System layer
• ISVs are at the forefront of the transformation – already selling SW decoupled from HW
• Implement SW-based storage systems built on standard, high-volume servers
  ▪ Features like compression, de-duplication, and erasure coding efficiently use resources
  ▪ Caching or tiering features present an opportunity to implement SSDs
• As SDS controllers become available, deploy them to manage diverse storage systems

Deploy SW building blocks today to allow seamless transition to SDS tomorrow
Enable the Server to Become the New Storage Appliance by Delivering Horizontal Ingredients for Proprietary and Open Solutions
Ecosystem of Storage SW Solutions
## Overview Table: ISV Solutions

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<td>MPStor</td>
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<td>MSP, CSP, Private Cloud, SMB</td>
<td>Yes</td>
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<td>NexentaStor</td>
<td>Block and File</td>
<td>Compression, de-dup, caching, ZFS-based data security</td>
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<td>Yes</td>
<td>OpenStack, CloudStack, VMware</td>
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<td>▪ Local and remote DR for optimal RTO and RPO</td>
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<td>Red Hat Inktank Ceph</td>
<td>Block and Object</td>
<td>Erasure coding, caching, thin provisioning</td>
<td>Enterprise, private cloud, CSPs</td>
<td>Yes</td>
<td>OpenStack</td>
<td>▪ Cloud storage (object and block)</td>
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<td>Red Hat Storage</td>
<td>File and Object</td>
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<td>Enterprise, private cloud, CSP</td>
<td>Yes</td>
<td>AWS, NFS, CIFS, HDFS, S3</td>
<td>▪ Content storage (file)</td>
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<td>SwiftStack</td>
<td>Object</td>
<td>Erasure Coding</td>
<td>Enterprise, private cloud, CSP</td>
<td>Yes</td>
<td>OpenStack, AWS</td>
<td>▪ Cloud storage</td>
</tr>
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<td>▪ Archiving, Backup, DR</td>
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<tr>
<td>VMware Virtual SAN</td>
<td>Block</td>
<td>Thin provisioning, auto-tiering, replication, policy-based management (QoS)</td>
<td>Enterprise and Mid-market</td>
<td>No</td>
<td>VMware</td>
<td>▪ VDI</td>
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<td>▪ Tier 2 production, Staging Test/Dev</td>
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*Other brands and names are the property of their respective owners.*
# Overview Table: Intel Software Products for Storage

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<th>ISV</th>
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<th>Target Customers</th>
<th>GTM: SW or Solution</th>
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<td>Intel® Cache Acceleration Software</td>
<td>Cost-effective way to quickly improve application SLAs without modification to the application or storage architecture. Caches the most active data on Intel Data Center SSDs.</td>
<td>Enterprise servers and workstations</td>
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<td>Solution, sell with Intel Data Center SSDs</td>
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<tr>
<td>Intel® Enterprise Edition of Lustre*</td>
<td>Distributed, parallel storage software purpose-built for very high performance and scalability</td>
<td>Enterprises; academic institutions, government R&amp;D; manufacturing; energy; earth sciences</td>
<td>Subscription-based support of value-added software via storage OEMs and system integrators</td>
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<tr>
<td>Software</td>
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</table>
Storage Usage Models & ISV Support

- **Business Database**
  - OLTP, OLAP

- **Application Data**
  - Web, E/V-mail, VM/Boot

- **Business Intelligence Data**
  - Large Relational Database
  - Large analytics (Hadoop)

- **HPC Storage**
  - High performance compute

- **Backup and Archive**
  - Large object storage
  - Active archive
  - Cold storage

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**NexentaStor**
- VMware VSAN

**MPStor Orkestra**
- NexentaStor
- Red Hat Inktank Ceph Enterprise
- VMware VSAN

**Amplidata**
- Cloudian
- MPStor Orkestra
- NexentaStor
- Red Hat Storage (GlusterFS)
- SwiftStack
- VMware VSAN

**Red Hat Storage (GlusterFS)**

**SwiftStack**

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Information provided by ISV.
Not verified by Intel.

* Other brands and names are the property of their respective owners
**Target Customers:**
Cloud Service Providers and Large Enterprises  
Life Sciences, M&E, Video Surveillance, R&D, Oil & Gas, Government

**Storage Interfaces:**
HTTP/REST (S3 compatible), File, Block

**Efficiency technologies:**
Low power – Optimized for Intel-based COTS HW  
BitSpread – 15 nines durability with significantly less capacity overhead than RAID + replication  
BitDynamics – Continuous data integrity audit and self healing  
GeoSpread – Disaster prevention without replication  
Dynamic non disruptive changes and upgrades – no data migration

**Geos supported:**
Americas

**Distis (where product can be purchased):**
Amplidata

**Training & Support offered:**
Professional services & training

**Pricing:**
Software only capacity-based licensing

**Links:**
www.amplidata.com

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**Brief Overview Statement:**
Amplidata offers object-based software defined storage software that enables a massively scalable mainstream storage solution. New Himalaya software in two versions – Service Provider/OEM edition and Enterprise edition. Runs on Intel-based COTS hardware. Offers unbreakable durability at greater than 15 nines, up to zettabyte scalability, and operates at a significantly lower cost than traditional storage systems.

**Feature/Capability Highlights (top 3):**
- Dynamic 3D elastic scalability to easily adapt to growing user requirements  
  - Global namespace (# objects) and accessibility (service provider edition)  
  - Capacity by adding one or more storage nodes  
- IO throughput by adding any number of high performance controller nodes  
- Non-disruptive changes or upgrades – dynamic rebalancing without data migration  
- Secure multi-tenant support with the flexibility to meet multiple SLAs

**Storage Usage models:**
- Tier 2+ (consolidate multiple tiers into one including disaster prevention)  
- Archive and Backup

*Other brands and names are the property of their respective owners*
<table>
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<tr>
<th><strong>Target Customers:</strong></th>
<th>Medium to large enterprises and regional cloud service providers</th>
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<td>Resources: <a href="http://www.cloudian.com/resources/#wp">http://www.cloudian.com/resources/#wp</a></td>
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**Brief Overview Statement:**
Object storage software designed to be run behind the firewall within the corporate datacenter on commodity X86 based hardware. This provides an Amazon S3 look and feel as a private storage cloud with infinite scale. All S3 applications run on premise as if they were interfacing directly to Amazon’s cloud.

**Feature/Capability Highlights (top 3):**
- 100% Amazon S3 API compliance
- Multi-tenant, multi-region, multi-datacenter
- Data tiering to Amazon S3 and Glacier

**Storage Usage models (top 3):**
- Enterprise File Sync and Share
- OpenStack/CloudStack storage
- Cold storage/archival

* Information provided by ISV. Not verified by Intel.

* Other brands and names are the property of their respective owners.
Maxta Storage Platform

- **Target Customers:** Enterprises, Small and medium business, Public/Private Cloud service providers
- **Storage Interfaces:** NFS, VM-centric storage
- **Efficiency technologies:** Dynamic Auto Tiering, Snapshots, Zero-copy clones, Capacity optimization (Thin Provisioning, Compression and De-duplication), and Flash optimized
- **Geos supported:** Americas, EMEA and APJ
- **Distributors (where product can be purchased):** Value Added Resellers and Distributors
- **Training & Support offered:** Product Training (Web conference and/or face-to-face) and Hands on Labs
- **Pricing:** Based on Raw Capacity and includes all storage features. Perpetual and Subscription pricing options

**Brief Overview Statement:**
Maxta's groundbreaking software-defined, VM-centric storage platform dramatically simplifies IT, while delivering significant cost savings. It enables the convergence of compute and storage on standard servers, leveraging server-side flash and disk drives to optimize performance and capacity. Maxta enables shared storage with enterprise-class data services and full scale-out without performance degradation.

**Feature/Capability Highlights (top 3):**
- Data Integrity and Dynamic Auto Tiering
- Snapshots and Zero-copy clones, Capacity
- Replication and High Availability

**Storage Usage models (top 3):**
- Primary Storage
- Virtual Desktop Infrastructure
- Remote Office and Branch Office

*Other brands and names are the property of their respective owners.*

Information provided by ISV. Not verified by Intel.
Target Customers:
For Integrators, Enterprises or CSPs deploying storage in the datacenter or public/private cloud.

Storage Interfaces:
Block/File/Object over FC/SAS/Eth and FCOE fabrics

Efficiency technologies:
Snapshot, Thin Provisioning, Replication, Block to Object Back Up. Media Tiering, Media caching

Geos supported: USA, EMEA, ASIA

Distis (where product can be purchased):
Please consult sales@mpstor.com

Training & Support offered:
3 support packages and free online webinar based training.

Pricing:
Storage is priced per managed storage device (i.e HDD).

Links:

Brief Overview Statement:
MPSTOR's software integrates in a single product scale out automated provisioning of Storage, Compute and Networking for OpenStack and VMWARE. MPSTOR solves the 6 big storage issues for datacentres of resiliency, diverse workload management, Capex&Opex, storage security, scalability and multiple consumer types.

Feature/Capability Highlights (top 3):
- Full featured Block, File and Object store across multiple fabrics and media types
- Single downloadable distribution for Open platforms
- Single distribution integrating storage, OpenStack, and plug-ins for multiple hypervisors

Storage Usage models (top 3):
- Elastic Block & Object stores for public or private clouds
- Video storage
- SMB Storage

* Other brands and names are the property of their respective owners

Information provided by ISV. Not verified by Intel.
Brief Overview Statement:
Software Defined Storage platform delivering Enterprise-class, High Performance Storage
Full-featured NAS/SAN software platform that can be installed on standard commercial hardware with capabilities that exceed the capabilities of legacy storage systems. NexentaStor is the leading hardware-independent Open Storage solution with a ZFS-based architecture. The key benefits of software-defined storage over traditional storage are increased flexibility, automated management, and cost efficiency.

Feature/Capability Highlights (top 3):
- Unified file and block services (NFS, CIFS/SMB, iSCSI, FC)
- unlimited snapshots and clones, inline data reduction with high performance, asynchronous replication
- Based on open source ZFS, with specific enhancements to add scalability, availability, and durability
- Very high performance from advanced caching – read I/O mostly served from DRAM, then SSD, then backend disk

Storage Usage models (top 3):
- Cloud Hosting Providers
- Cheap & Deep High Performance
- Archiving databases
ProphetStor Federator SDS

**Target Customers:** Enterprises, cloud service providers

**Storage Interfaces:** Block (iSCSI & FC)

**Efficiency technologies:**
Unified policy-based provisioning for different tiers of storage from different vendors, traffic modeling, dynamic caching, block-based disaster recovery

**Geos supported:** North America and APAC

**Distis (where product can be purchased):** Authorized reseller and system integrator

**Training & Support offered:** yes

**Pricing:** Capacity based subscription and perpetual license

**Links:**
- Federator connects to many storages through their Cinder driver listed here: [https://wiki.openstack.org/wiki/CinderSupportMatrix](https://wiki.openstack.org/wiki/CinderSupportMatrix)

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**Brief Overview Statement:**
A federated management framework including data services and analytics that enable cloud service providers and enterprises to reduce cost and improve data agility and time to value.

**Feature/Capability Highlights (top 3):**
- Unified policy-based provisioning for different tiers of storage from different vendors
- Traffic modeling, dynamic caching
- Block-based backup for rapid disaster recovery

**Storage Usage models (top 3):**
- Cloud computing automated provisioning and tiering
- Performance optimization by traffic analytics and elastic resource control
- Local and remote block-level disaster recovery

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*Other brands and names are the property of their respective owners*
Red Hat Storage

**Target Customers:**
- Large enterprises
- Private and public cloud providers
- Service providers

**Storage Interfaces:**
- Scale-out File storage (Hi-Perf, NFS, CIFS, HDFS), with optional object interface

**Efficiency technologies:**
- Encryption (at rest)

**Geos supported:**
- Global

**Distis (where product can be purchased):**
- Direct and channel

**Training & Support offered:**
- Virtual sales training (1.5 hrs)
- Virtual SE training (17.5 hrs, with hands-on virtual servers)
- Reference architectures and technical webinars
- Worldwide support

**Pricing:**
- Priced per server

**Links:**
- [http://www.redhatgrid.com/storage-test-drive/partnercompany](http://www.redhatgrid.com/storage-test-drive/partnercompany) (co-branded campaign site)

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**Brief Overview Statement:**
Red Hat Storage connects clusters of standard x86 servers into a single pool of storage. Meets criteria for scale-out storage, with a shared nothing architecture and the ability to scale capacity independently from performance. Commercially supported version of GlusterFS community project.

**Feature/Capability Highlights (top 3):**
- Data protection (against server and site failures)
- Seamlessly extensible and self-healing
- Ships as ISO image for on-premise use or as an Amazon AMI for public cloud use

**Storage Usage models (top 3):**
- Content storage (large files, including video, audio, image, scientific, geospatial)
- Big Data analytics (Hadoop, Splunk, etc.)
- Backup storage

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* Other brands and names are the property of their respective owners.

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Information provided by ISV.
Not verified by Intel.
**Target Customers:**
- Large enterprises
- Private and public cloud providers
- Service providers

**Storage Interfaces:**
- Object and block storage

**Efficiency technologies:**
- Erasure coding
- Cache tiering

**Geos supported:**
- Global

**Distis (where product can be purchased):**
- Direct and channel

**Training & Support offered:**
- Virtual, public, and private training available
- Reference architectures and technical webinars
- Offices in North America, support available worldwide

**Pricing:**
- Priced per TB (capacity model)

**Links:**
- Inktank Ceph Enterprise
- Resources and Professional Services
- Inktank University

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**Brief Overview Statement:**
Expanded now beyond the cloud to cold storage and archiving, Inktank Ceph Enterprise™ is a solution combining the most stable version of Ceph for object and block storage with a Ceph management platform, enhanced integration tools, and support services: everything needed to confidently run production Ceph clusters at scale.

**Feature/Capability Highlights (top 3):**
- Erasure coding (for archiving and cold storage)
- Cache tiering (for hot-to-cold data management)
- Ceph management platform (Calamari) (for monitoring and management)

**Storage Usage models (top 3):**
- Cloud storage
- Cold storage
- Archival storage

* Other brands and names are the property of their respective owners

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Information provided by ISV.
Not verified by Intel.
Target Customers:
Company size doesn’t matter - large data footprints do. Enterprises looking for private cloud storage, archiving, DR or content distribution and management that fall in all industries. Web 2.0 companies to support web and mobile apps is a shoe-in.

Storage Interfaces:  Object, File

Efficiency technologies:  Erasure Code, Replication

Geos supported:  All

Distis (where product can be purchased):  SwiftStack

Training & Support offered:
Yes, both on OpenStack Swift and also on SwiftStack (24x7 critical)

Pricing:
Yearly subscription for Usable TB under management

Brief Overview Statement:
SwiftStack powers enterprise customers with a durable, massively scalable, software defined object storage platform that seamlessly integrates with existing IT infrastructure and manages any standard hardware across multi-geographic data centers.

Feature/Capability Highlights (top 3):
- Massive uninterrupted scalability
- Simplicity of management:
- Seamless integration into the enterprise

Storage Usage models (top 3):
- Web and mobile application asset storage
- Private Cloud deployments
- Backup, archiving, DR

Links:
- Concur: https://swiftstack.com/static/global/media/CaseStudy_Concur_Final.pdf
- Seagate Kinetic Platform in Action: https://www.youtube.com/watch?v=-TTflA2IMr8
- HP Helion: https://www.youtube.com/watch?v=XPUnRB9LIH8
- Fred Hutchinson Cancer Research Center: https://www.youtube.com/watch?v=Ym7e9C9BL-4#start=0:00;end=25:06;cycles=1;autoreplay=false;showoptions=false

*Other brands and names are the property of their respective owners
## VMware Virtual SAN

### Target Customers:
Enterprise, Commercial, and Mid-market – including Service Providers

### Storage Interfaces:
Block

### Efficiency technologies:
Thin provisioning, auto-tiering, replication, storage policy-based management (QoS), load balancing

### Geos supported:
All geos

### Distis (where product can be purchased):
All Distis where channel partner currently transacts VMware products

### Training & Support offered:
Please check VMware Partner University for VSAN Sales, Technical Sales, and Post-Sales trainings

### Pricing:
- Stand alone Virtual SAN priced per CPU
- Virtual SAN for Desktop priced per CCU (concurrent users)
- Included in the Horizon 6 Advanced and Enterprise Editions – priced per Named User or CCU

### Links:
- Community: [https://communities.vmware.com/community/vmtn/vsan](https://communities.vmware.com/community/vmtn/vsan)
- VMware Infrastructure Planner Tool: vip.vmware.com/salessignup

### Brief Overview Statement:
Virtual SAN is a new software-defined storage tier for vSphere, and it is a hypervisor-converged storage embedded in the vSphere kernel. By clustering server-side hard disks and solid state drives (HDDs and SSDs), Virtual SAN creates a flash optimized, highly resilient shared datastore designed for virtual environments.

### Feature/Capability Highlights (top 3):
- Radically simple VM based policy-driven storage (no more LUNs/Volumes & no RAID config)
- High Performance (2M IOPS from 32 clusters) with granular and linear scaling
- Lowers TCO by as much as 50% compared to traditional storage. Runs on standard x86 servers and easy to provision and manage

### Storage Usage models (top 3):
- Virtual Desktop (VDI) workload
- Tier 2 production and Staging Test/Dev
- DR Target

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*Other brands and names are the property of their respective owners*
Intel® Cache Acceleration Software

Brief Overview Statement:
Cost-effective way to quickly improve application SLAs without modification to the application or storage architecture

Storage Usage Models (top 3):
- Big Data
- Virtualization
- Database

Target Customers/Segments (end user):
- Any I/O bound application including:
  - Database (e.g., Microsoft SQL, Oracle, MySQL)
  - Business intelligence, sales analytics (SAP, SAS)
  - Customer CRM, marketing analysis (e.g., NAV)
  - Business process, financial analysis, logistics

Feature/Capability Highlights:
- Selective Optimized Caching
- SSD Performance without Migration Cost
- Built in Data Integrity

Hardware Options:
- Any standards based server
- Any Intel® Data Center SSD

Training/Support Model:
www.intel.com/CAS
- Free 30 day trials available on-line
- Free I/O Assessment tool on-line
- Available through distributors and resellers worldwide
- Support available through Intel call centers
Target Markets and Customers:
Government research, academic, large scale enterprises with technical applications, energy exploration, earth sciences, weather and climate, manufacturing
Private and public cloud providers
Service providers

Storage Interfaces: Very fast and highly scalable scale-out parallel storage with block interface to object-based data

Efficiency technologies:
Unique software ‘connectors’ that lower the barrier to adoption for Hadoop MapReduce applications; tiered storage (HSM) framework for integration with leading ISV solutions; intuitive UI simplifies management complexity and raised storage productivity

Geos supported: Global

Distribution: Global OEM and integrator partner network

Training & Support offered:
- Virtual, public, and private training available for partners & end users
- Reference architectures and technical webinars

Pricing: Annual subscription-based pricing based on number of object storage servers

Links:
- [http://lustre.intel.com](http://lustre.intel.com)

Brief Overview Statement:
Purpose-built for high performance computing, Intel® EE for Lustre adds vital features not found in standard Lustre software. These features help lower management complexity and cost – and expose interfaces that can be used for further integration. The software ‘connectors’ allow HPC users to more easily work with Hadoop for analytics.

Feature/Capability Highlights (top 3):
- Massive throughput and scaling supporting virtually unlimited number of clients
- Intel® Manager for Lustre UI simplifies management complexity
- Unique software ‘connectors’ for Hadoop MapReduce on HPC

Storage Usage models (top 3):
1. High throughput scale-out parallel storage designed for high performance computing
2. Hadoop MapReduce workloads targeted for deployment on HPC class resources
3. Tiered storage for data intensive computing configurations coupling Lustre & ISV tools

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Summary

Expansive Data Growth

*Breaks traditional storage models, but creates new opportunities*

Intel Components

*The foundation for your storage solutions*

ISV Storage Software

*Deliver innovative solutions to market, paving the way for SDS tomorrow*
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