NIMBUS DATA

Enterprise Solid State Storage:
Enabling Scalable and Sustainable Datacenters

Thomas Isakovich

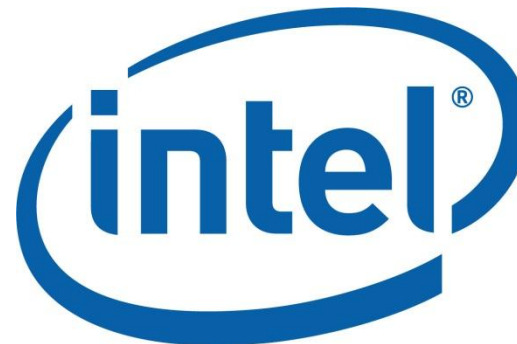*CEO & Founder*

April 4, 2011

COMPUTERWORLD   SNIA
SNW

Nimbus is the leading provider of solid state storage systems, or **Sustainable Storage™**, designed as intelligent and resilient primary storage for enterprises & datacenters.

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Who Uses Nimbus?

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What are Analysts Saying?

"Nimbus' approach runs counter to the accepted notion in storage over decades by addressing underlying causes rather than merely ameliorating symptoms."

\- Mark Peters

ESG
Enterprise Strategy Group

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What are Analysts Saying?

"Comprehensive designs, such as Nimbus' S-class Enterprise Flash Systems, that deliver increased performance and high availability at far lower OpEx, are a welcome solution to today's challenges."

- Jeff Janukowicz

What are Analysts Saying?

"Nimbus S-Class Sustainable Storage is shattering the price-performance curve. Few systems can match the S-class in NAND capacity, functionality, and sustained performance."

- Marc Staimer

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What are Analysts Saying?

"Nimbus offers a pure solid state and highly reliable platform with complete storage services, a critical part of the transition to SSD as the dominant storage within the next 5 years. "

- George Crump

Storage Switzerland

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Market Forecast

Enterprise solid state shipments will double to 762,400 units and $800 million in 2011, **growing to $2.5 billion by 2014**.

IDC
Analyze the Future

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What's Wrong with Storage?

▶ **Performance and efficiency are stagnant . . .**

> › . . . While storage demands increase exponentially
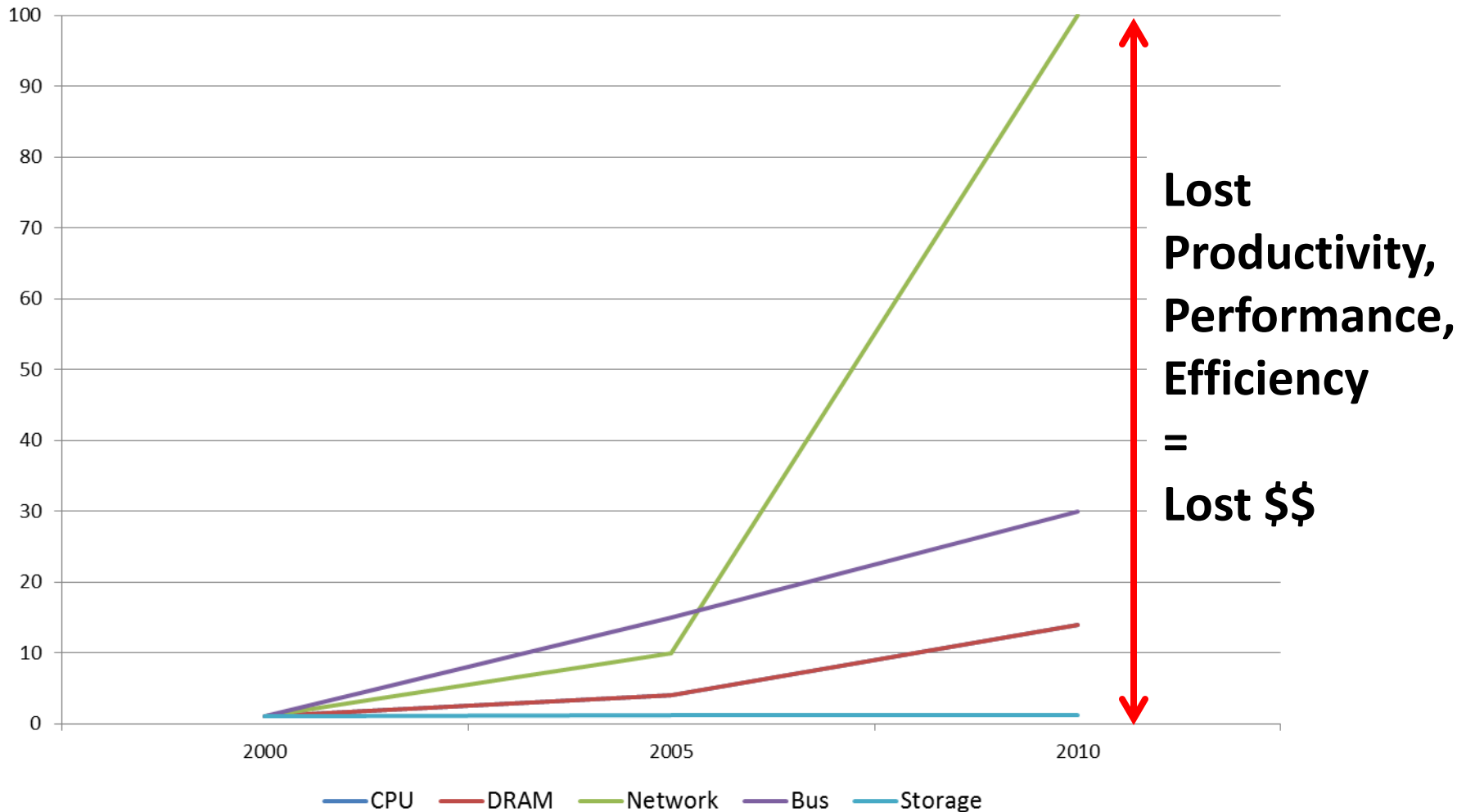> › . . . And workloads become more IO intensive

A Decade at the Back of the Line

	2000	2005	2010
CPU speed	**1 x** Pentium 4 1.5 GHz	**4 x** Pentium D 2.6 GHz	**14 x** Nehalem Quad 2.6 GHz
DRAM speed	**1 x** 2.1 GB/s DDR1 PC-2100	**4 x** 8.4 GB/s DDR2 PC2-4200	**14 x** 25.6 GB/s DDR3 PC3-8500
Network speed	**1x** 100Mb Ethernet	**10 x** Gigabit Ethernet	**100 x** 10 Gigabit Ethernet
Bus speed	**1 x** 133 MB/sec PCI 32/33 MHz	**15 x** 2000 MB/sec PCIe Gen1 x8	**30 x** 4000 MB/sec PCIe Gen2 x8
Storage speed	**1x** 3.8 ms seek Cheetah 15K.2	**1.2 x** 3.6 ms seek Cheetah 15K.4	**1.2 x** 3.6 ms seek Cheetah 15K.7

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Before Solid State…

Lost Productivity, Performance, Efficiency

=

Lost $$

CPU —— DRAM —— Network —— Bus —— Storage

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Unacceptable Alternatives

▶ **Option #1: More spindles**

› Does not address latency, increases failure risk, and multiplies power, cooling, and datacenter rackspace costs

▶ **Option #2: Short-stroke hard drives**

› Wastes 70% of storage capacity for limited speed gains

▶ **Option #3: Caching**

› Caches are 1000:1 oversubscribed, leading to inconsistent results

▶ **Option #4: Tiering**

› Unproven, adds management complexity, more hardware, and does not improve tier 1 performance

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NAND Flash as 15K Disk Replacement
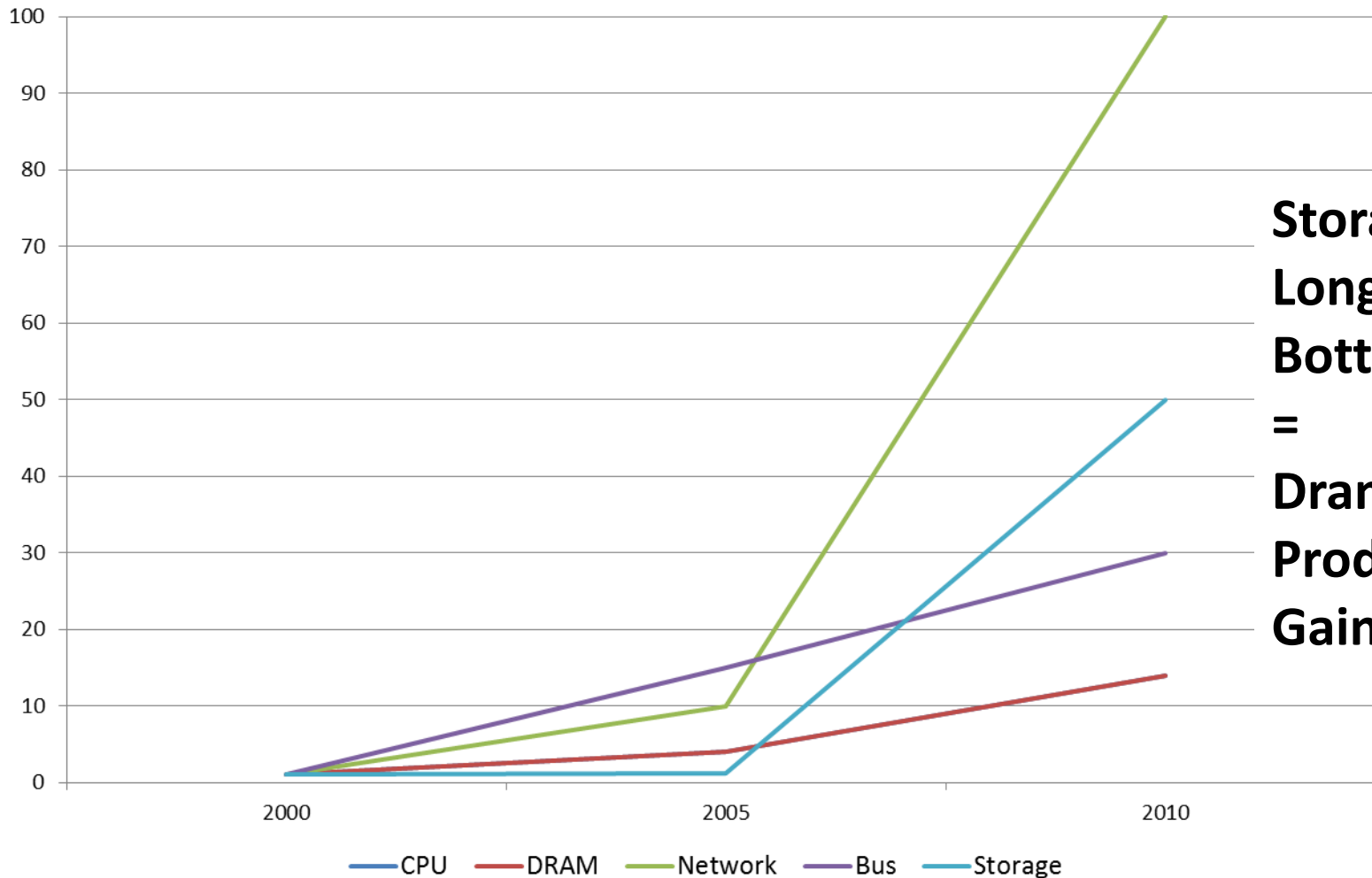
▶ **Huge Performance and Reliability Gains**

	15K HDD	**NAND Flash**	**Improvement**
Performance (IOps)	350	30,000	**86x greater**
Latency (ms)	10 ms	0.3 ms	**30x faster**
Reliability (MTBF)	1.2 M	2.0 M	**67% greater**
Rebuild Times	10-20 hrs	20-30 min	**40x faster**

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NAND Flash as 15K Disk Replacement

► **Significant Efficiency and Economic Gains**

	15K HDD	NAND Flash	Improvement
Power (W / TB)	30	5	**83% lower**
Efficiency (IO / W)	15	6,500	**433x higher**
Density (TB / U)	3	5	**67% higher**

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Challenges with Solid State

▶ **Issue #1: Cost**

 › Flash memory is typically 10 to 50x the cost/GB of 15K disk

▶ **Issue #2: Reliability**

 › Flash has a fixed lifespan that must be managed intelligently

▶ **Issue #3: Software**

 › Using flash as primary storage requires new file systems, software

▶ **Issue #4: Scale**

 › External networkable flash storage must expand non-disruptively

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The Nimbus Solution

▶ Sustainable Storage™

- › 100% NAND flash memory storage
- › > 10x higher storage performance
- › > 90% lower operating expenses
- › Superior reliability and availability

▶ Nimbus S-class Platform

- › Designed exclusively for flash memory
- › Total acquisition cost comparable to 15K disk arrays
- › Complete data protection and management software
- › Multi-protocol, unified SAN and NAS up to 250 TB
- › Up to 5 year enterprise-class warranty and service

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About Nimbus

▶ Milestones

› Profitable since 2009; privately-financed

› Over 200 Nimbus installations worldwide

▶ Awards / Recognition

› *Winner*: Product of the Year – *Storage Magazine, 2010*

› *Winner*: Best Midrange Storage – *Tech Awards Circle, 2010*

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System Architecture

▶ **Hardware Details**

› 2.5, 5.0, and 10.0 TB sizes, scalable to 250 TB

› 2U rackmount chassis, redundant components

› No single point of failure cluster configuration

› Up to 4 active-active network IO modules

▶ **Enterprise Flash Blades**

› 6x more durable than MLC

› 28% NAND overprovisioning

› Wear-leveling to distribute load

› IO shaping to prevent burn-out

› Real-time garbage collection

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FlexConnect Technology

▶ **Up to 4 network IO modules**

› 10 Gigabit Ethernet (up to 16 ports)

› 8 Gb Fibre Channel (up to 8 ports)

› 40 Gb Infiniband (up to 8 ports)

▶ **Multi-protocol**

› SAN

› NAS

▶ **Active-active Design**

› All ports active in parallel for load-balancing and failover

› Supports all protocols simultaneously for true unified storage

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HALO Operating System

▶ **Nimbus File System**

› 64-bit scalability (up to 4,096 PB)

› No silos: block and file data unified

› Expand storage and volumes on-the-fly

› No pre-allocation: < 3% file system overhead

▶ **Storage Protocols**

› iSCSI

› FC

› NFS

› CIFS

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HALO Data Protection

► **Snapshots**

› High-performance, writable snapshots

› Space-efficient and instantaneous

► **Replication**

› Continuous, "always-on" for superior data protection

› Asynchronous IO for zero local performance impact

› Bandwidth throttling and automatic recovery on link failures

► **Mirroring / HA**

› Synchronous IO for local/campus mirroring

› Automatic failover to secondary Nimbus system

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HALO Data Management

▶ **Deduplication**

  › Block-based and inline

  › Perfect for VM and VDI deployments

  › Superior tiger2 hash algorithm eliminates collisions

  › Up to 10:1 data reduction in real-time

▶ **Thin-provisioning**

  › Create up to 250 TB "virtual" LUNs

  › Consumes storage capacity only as needed

  › Eliminates client-side file system management

▶ **Data Elimination**

  › Instant secure erase capability

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HALO Administration

▶ **Application Integration**

› Microsoft Exchange, SQL Server, and SharePoint-aware

› VMware ESX/vSphere support

› Citrix XenServer support

› Oracle RAC, ASM support

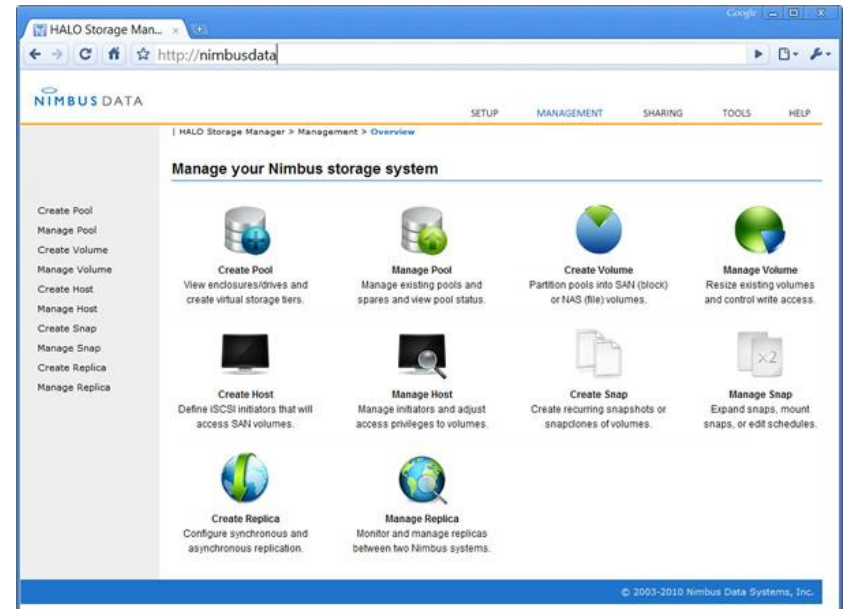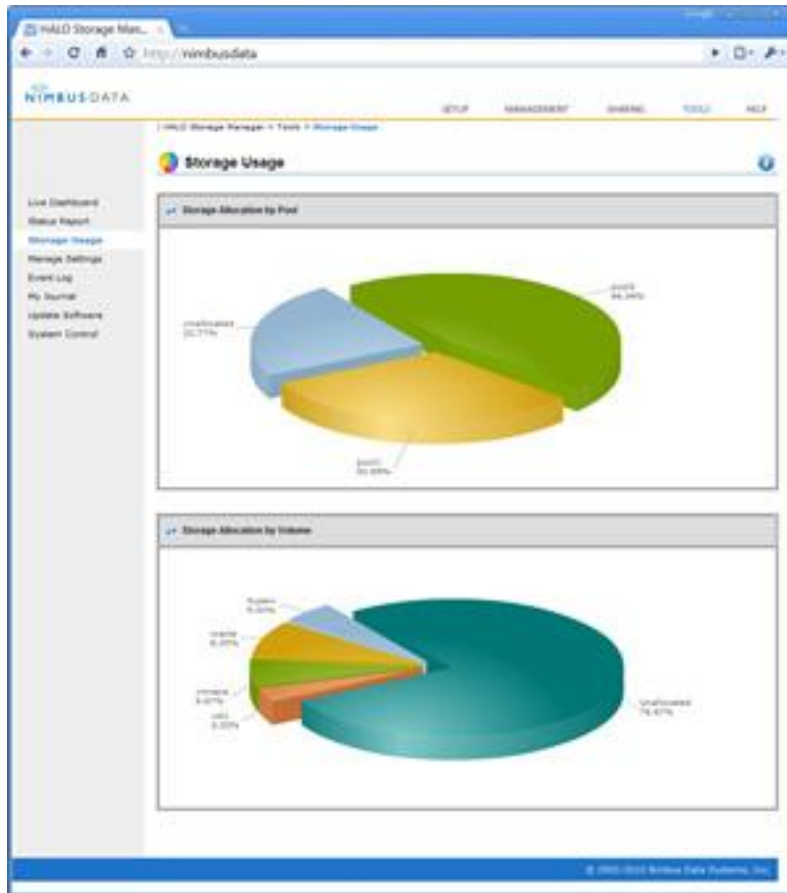▶ **Full CLI**

› Management via command line interface

› Fully documented and scriptable

▶ **Web/Mobile Management**

› Intuitive web management interface

› Apple iPhone and iPad native management interface

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HALO Screenshots

Ideal Applications

▶ **Virtualization/VDI**

› Servers: Microsoft Hyper-V, Citrix Xen, VMware vSphere

› Desktops: VMware View, XenDesktop, Hyper-V

▶ **Databases/OLTP**

› Microsoft SQL Server, Exchange, SharePoint

› Oracle RAC, SAP, IBM DB2

▶ **HPC**

› Energy, scientific computing, biotech, healthcare, imaging

▶ **Cloud Computing**

› Public and private "cloud" providers, Web 2.0, content delivery

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Support and Services

► **Worldwide Onsite Support**

› USA, Canada, and European coverage

› 9AM to 5PM, next business day onsite service

› 24 x 7 x 365 same day onsite service

› Call center @ Nimbus HQ for optimal technical expertise

› Support contracts up to 5 years

› Spares kits available for customer self-service

› Security plan available for organizations with sensitive data

► **Installation and Training**

› 95% of customer self-install Nimbus systems

› Online certification training available

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Why Nimbus?

► Software

- › Complete multiprotocol SAN/NAS platform
- › Flash-focused file system optimizes reliability, performance
- › Advanced high availability, deduplication, and management features

► Hardware

- › Ground-up design maximizes flash performance, density
- › Modular, scale-on-demand to hundreds of TB's, PB's
- › Versatile 10 GbE, Infiniband, FC, and FCoE connectivity

► Model

- › Cost advantage through vertical integration, no disk legacy
- › Profitable company, 100's of customers, fiscally responsible growth

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