



HPC Storage Solutions at transtec

Parallel NFS with Panasas ActiveStor

HIGH PERFORMANCE COMPUTING AT TRANSTEC

More than 30 Years of Experience in Scientific Computing

1980: transtec founded, a reseller for DEC equipment

1987: SUN/SPARC workstations in portfolio

1991: IBM RS/6000 systems in portfolio

2000: „Kepler Cluster“ in Tübingen installed (#215 in **TOP500**)

2003: transtec HPC cluster at **RRZ Erlangen** no. 317 in **TOP 500**

2005: transtec is **key supplier** for **CERN** in Geneva

2007: transtec HPC cluster at **KIT Karlsruhe** no. 104 in **TOP 500**

2010: transtec focusses on HPC as a **strategic business unit**

up to now: around **500 HPC installations** in Europe

HIGH PERFORMANCE COMPUTING AT TRANSTEC

High Performance Computing in Europe

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HPC Competence Center

HPC Lab:

- evaluating new technology
- configuration/preinstallation of customer systems

HPC Benchmark Center:

- running and evaluating **customers' applications**
- **remote customer access**

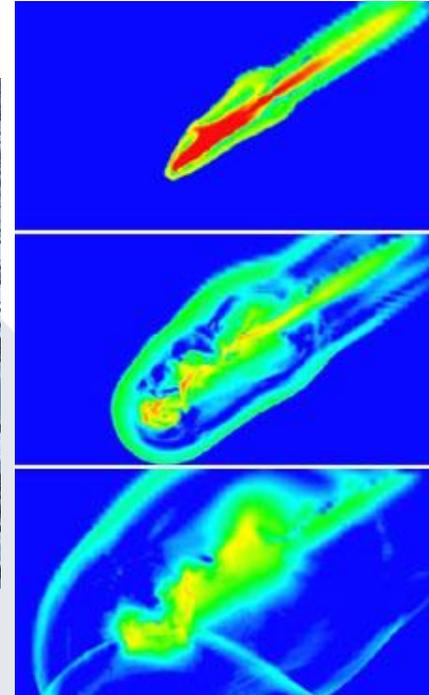
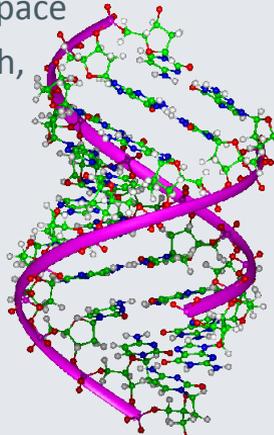
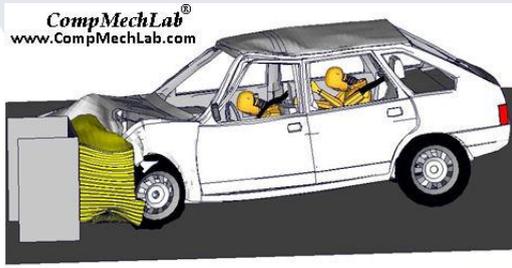
12 HPC Specialists in Sales, Presales, and Solution Engineering

HIGH PERFORMANCE COMPUTING AT TRANSTEC

Solutions for Getting Results Faster and Easier

transtec HPC solutions for scientific and technical **simulations** and **Big Data Analytics**:

- Life Sciences & Pharmaceutical
- Engineering, Automotive & Aerospace
- Climate & Environmental Research, Geophysics
- Finance & Insurance

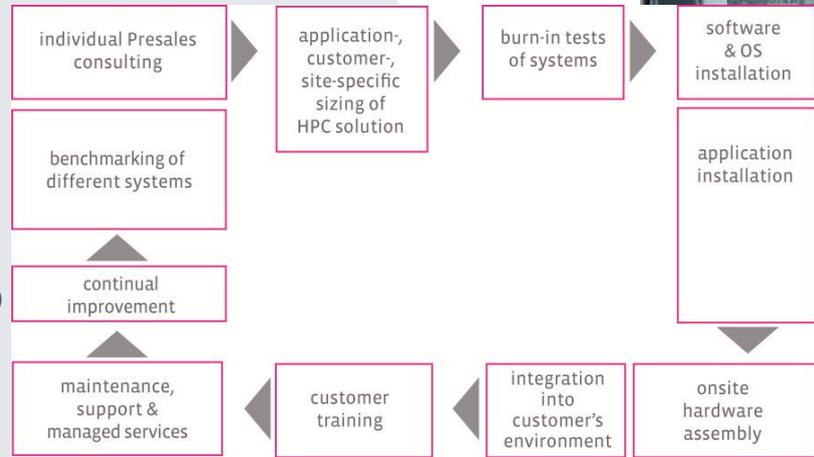


HIGH PERFORMANCE COMPUTING AT TRANSTEC

Customer Care From A to Z

comprehensive solutions for High Performance Computing (HPC)

- **turnkey**
- caring for the customer during the whole **solution lifecycle**:
 - from **individual consulting** to **managed services**
 - customers have access to **transtec benchmark center**

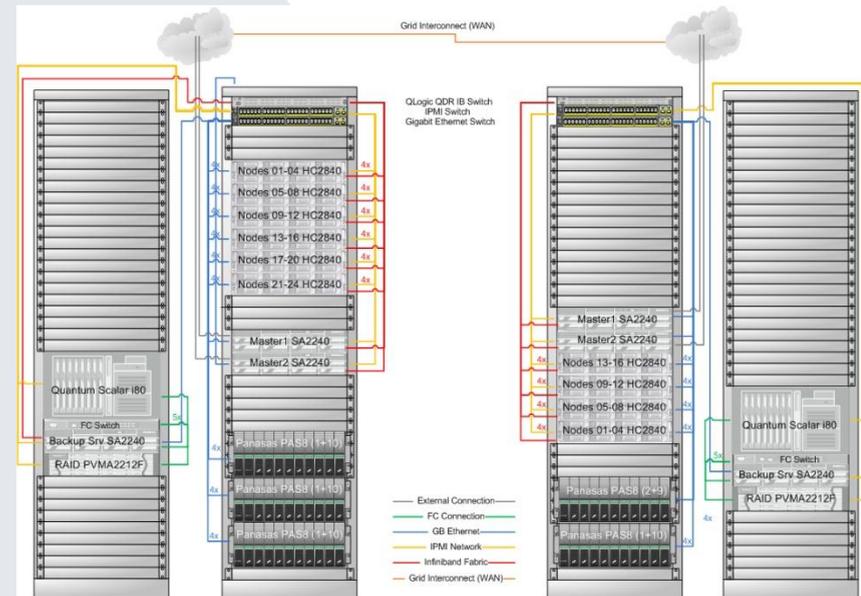


CASE STUDY 2011

Manufacturer of Engines and Generators – several European sites

Deployment of HPC cluster solutions at **2 sites** connected by a **dedicated WAN** link.

- II 40 nodes, 480 cores, total of 1,920 TB RAM, QDR InfiniBand interconnect
- II 200 TB parallel HPC storage
- II **Moab Grid Suite** as middleware layer for unified management of 2 sites
- II Installation and configuration of approx. **13 productive applications**, integration into Moab **workload management** system
- II very high demands on energy-efficiency and user- and admin-friendly application management



STORAGE DEMANDS IN HPC

- || need for **computing power**
 - due to need to run larger and more accurate models
 - more CPUs, more cores, more nodes, more RAM
 - || need for **network performance**
 - more highly parallellized jobs
 - high-speed interconnects (10GbE, InfiniBand,...)
 - **massive explosion of data sets**
 - demand for
 - **large storage capacity**
 - **high bandwidth**
 - **low latency**
-

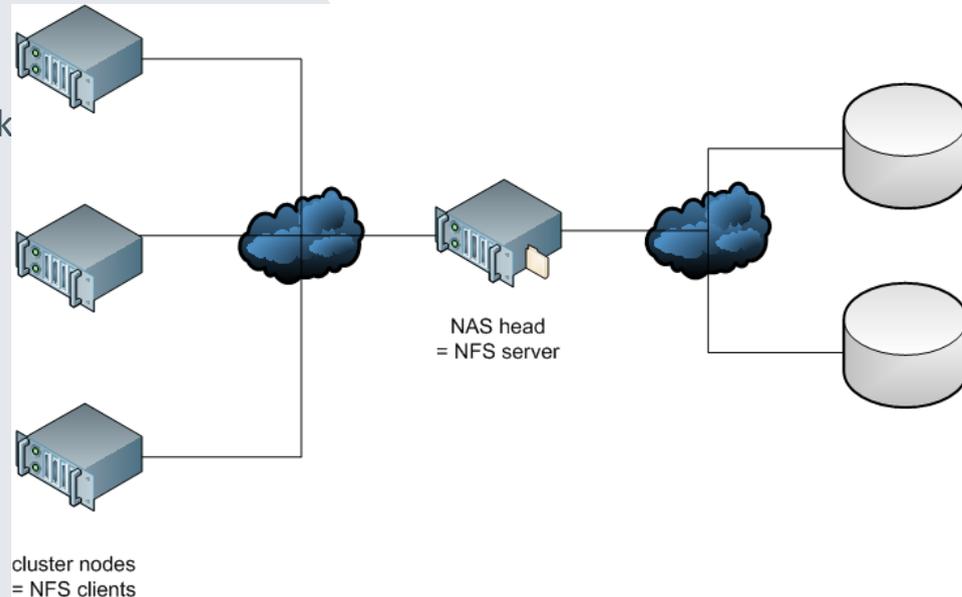
DEFICIENCIES OF TODAY'S SOLUTIONS

II most widespread solution: **single NFS server**

- does not scale: NFS head is bottleneck
- „high-speed“ NFS server will be bottleneck by tomorrow

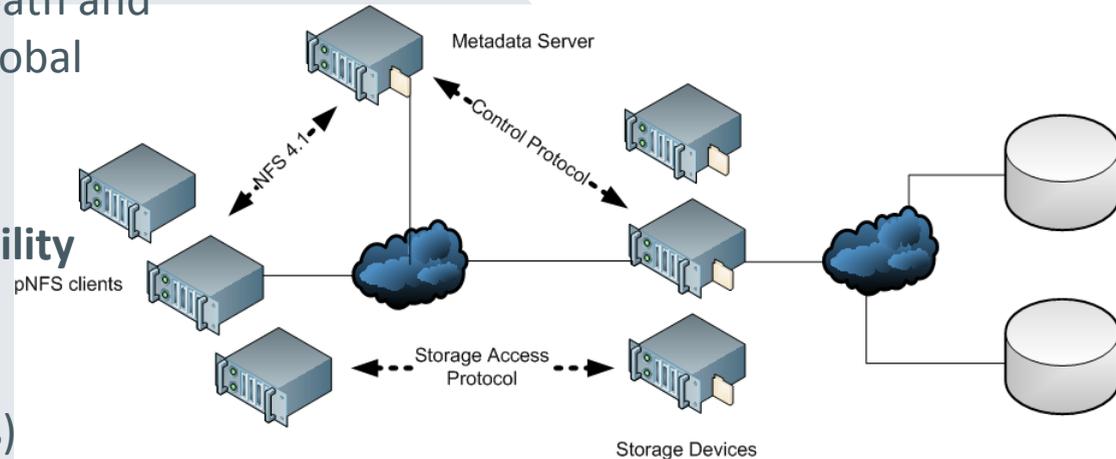
II „clustered NFS“: problematic

- either head-to-head synchronization limits scalability
- or manual partitioning of global namespace is cumbersome
- NFS is not suitable for dynamical load balancing (inherent state)



PARALLEL NFS (PNFS): GENERIC ARCHITECTURE

- || **separation of metadata path and data path (out-of-band global namespace)**
- || **built for interoperability and backwards-compatibility**
- || **flexible design allows for different storage implementations (layouts)**

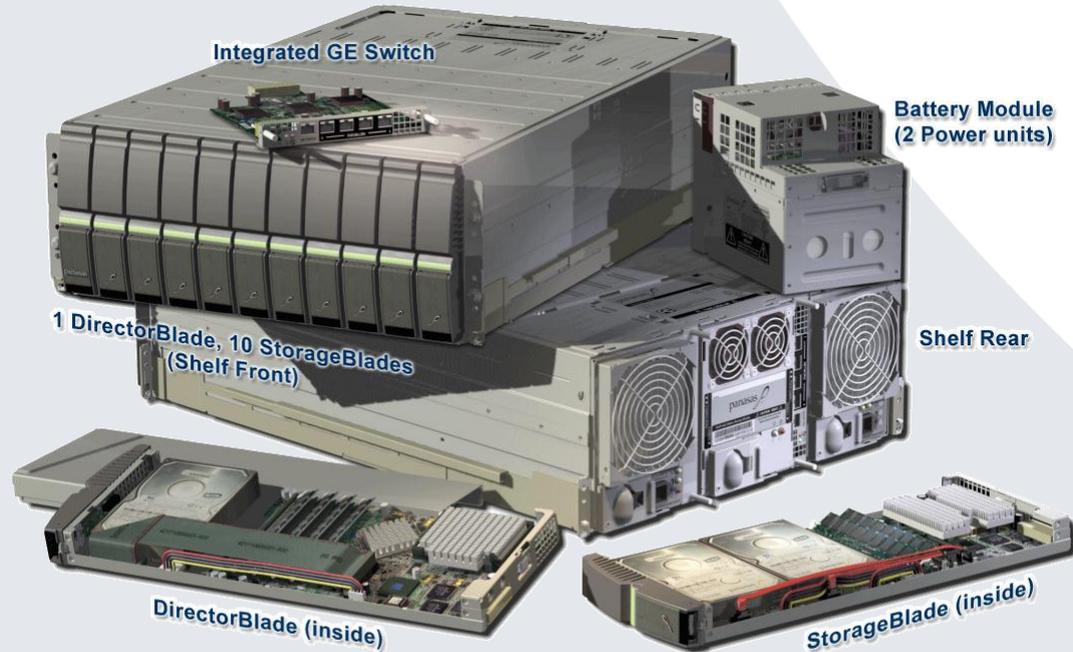


PANASAS HIGH PERFORMANCE STORAGE FROM TRANSTEC



- || Blade-based parallel NFS appliance
 - || 11 blades per shelf = approx. 60 TB in 4 U
 - || Approx. 1.5 Gbyte/sec aggregate bandwidth per shelf
-

PANASAS HIGH PERFORMANCE STORAGE FROM TRANSTEC



PANASAS ACTIVESTOR 11 AND 12 SPECS

	ActiveStor 11	ActiveStor 12
Product Focus	Balanced Capacity & Performance	Highest Performance
Read Throughput (MB/sec)	1,150	1,500
Write Throughput (MB/sec)	950	1,600
File Creates/Sec. per Director Blade (Metadata Performance)	4,260	6,250
Capacity (TB)	40/60	40 / 60
Cache (GB)	40 + 8	80 + 12
Architecture	64-bit	64-bit
High Availability Network Failover	Optional	Standard
Link Aggregation	No	Yes

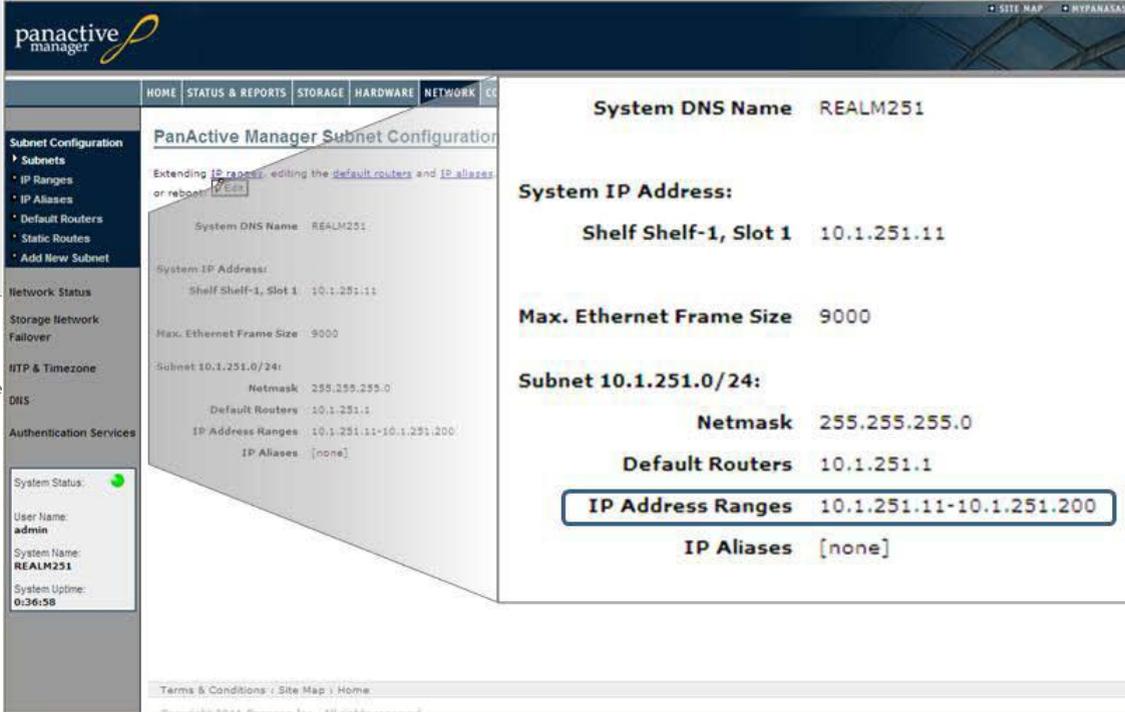
PANACTIVE MANAGER

- II Single Point of Management
- II Simple out-of-box experience
- II Seamlessly deploy new blades
- II Capacity & load balancing
- II Snapshots
- II 1-touch reporting capabilities
- II Scriptable CLI



EASY TO MANAGE

- II Scriptable CLI
- II Easy web-based or CLI-based setup



The screenshot shows the PanActive Manager web interface for Subnet Configuration. The main content area displays the following configuration details:

- System DNS Name:** REALM251
- System IP Address:** Shelf Shelf-1, Slot 1: 10.1.251.11
- Max. Ethernet Frame Size:** 9000
- Subnet 10.1.251.0/24:**
 - Netmask: 255.255.255.0
 - Default Routers: 10.1.251.1
 - IP Address Ranges: 10.1.251.11-10.1.251.200
 - IP Aliases: [none]

On the right side, a summary table lists the key settings:

System DNS Name	REALM251
System IP Address:	
Shelf Shelf-1, Slot 1	10.1.251.11
Max. Ethernet Frame Size	9000
Subnet 10.1.251.0/24:	
Netmask	255.255.255.0
Default Routers	10.1.251.1
IP Address Ranges	10.1.251.11-10.1.251.200
IP Aliases	[none]

The left sidebar contains navigation menus for Subnet Configuration, Network Status, Storage Network Failover, NTP & Timezone, DNS, and Authentication Services. A system status box shows 'System Status' as green, 'User Name' as 'admin', 'System Name' as 'REALM251', and 'System Uptime' as '0:36:58'.

```
0187ee222f0012# pancli
pancli -- Initial network setup

You may now configure the IP address, netmask, and default route
address of this system.

Would you like to setup the network now? (recommended)
[yes]

System IP Address: 10.1.251.11
Netmask: [255.255.255.0]
Default Router (type "none" to leave blank): [10.1.251.1]

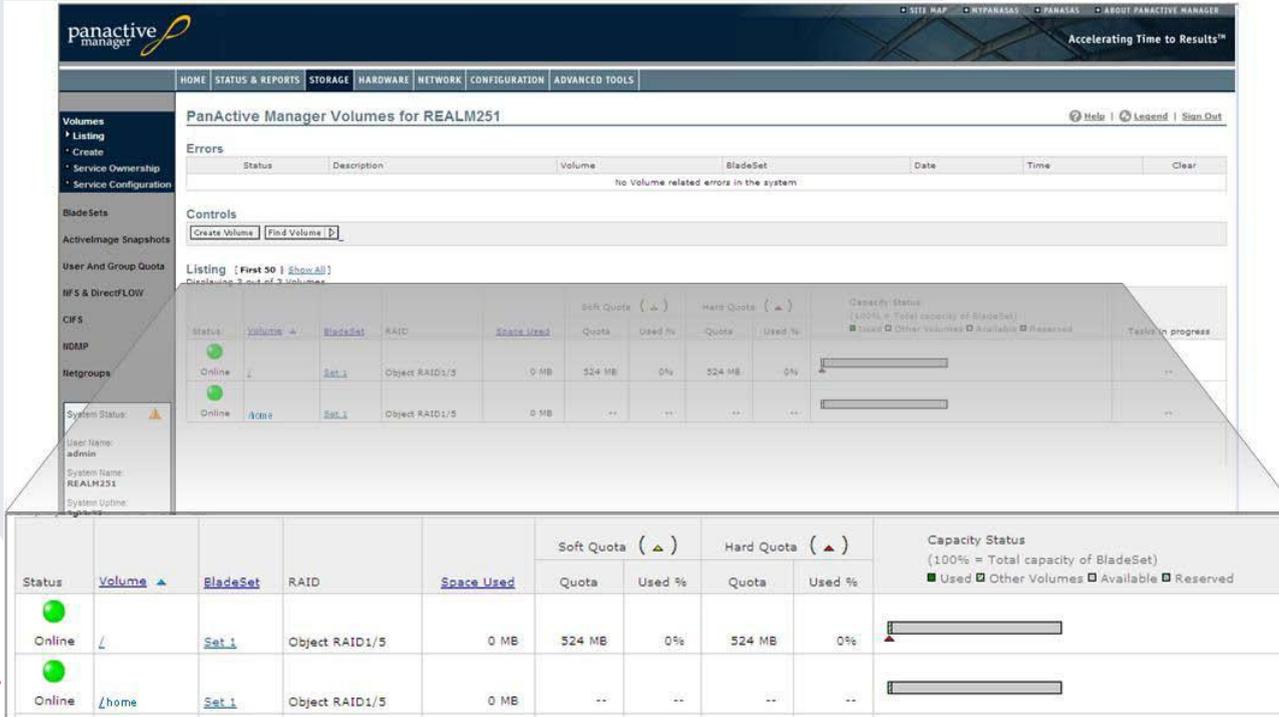
Validating entries. Please wait...

Settings chosen:
System IP Address: 10.1.251.11
Netmask: 255.255.255.0
Default Router: 10.1.251.1

Save settings? [yes]
```



EXTENSIVE MANAGEMENT AND MONITORING CAPABILITIES



The screenshot displays the PanActive Manager interface for REALM251. The top navigation bar includes links for HOME, STATUS & REPORTS, STORAGE, HARDWARE, NETWORK, CONFIGURATION, and ADVANCED TOOLS. The left sidebar contains a navigation menu with options like Volumes, Listing, Create, Service Ownership, Service Configuration, BladeSets, ActiveImage Snapshots, User And Group Quota, NFS & DirectFLOW, CIFS, NDMP, and Netgroups. The main content area is titled "PanActive Manager Volumes for REALM251" and includes a "Help | Legend | Sign Out" link.

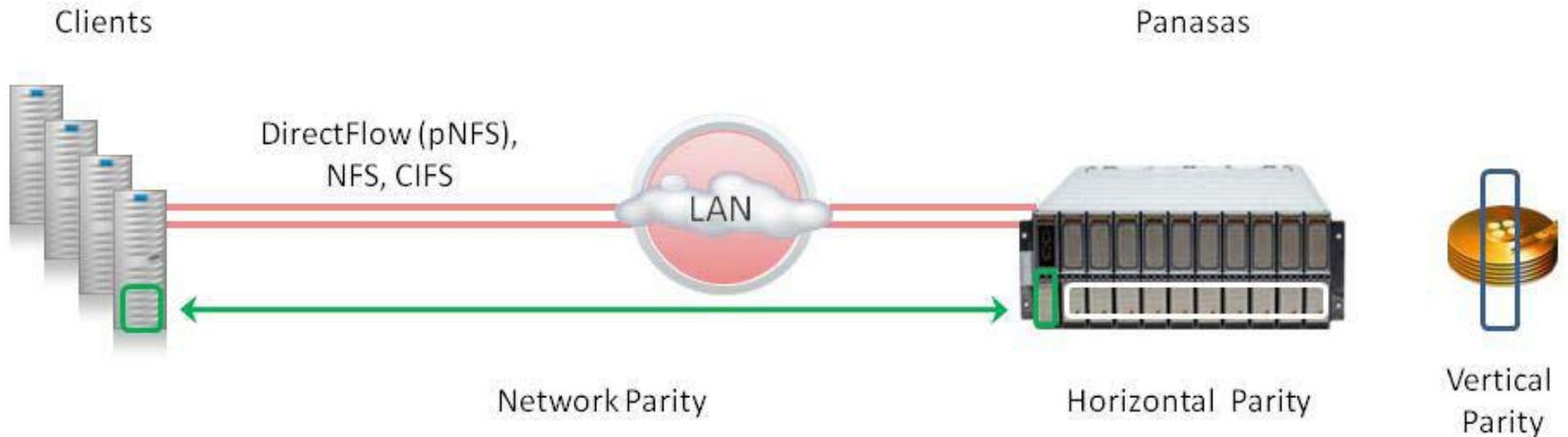
Below the title, there is an "Errors" section with a table showing no volume-related errors. A "Controls" section contains "Create Volume" and "Find Volume" buttons. The "Listing" section shows a table of volumes with columns for Status, Volume, BladeSet, RAID, Space Used, Soft Quota, Hard Quota, and Capacity Status. The table lists two volumes: "/" and "/home", both online and using Set 1 RAID1/5 configuration.

Status	Volume	BladeSet	RAID	Space Used	Soft Quota (▲)		Hard Quota (▲)		Capacity Status (100% = Total capacity of BladeSet) ■ Used □ Other Volumes □ Available □ Reserved
					Quota	Used %	Quota	Used %	
Online	/	Set 1	Object RAID1/5	0 MB	524 MB	0%	524 MB	0%	
Online	/home	Set 1	Object RAID1/5	0 MB	

The interface also shows system information in the bottom left: System Status: Online, User Name: admin, System Name: REALM251, and System Uptime: 19 days.

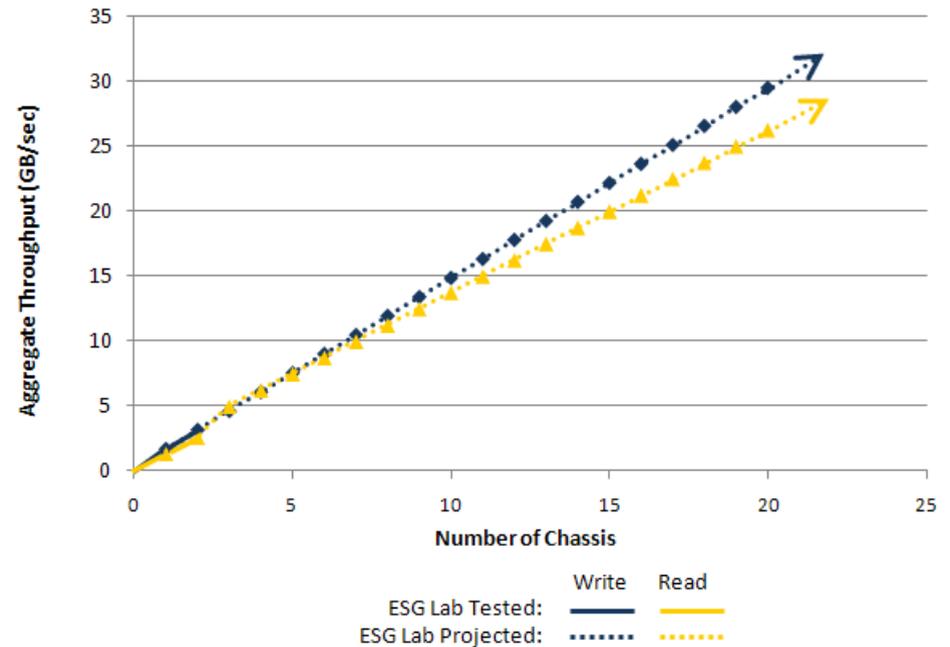
TIERED-PARITY RAID

- || 3-level parity: network, horizontal, and vertical



SCALABLE PERFORMANCE

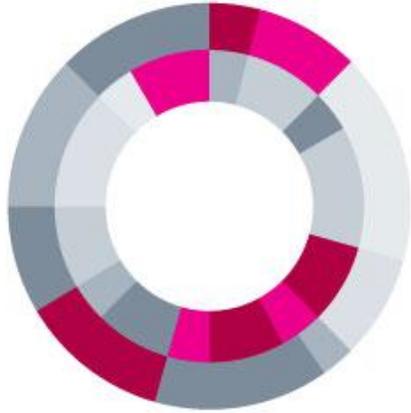
II ESG Labs Performance Tests with ActiveStor12 chassis



NEW: PANASAS ACTIVESTOR 14

- || additional SSD drives for increasing IOPs and metadata performance
- || 30-50% faster RAID reconstruction
- || enhanced management GUI with PanFS 5
- || approx. 80 TB per shelf raw capacity
- || 1.6/1.5 Gbyte/s write/read throughput per shelf
- || Approx 14,000 IOPs per shelf
- || More efficient double-parity algorithm





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accelerate productivity
