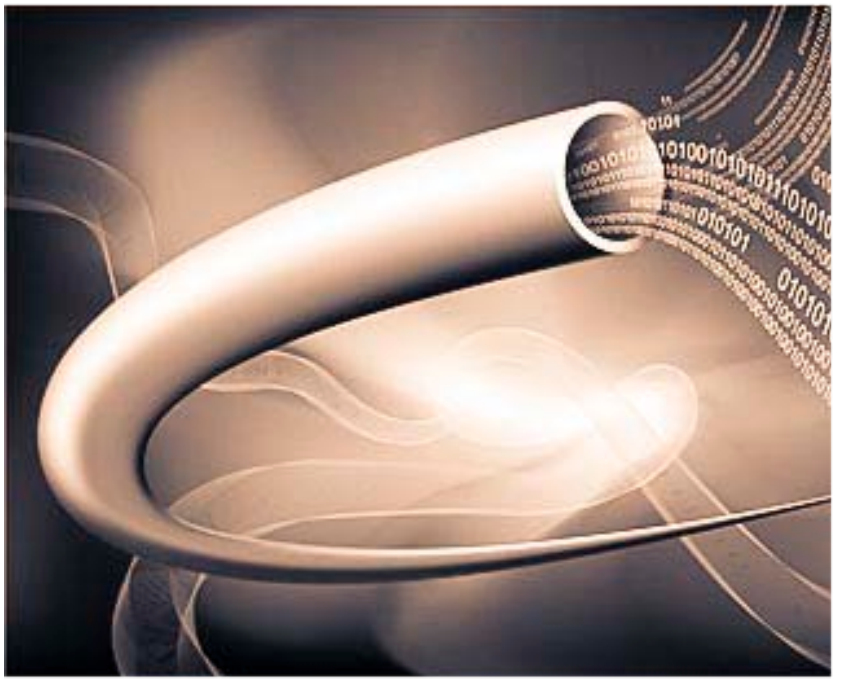
What Does Tiered Storage Really Do for Performance?

Doug Rainbolt, VP of Marketing

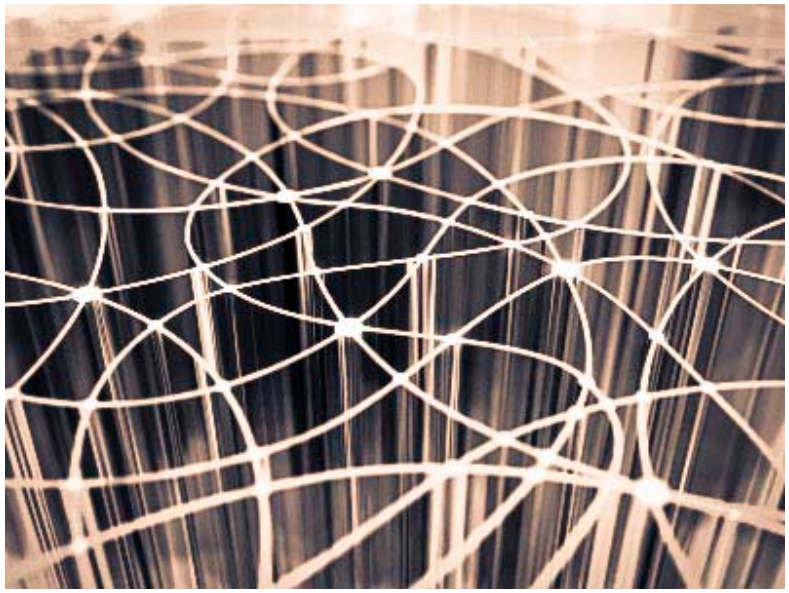
What Does Tiered Storage Really Do for Performance?

- What does this mean?
- The axiomatic “givens”
- Notion of two complimentary architectures
  - Capacity layer
  - Performance layer



Shifting to the World of NAS

- SSDs can add tremendous value to NAS, but where?
- An either/or approach is not necessary
- Understanding the cost of performance is required



Designing for Performance: What Does it Cost?

- The relative cost of media per I/O

Media	Cost per I/O
Rotational disk	$3
Flash	$.35
DRAM	Less than $.01

Courtesy of Taneja Group.

Designing for Performance: What Does it Cost?

- Systems costs for performance

Item	I/O Capability	Costs
Storage controllers and system costs	50,000 I/Os	$100,000
Rotational disk drives (250)	50,000 I/Os	$125,000
A few Flash drives	50,000 I/Os	$ 60,000
Total		$285,000

Courtesy of Taneja Group.

What Does Tiered Storage Really Do for Performance?

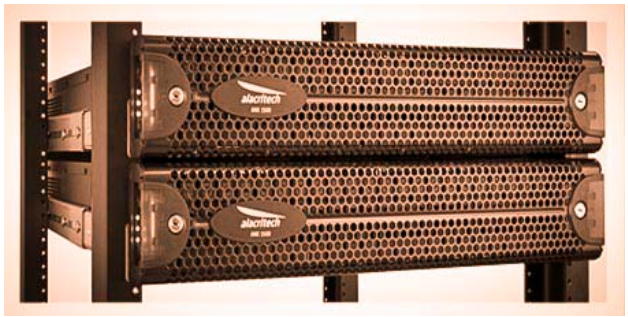
- Flash performance is only as effective as its hosting server performance
  - System bottlenecks can constrain Flash effectiveness
- Consider two approaches
  - Conventional server
  - Performance layer appliance
- Both applied to “moving data”……

Architectural Differences

- Conventional server
  - Multithreaded design
    - Sleeps
    - Wakeups
    - Interrupts
- Performance layer appliance
  - Single-stack design
    - No sleeps
    - No wakeups
    - No interrupts
  - CPU optimizations
    - Minimal spinlocks
    - Code optimizations for cache locality
    - Code optimizations memory locality
  - Dynamic TCP offload

Alacritech ANX 1500

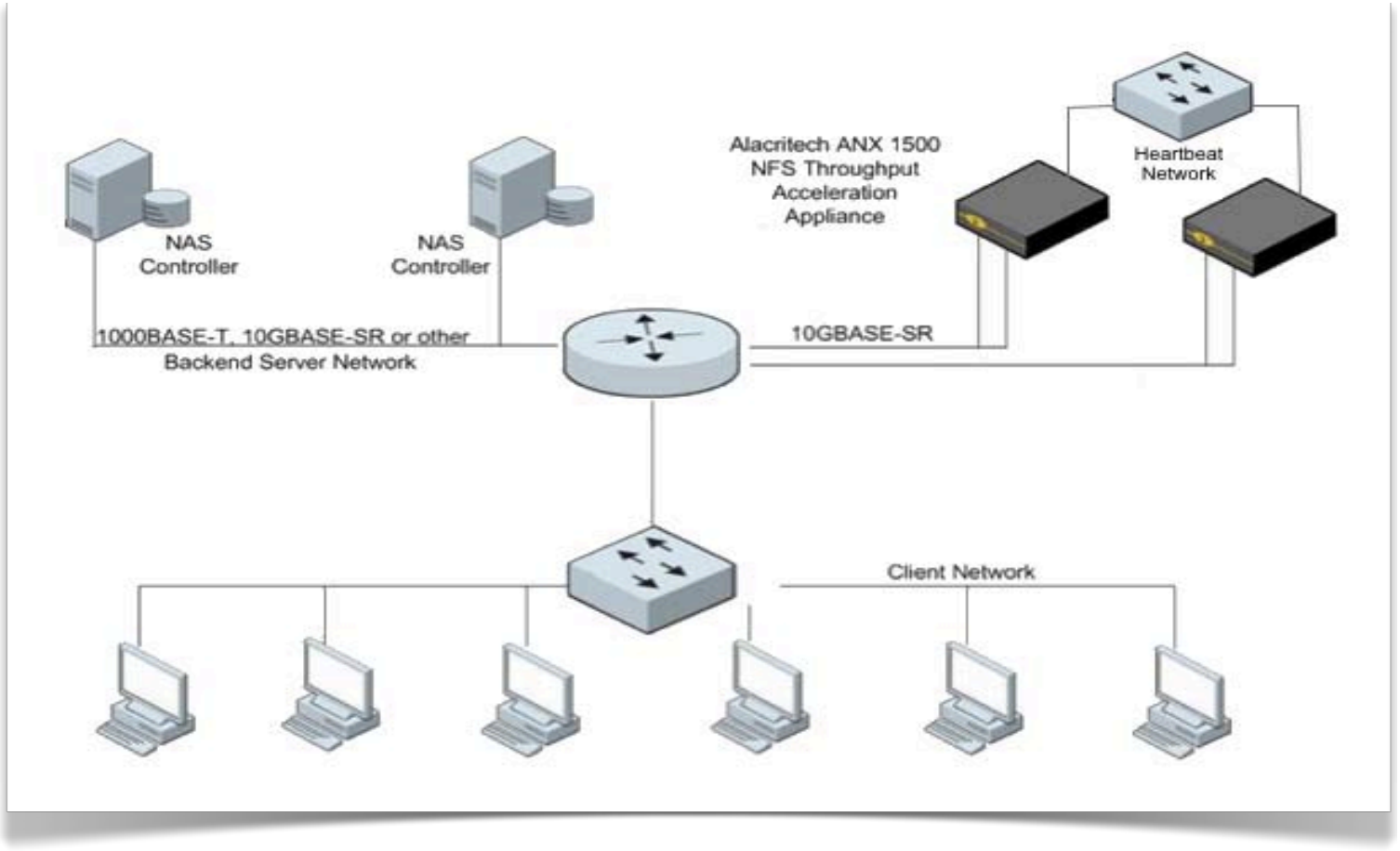
- Network storage acceleration appliance
  - Increases aggregate data throughput
  - Reduces latency
  - Lowers cost per OPS
- Full compatibility
  - Works with filer snapshots, de-dupe, mirroring, etc.
  - Maintains integrity of current storage infrastructure
- Speed
  - 2M+ metadata OPS
  - Lowest latency on SPEC.org
    (as of 07/26/2011)



Who Is Alacritech?

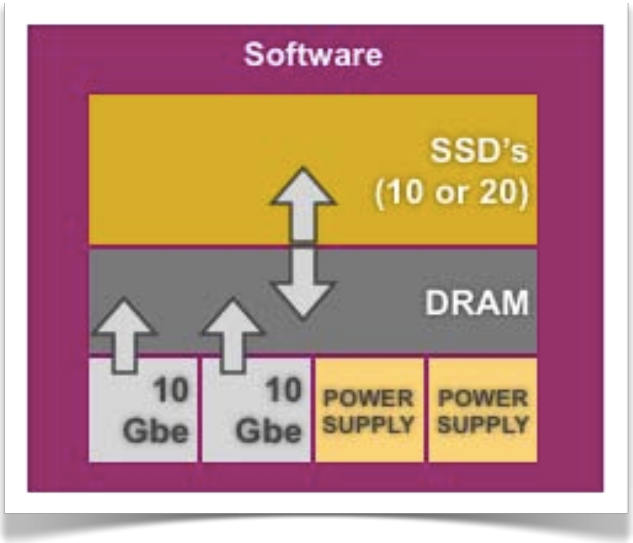
- First, a pioneer in data acceleration technology
- Second, experts in storage
- Third, Alacritech pulling from both networking and storage expertise
  - To Introduce the Alacritech ANX 1500
    - An example of a Performance Layer Architecture

ANX 1500 Integration



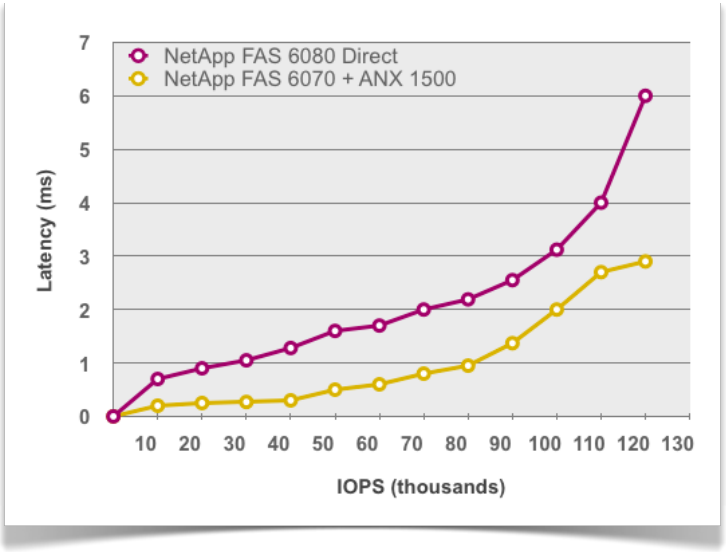
ANX 1500 Architecture

- 5 components of ANX 1500
  - 48 GB DRAM
  - Solid state disks
    - 2TB – 10 X 200GB
    - 4TB – 20 X 200GB
  - Dual 10GbE TCP offload NICs
  - Hardware
    - Dual Intel® Quad Core Xeon®, 5500s
    - Dual auto switch power supplies
    - Quad 10/100/1000 BASE-T (management connectivity)
  - Software
    - Alacritech NFS Bridge patented technology



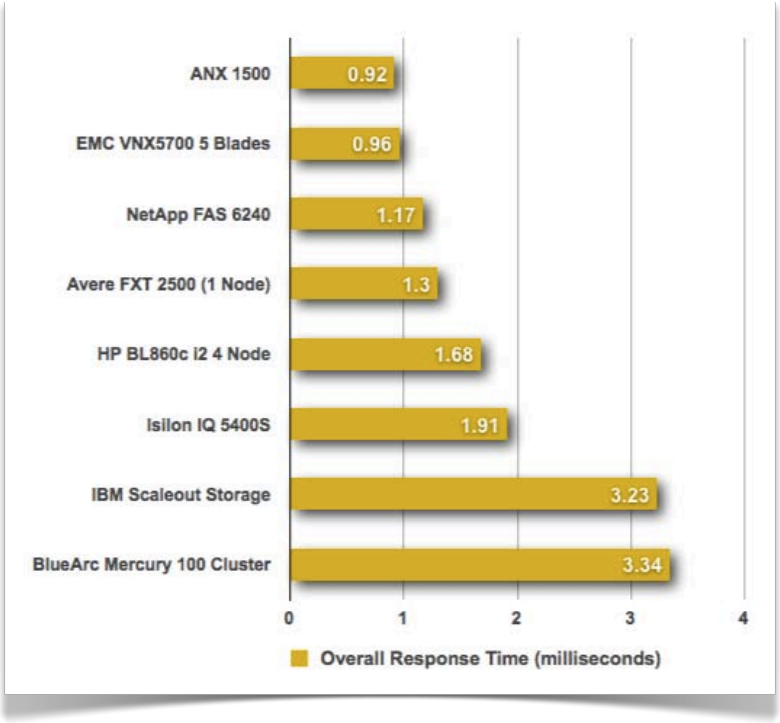
ANX + NetApp 6070 vs. 6080 Only

- Matches throughput of newer more powerful 6080
- Significantly lower latency
- 324 disks in 6080 vs. 188 with ANX
- ANX 1500 ORT half of NetApp® 6080
- Lowest published ORT on SPEC.org (as of 07/26/2011)



Lowest Overall Response Time

- .92 overall response time (latency)
- Lowest number of all vendors on SPEC.org (as of 07/26/2011)
- 120,954 OPS achieved during SPEC run
- NetApp 6070 backend storage used for ANX 1500 testing



Performance Examples

- Sony Pictures Imageworks
- Large government laboratory
- Large semiconductor designer

Sony Pictures Imageworks

SearchStorage.com

Alacritech packages SSD, offload into NAS acceleration device

By Dave Raffo, Senior News Director
11 Jan 2011 | SearchStorage.com

Excerpt:

Nick Bali, senior software engineer at Sony Pictures Imageworks, said he's been testing a 2 TB ANX 1500 with a NAS farm used for rendering and visual effects for animated movies.

Bali said he's looking for a way to accelerate his NetApp and Isilon (now being acquired by EMC Corp.) NAS filers or perhaps even ***use the caching appliances in front of cheaper commodity storage.*** *He said Imageworks has more than 100 TB of tier 1 data on Fibre Channel storage, and more than 1 PB of data that must always be available.*

Bali wrote a testing script that generates a high number of metadata operations, and ran the script across 80 clients on a four-year-old Isilon cluster with an ANX 1500 in front of it. ***He said the ANX 1500 delivered 500,000 NFS metadata operations per second with only 10% CPU usage in his tests.***

"We're getting very impressive numbers," *he said. "Once we move forward, we'll probably put it in front of NetApps and Isilons for production data and see what happens. We're throwing 80 clients at it;* ***I'm hoping to get two or three million metadata OPS with about 300 clients."***

Sony Pictures Imageworks also uses NetApp's Flash Cache, Avere's FXT Series boxes and Violin's vCache devices, but ***Bali said he likes Alacritech's cost effectiveness in regard to dollars per metadata operations.***

"One [ANX1500] box can handle all the metadata for all the devices behind it," Bali said.

Large Government Laboratory

- Executing massive parallel Python module simulations
- Problem has been nodes not retrieving data fast enough from filers
  - Cluster time is very valuable
  - Cluster use becomes less efficient
- Laboratory installed ANX 1500 + NetApp filer
- Launched 1,012 clients, 8,076 jobs

Large Government Laboratory

- Performance results:
  - With NetApp only: 2,130 seconds
  - With ANX 1500 and NetApp: 400 seconds
  - Represents a 5.3x improvement

Large Semiconductor Designer

- Mixed environment
  - Windows®, Linux
  - Isilon® and NetApp NAS
- Objective: decrease build times
- Results achieved:
  - Average NFS Read time decreased by 23.68%
  - Average NFS Write time decreased by 11.14%
  - Bonus: CIFS performance improved
    - ANX 1500 satisfying NFS requests contributed to increased CIFS performance
    - CIFS OPS improved from 82K to 92K, or 10%

Potential Savings, Assuming 100K OPS Target

Summary

- Flash matters
- System design impacts Flash effectiveness
- Introduced performance layer architecture
  - Alacritech ANX 1500
- Performance layer
  - Single stack design
  - Gives IOPS back
  - Reduces latency
  - A shared resource
  - Complimentary to existing NAS
- Questions?

Thank You

- Find out more at **www.alacritech.com**