Accelerating Data Through the Fabric

The Benefits of a Parallelized, Highly Scalable Storage Architecture in Performance Driven and Multi-Protocol HPC Environments

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High-Performance SAN Requirements

DataDirect NETWORKS

- High Throughput and I/O access with <u>linear performance scalability</u>

- Simplicity - easy management with fast deployment and reconfiguration

- Open systems architecture, supports O/S independent workstations to clusters to monolithic supercomputers

- Reduce raw disks and hosts (as much as possible) to commodities

- Multi-Protocol Support (FC, GigE…)

SAN Scalability Issues

Is anyone in the audience trying to scale a SAN with a shared file system?

- If not, you probably aren't aware of what will really limit your performance!

If the world was perfect, just adding RAIDs and switches would linearly scale…

- Unfortunately, the world is not perfect.

WHY?

Because slow LUNs, host-based striping, non-deterministic I/O patterns, and fabric contention and switching latencies are evil and pernicious %@#& that conspire against you as you try to scale!

SAN Scalability Answers

The solution is an architecture that:

- Supports very high performance "PowerLUNs" (>>1GB/sec) as a <u>single target</u>
- Supports true parallel concurrent access to PowerLUNs
- Distributed, parallel processing RAID
  - Equal performance Read & Write
  - Excellent multi-initiator performance (non-determinism)
  - No performance degradation in crippled or rebuild modes
  - True duplex operation
  - High availability and fault tolerance
- Multi-Protocol Support (FC, GigE, OBD…)
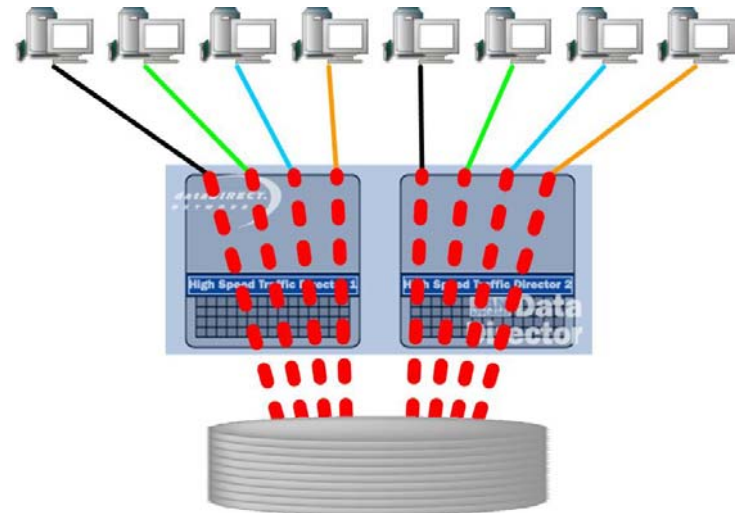- Cost Effective

The Test

TEST #1 No Acceleration

- Essentially 8 Striped RAID Arrays
- Eight Striped (8+1) LUNs
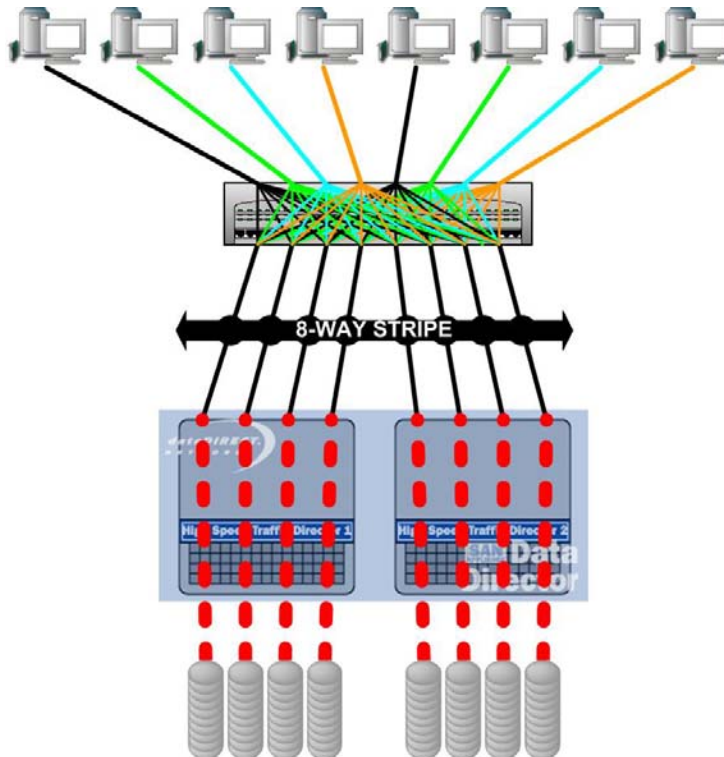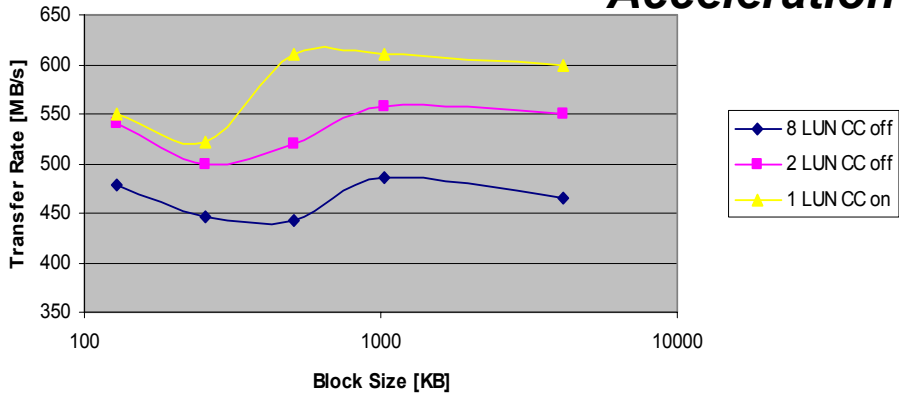
TEST #3 Full Acceleration

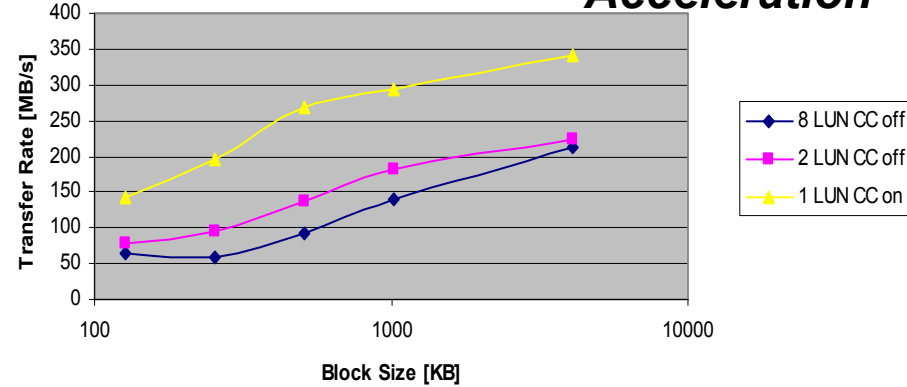- One (64+8) PowerLUN
- No Striping

Test Comparisons

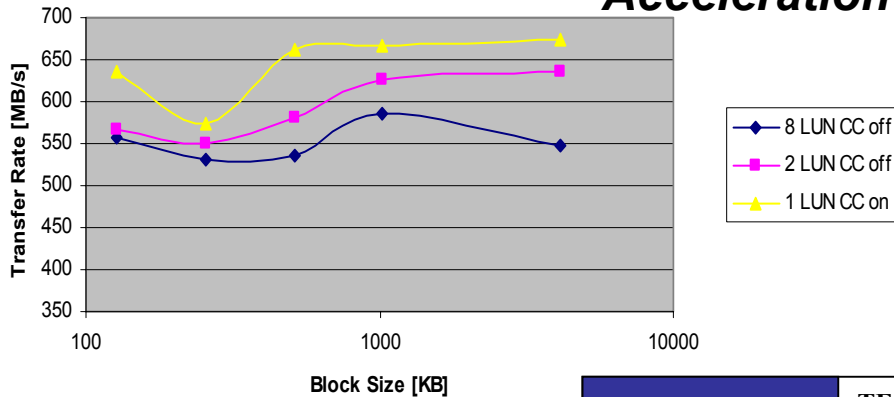
100% Sequential Reads — *Up to 41% Acceleration*
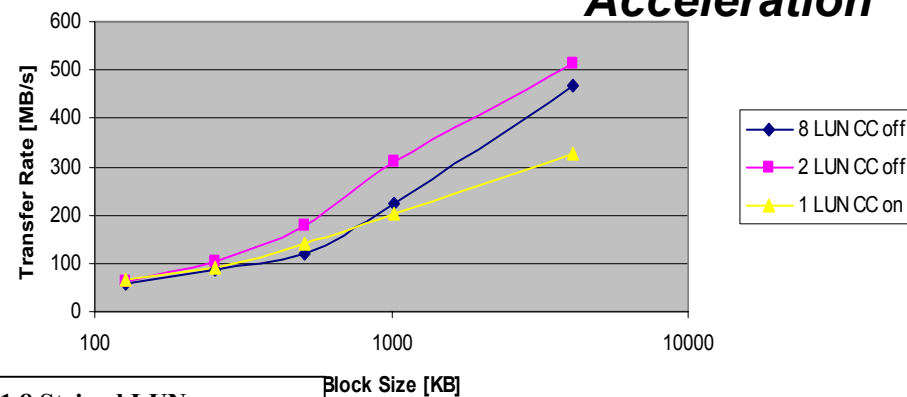
100% Random Reads — *Up to 53% Acceleration*

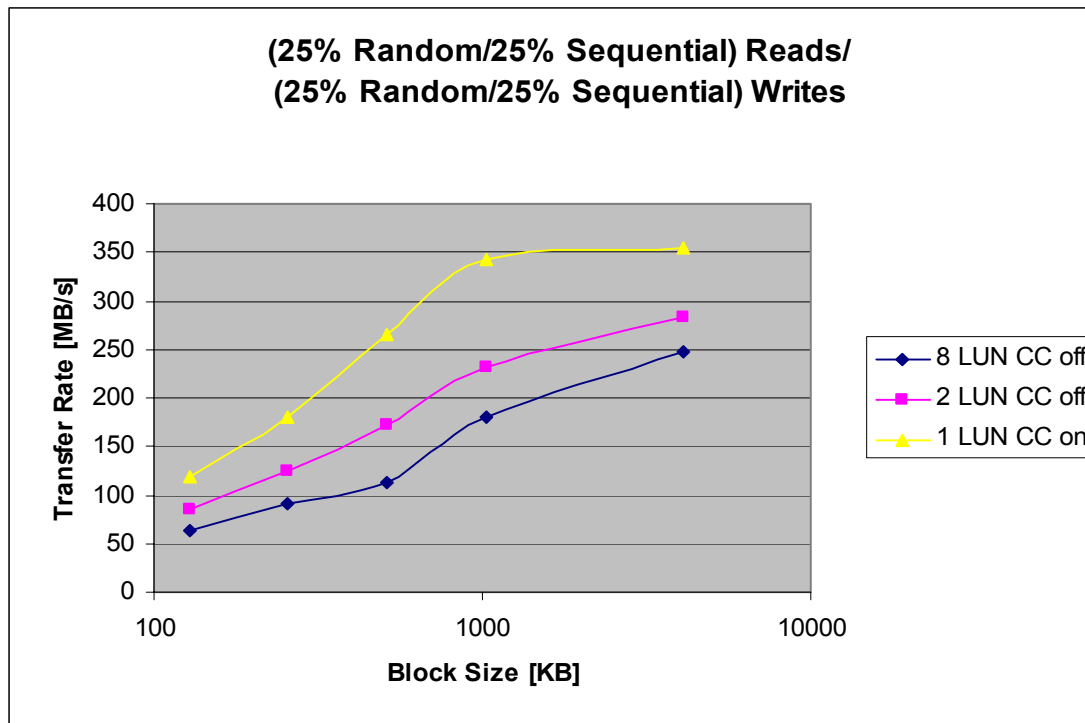100% Sequential Writes — *Up to 35% Acceleration*

100% Random Writes — *Up to 9% Acceleration*

TEST #1 8 Striped LUNs

TEST #2 2 Striped PowerLUNs

TEST #3 1 PowerLUN

Test Comparisons

(25% Random/25% Sequential) Reads/
(25% Random/25% Sequential) Writes

Up to 40% Large-Block Data Acceleration

Chart legend:
- 8 LUN CC off
- 2 LUN CC off
- 1 LUN CC on

Y-axis: Transfer Rate [MB/s] (0 to 400)
X-axis: Block Size [KB] (100 to 10000)

TEST #1 8 Striped LUNs

TEST #2 2 Striped LUNs

TEST #3 1 LUN

What does it Cost?

- ## Fibre-Channel 2Gb
  - *100TB @ 10GByte/sec*   ***<$3M***

  - *1PB @ 100GByte/sec*   ***<$30M***

- ## Gigabit Ethernet
  - *50TB @ 5GByte/sec*   ***<$1.5M***

Who Can Say it Works?

- **US Army Fort Schafter**
- **US Army ARL**
- **DKRZ Germany**
- **Lawrence Livermore**
    (12 @ 90TB)
- **NASA Goddard**
    (6 @ 200TB)
- **NCAR**

- **NCSA**
    (7 @ 60TB)
- **NEC**
- **NOAA FSL**
- **Northrop Grumman**
- **Sandia Labs**
    (8 @ 40TB)
- **White Sands Missile Range**

The Accelerators

Silicon Storage Appliances

Only from DataDirect Networks!