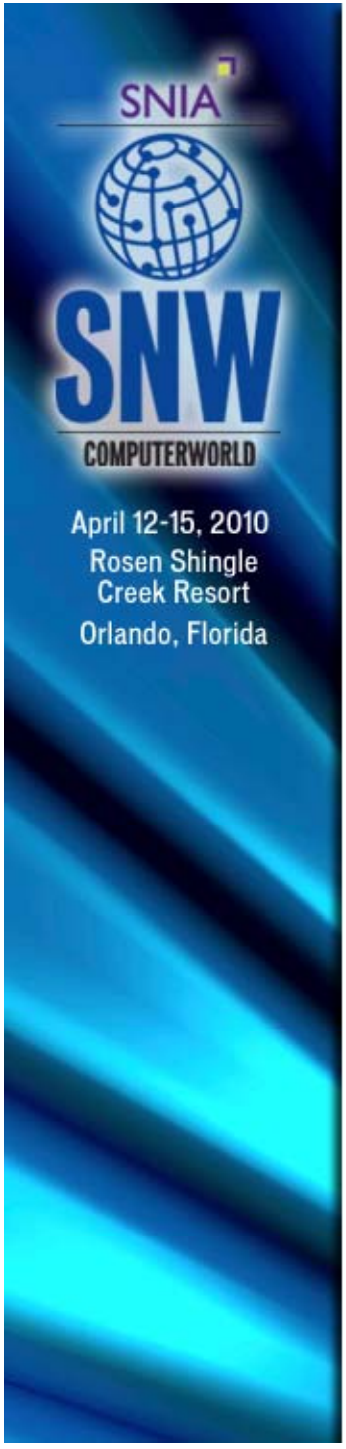

Building Efficient Storage Solutions

Mike Chenery
President and Co-founder
Pliant Technology, Inc.

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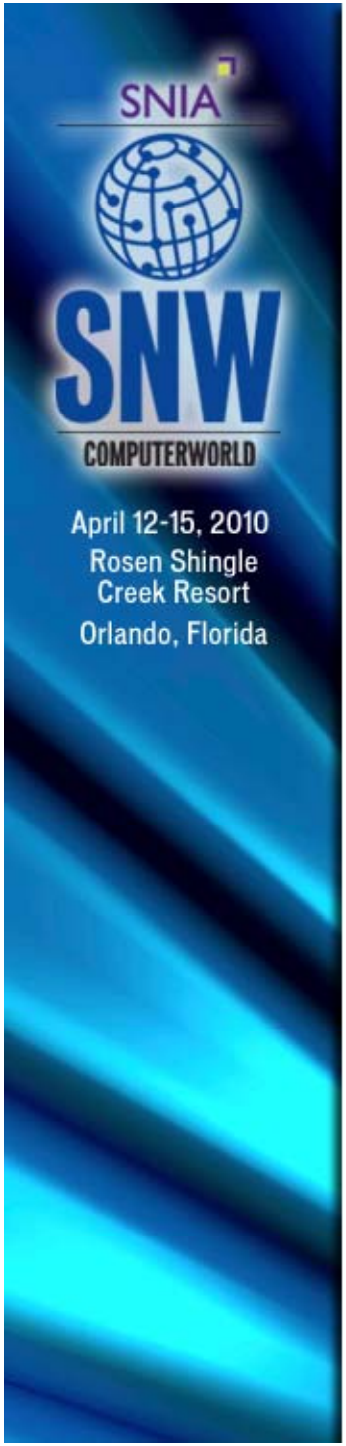
$ PER GB
3.5-inch standard form factor
Global IT green initiatives
OPEX
Growing capacity
Lower cost systems
People costs
Energy costs
Reliability
SSD
Read/Write endurance
IT system performance demands
Dollars per IOPS
Single port
Low energy consumption
Peak periods
No write cache
Consolidation
High RPM HDDs
Fewer Servers
Reduced floor space
2.5-inch standard form factor
End-to-end data protection
Cloud computing
Raise temperature
Capital investment
Performance
flexibility
SAS
Enterprise Flash Drives
Dual port
Enterprise computing environments



The Efficient Storage Solutions Dilemma

- Demand for more capacity accelerating
- User want faster access to more storage
- Walls don't move easily and there is no more power
- Datacenters need better GB/cubic ft., IO/cubic ft., and GB/watt
- SSDs are an ideal solution except for the fundamental storage metric
  – they cost more $/GB!

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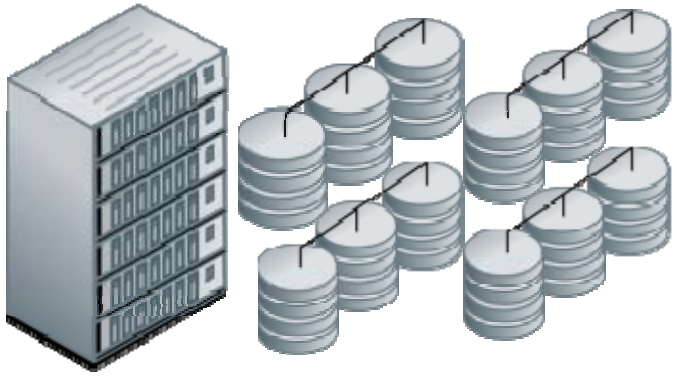
New Approach: Improved Efficiencies

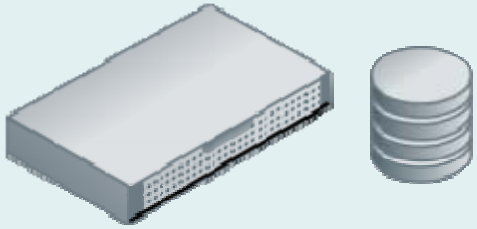
HDD Attributes

- Higher RPM (10K/15K)
- Short stroke HDDs
- Smaller FF drives
- Over provision HDDs
- Lower capacity HDDs
- Striped data for MB/s



Hybrid Approach

- Storage tiers ‘Hot’ data on SSDs
- High capacity HDDs
- Few devices for reliability
- Dual port for performance
- DO MORE FOR LESS!



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Example: Typical Enterprise Application

Order Entry System*

Transactions including entering and delivering orders, recording payments, checking the status of orders, and monitoring the level of stock at the warehouses.

Requirements

- 640,000 transactions/minute
- 320,000 IOPS
- 18 TB database

* Case study from TPC-C Benchmark

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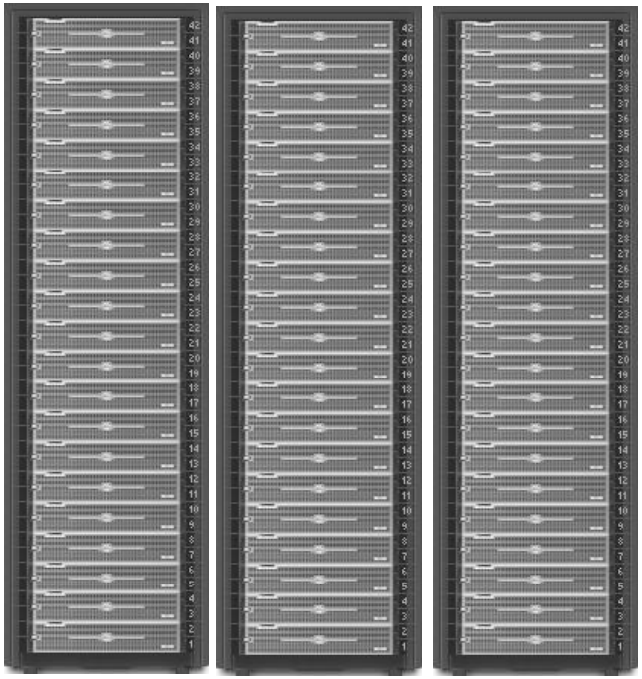
Current HDD Solution: High Cost / High TCO/ Low Efficiency



- >$450K purchase price
- 450 usable GB GG1
  (7 GB/cu ft.)
- 320K I/Os
  (4.6K I/Os/cu ft.)
- 16,000 watts
  (0.03 GB/watt)

Slide 6

GG1

450 usable GB?
per shelf attributes?

16,000 watts (vs 1600)
Greg Goelz, 3/30/2010

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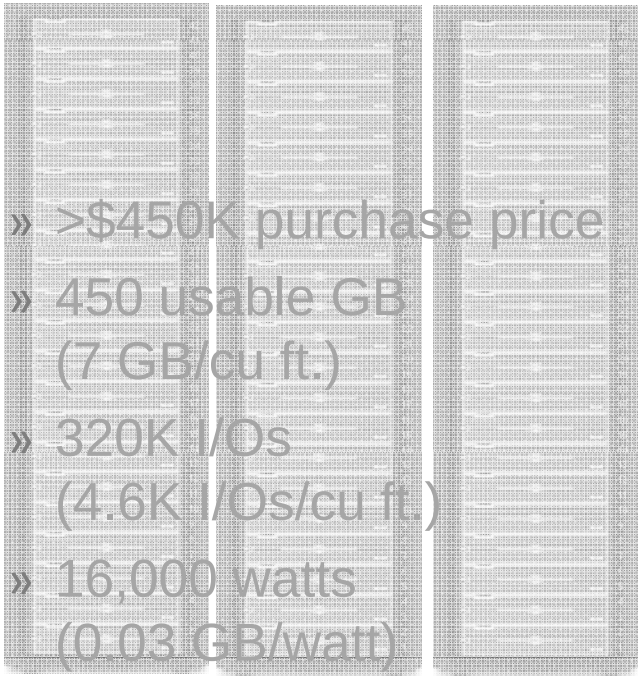
Simple Proposition: More For Lower Cost ($)

HDD Solution



- >$450K purchase price
- 450 usable GB (7 GB/cu ft.)
- 320K I/Os (4.6K I/Os/cu ft.)
- 16,000 watts (0.03 GB/watt)

EFD+HDD Solution

- <$225K purchase price
- 3500 usable GB (337 GB/cu ft.) >50x
- 320K I/Os (30K I/O/cu ft.) >6x
- 2,000 watts ($1.75 GB/watt) >60x

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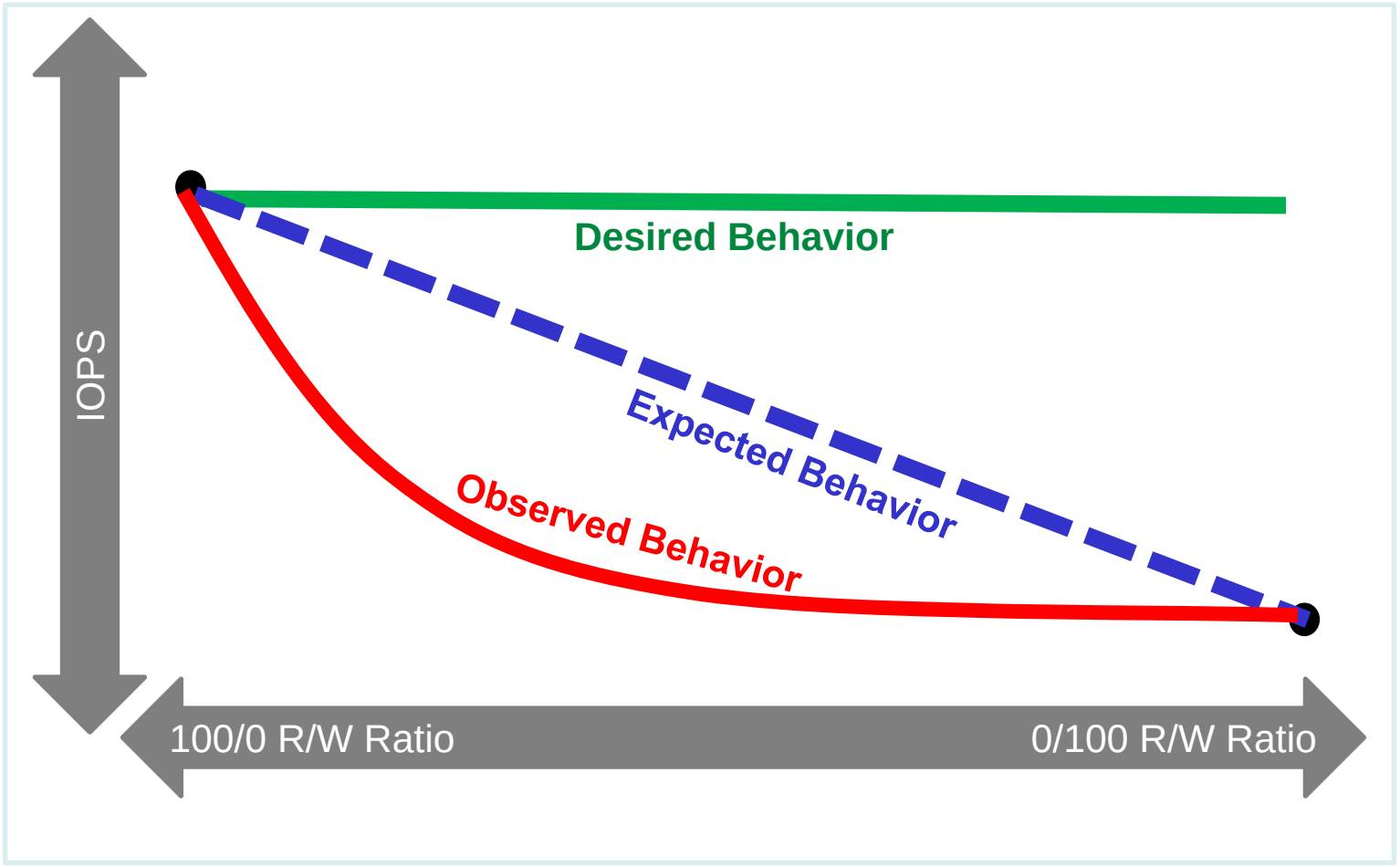
Desired Performance Not 'Droop'



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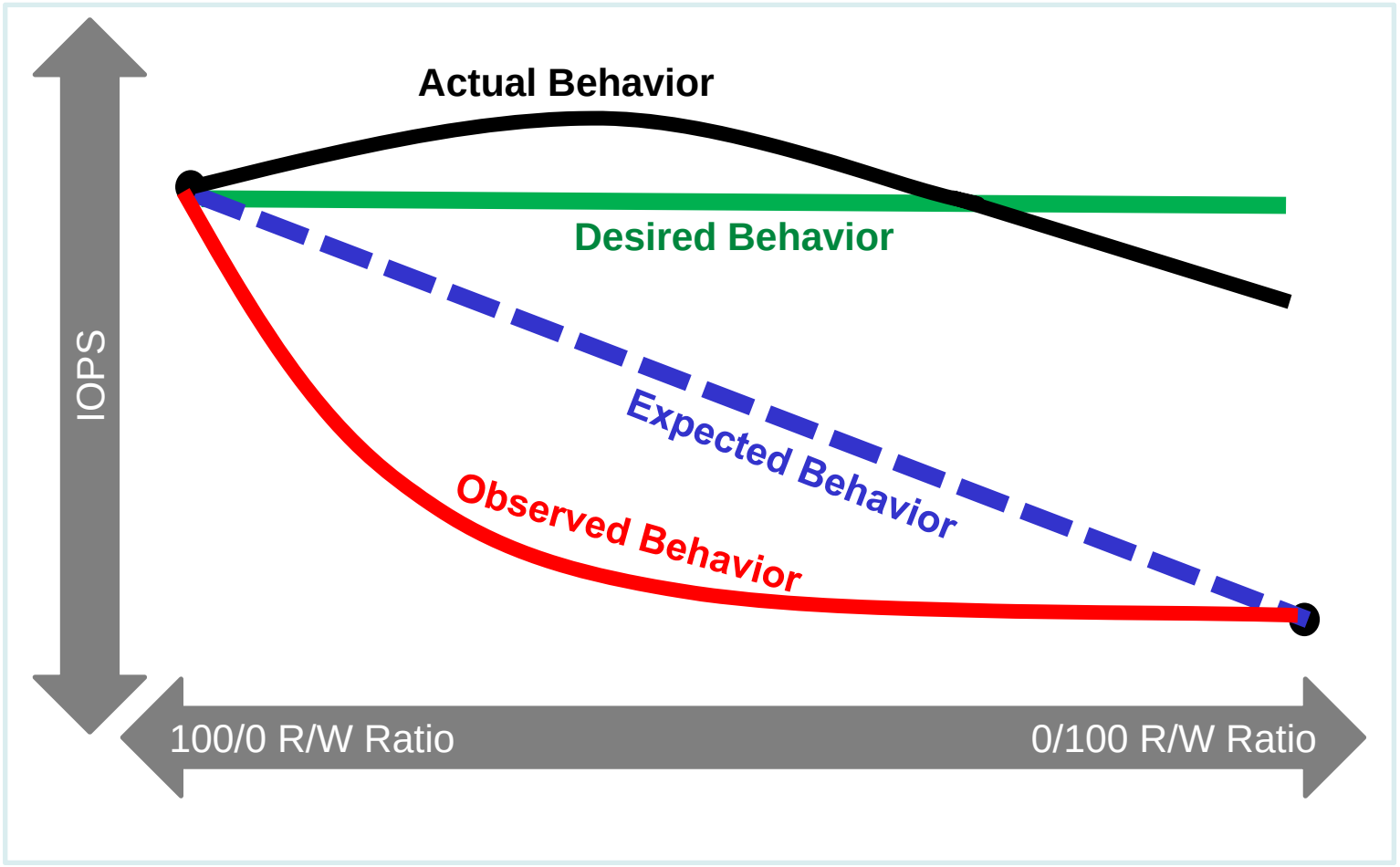
Desired Performance Not 'Droop'



Benchmark Video: Real-World Workload (80%/20%)

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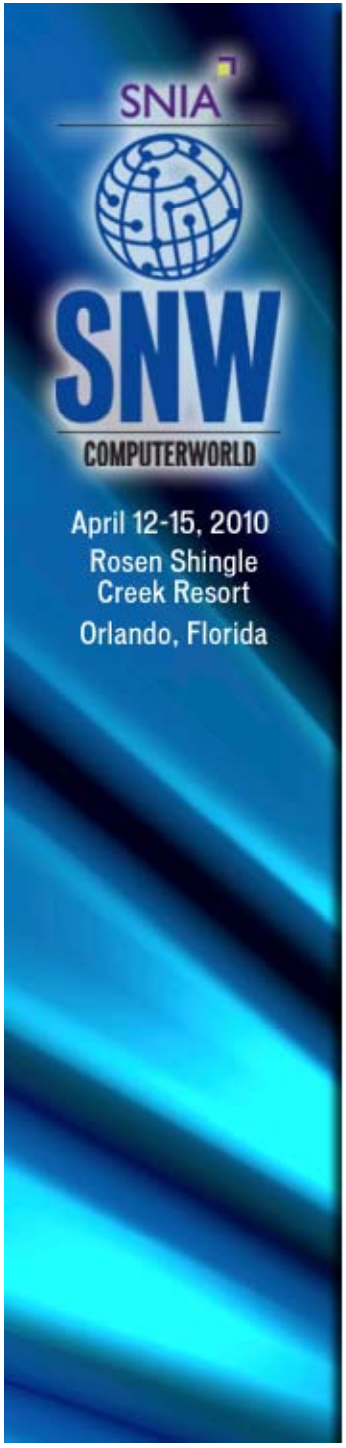
SAS = Reliability & Performance

SAS
- Dual Port
- Full Duplex

SATA
- Single Port
- Half Duplex

Dual path for redundancy
- Fully independent ports = concurrent writing & reading
- 4X the link bandwidth, supports multi-initiators seamlessly



Enterprise Flash Drives

Do **MORE** For Less

- More Performance = Lower Cost
  - Lower cost = $$$, energy, space
  - Predictable across enterprise workloads
- More Reliability = Lower TCO
  - Both data and device improvements
- No Changes Required = Easy Adoption
  - Use existing systems and software

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Thank You!