zEnterprise – The Ideal Platform For Smarter Computing

The Benefits Of Storage Consolidation

From Server Sprawl To Storage Sprawl The New Era Of CIO Pain

But what about the storage?

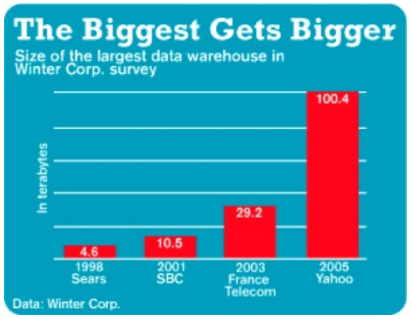
CIO

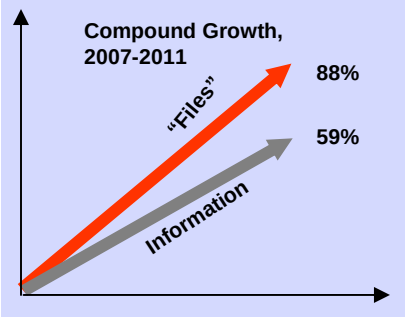
You can virtualize and consolidate it all on DS8000.

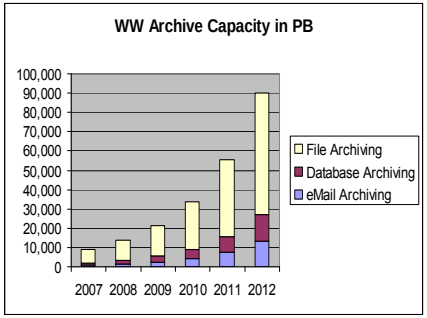
IBM

Storage Administrators Face Problems Similar To Server Administrators

- Insatiable demand for growth
  - Continuous hunger for more storage
  - Both structured
    - Larger databases
    - Bigger data warehouses
  - And unstructured
    - Rich media (web, images, video, email, documents, etc.)
    - Driven by Big Data Analytics
  - Regulatory requirements to maintain more data for longer periods
- Flat IT budgets
  - Little to no growth in budgets
  - Expectation to manage more with the same staff
  - Traditional approaches

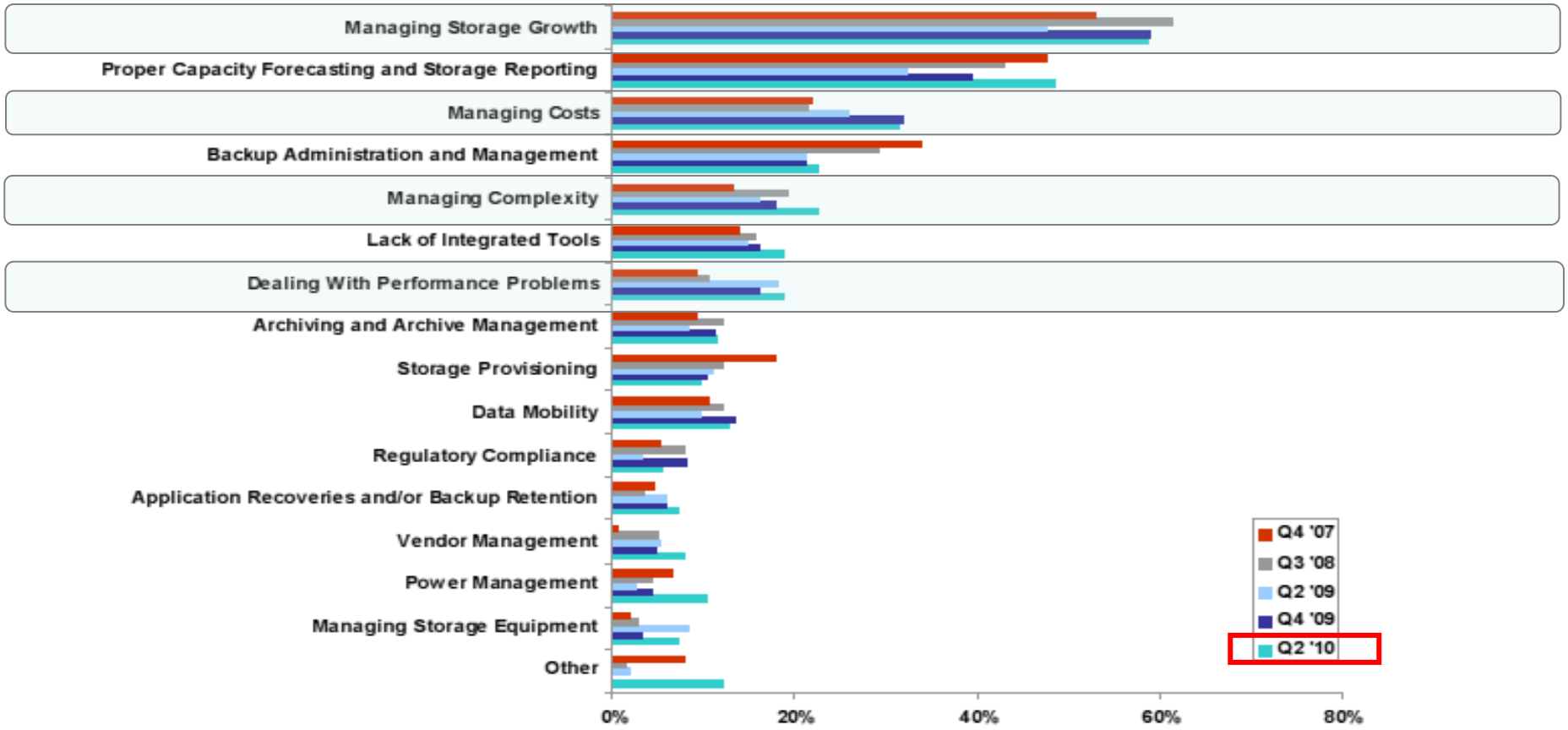






Industry Analysts Confirm What IT Managers Already Know

These pain points result from storage sprawl. Smarter Storage Strategies



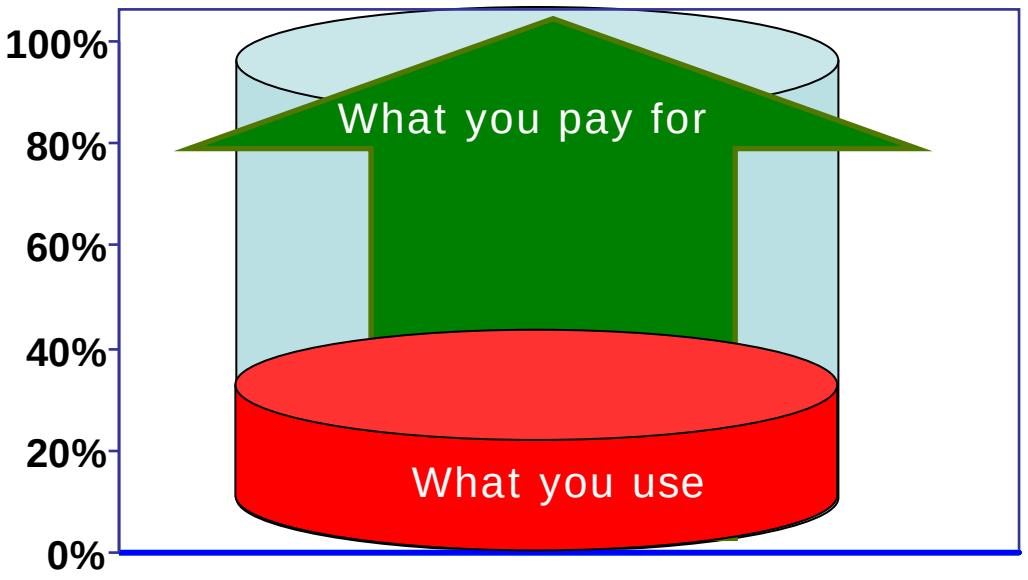
Source: The InfoPro, 2010

Low Disk Utilization Drives Up Cost

The typical UNIX or x86 disk storage is running at 20-40% utilized

System z disk storage runs as high as 60-80% utilized

- System spins disks that are mostly empty
- Configuration planned for I/O peaks
- Configuration planned for Data growth

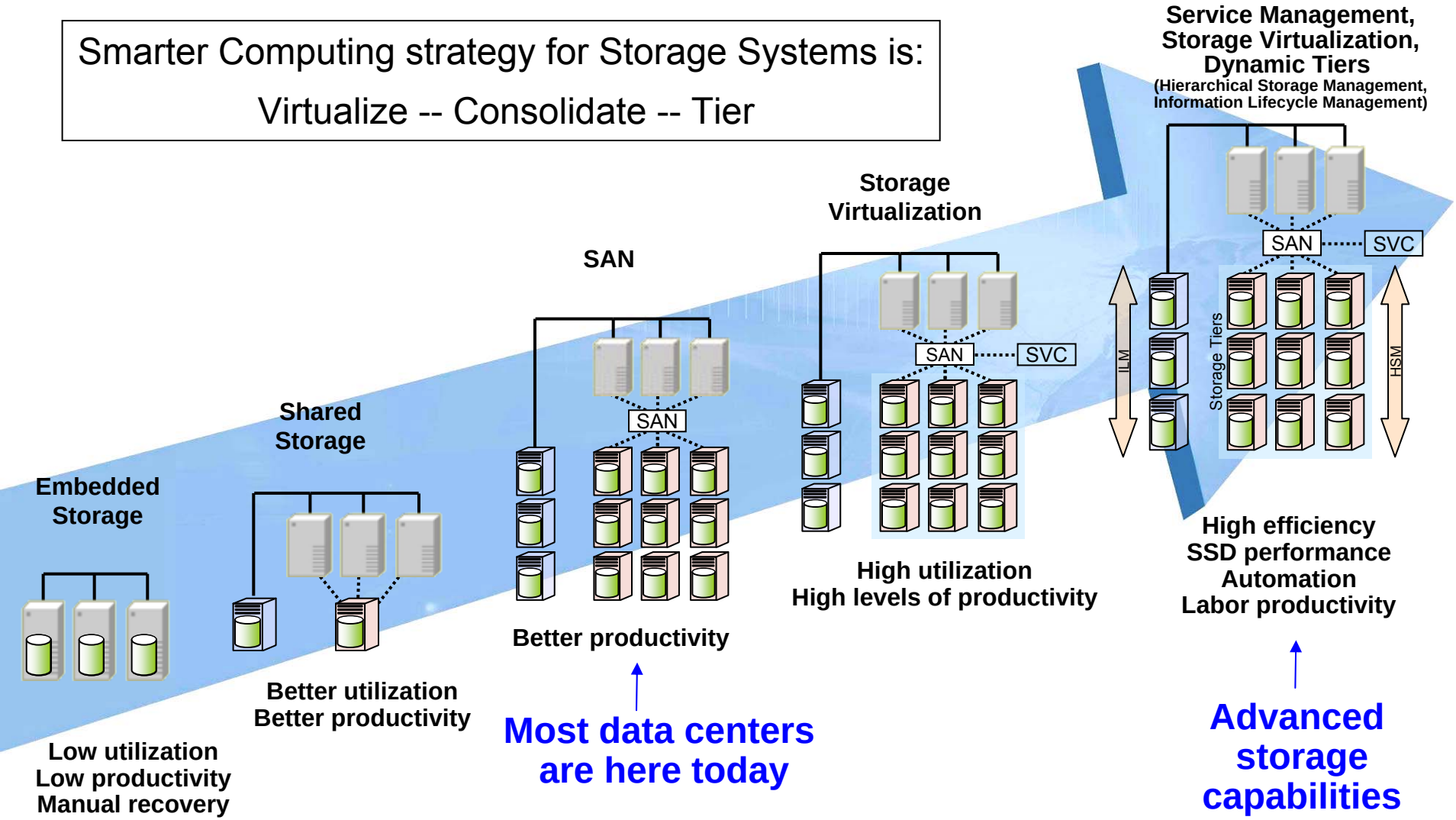


Resulting in 60-80% of the hardware, storage software licenses, maintenance, floor space, and energy that YOU pay for, being wasted

Smart Computing Strategies Drive Storage To Higher Levels Of Efficiency

Smarter Computing strategy for Storage Systems is:

Virtualize -- Consolidate -- Tier



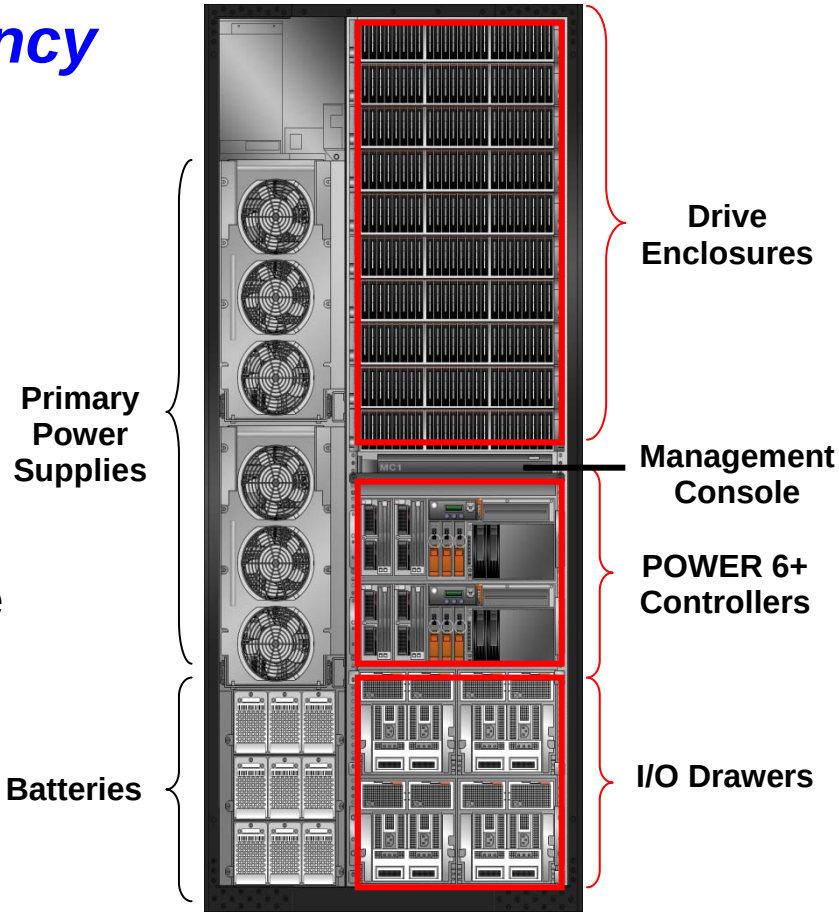
Introducing DS8800 – Smart Enhancements To A Superior Design

- In addition to its advanced hardware design, the DS8000 *is* smarter storage
  - Evolution from manual configuration and tuning to automation and efficiency
  - Automation and efficiency are imperatives for multi-tenancy environments, such as cloud computing
  - It all starts with our volume management foundation
- Advanced storage efficiency and quality of service (QoS) capabilities
  - Support for larger volume sizes and new GUI can help increase administrator productivity and lower operating costs
  - Easy Tier enhancements can help clients more effectively optimize performance and capacity management
  - I/O Priority Manager feature can help improve application service levels, enable consolidation, and lower infrastructure costs

DS8800 Under The Covers

Higher performance and efficiency

- Compact and highly efficiency drive enclosures
  - New 2.5”, small-form-factor drives
  - 6 Gb/s SAS (SAS-2)
  - New enclosures support 50% more drives
- Upgraded processor complexes
  - IBM POWER6+ for faster performance
- Upgraded I/O adapters
  - 8 Gb/s host adapters
  - 8 Gb/s device adapters
- More efficient airflow
  - Front-to-back cooling
  - Aligns with data center best practices



Front view
(cover removed)

The Storage Cost Capacity Dilemma …

Our distributed storage is a mess. How can I contain and clean this up?

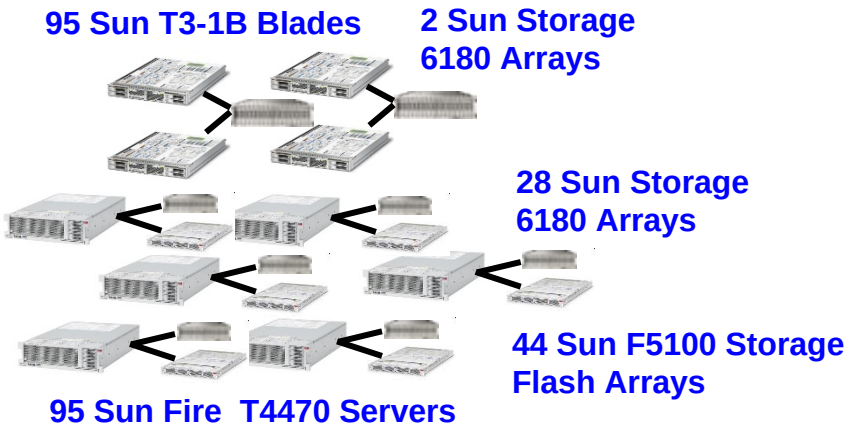
CIO

You need Smarter Storage. Let's show you a case study on how we can integrate a group of distributed server storage environments save you both capacity and storage costs.

IBM

Messy Distributed Storage vs. Clean Centralized Storage With DS8800

Deployed on Sun



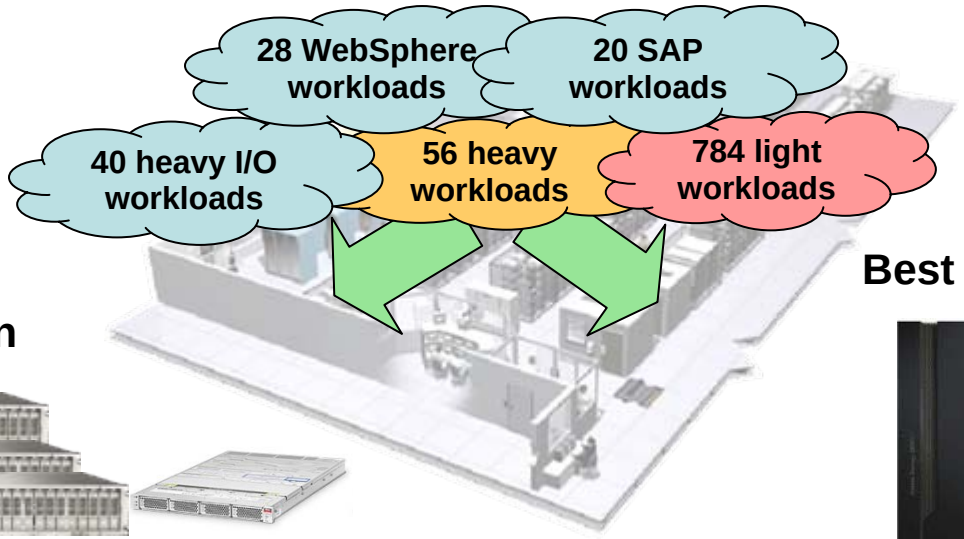
- Storage added on a per server basis
- Fragmented Storage Capacity and Storage Cache
- Storage is shared rather than virtualized
- Flash/SSD is over-provisioned and not available to all hosts
- Allocating Flash/SSD is a manual process

Best fit on zEnterprise

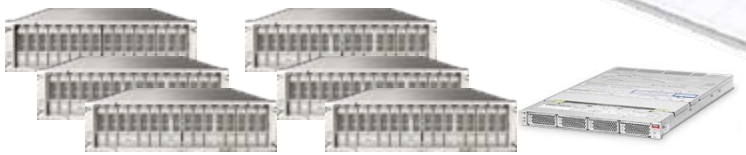
Incremental add on DS8800

- Enterprise class virtualization
- Storage utilized at 60%
- Use the same storage admin as your zEnterprise storage
- Storage Cache available to all connected hosts
- SSD can be provided to all/any hosts that would benefit

Dramatic Storage Cost Savings Through Consolidation In Smart Storage



Deployed on Sun



Sun Storage 6180 Array Sun F5100 Storage Flash Array

Best fit on zEnterprise

Incremental add on DS8800

235.3TB embedded storage
36.31% utilization
74 points of admin

143.0TB provisioned storage
59.73% utilization
1 point of admin

$7.8M TCO(3 years)

$4.6M TCO (3 years)

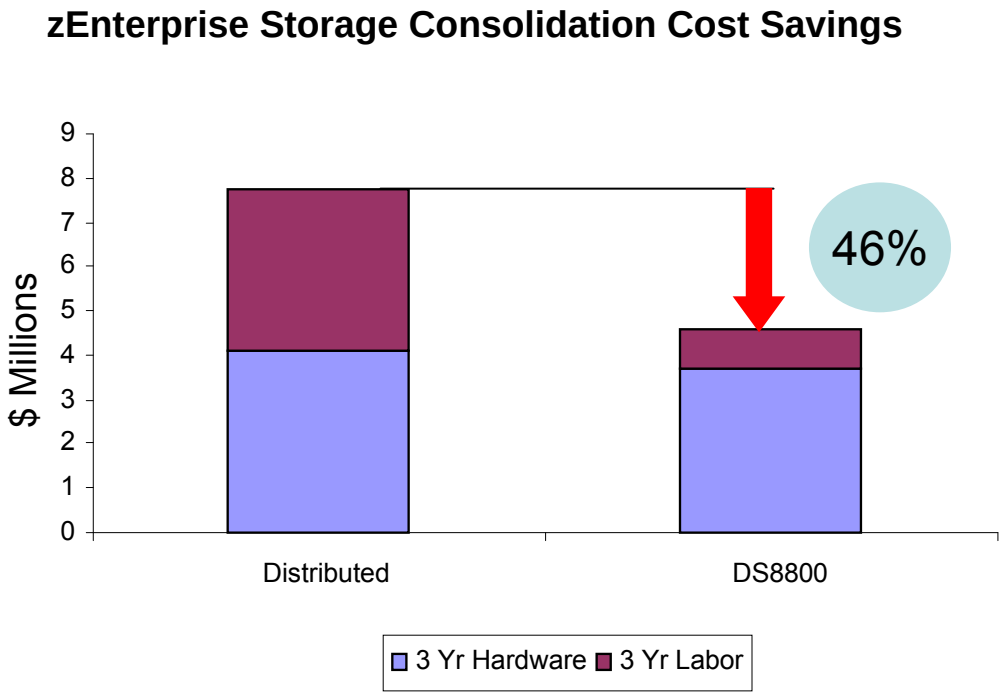
75GB/240GB active storage required per workload

46% less

Storage configuration is based on IBM internal studies.
Prices are in US currency, prices will vary by country

Consolidating Storage With DS8800 Saves 40% Over Distributed

- Hardware
  - DS8800 save 23% over Distributed
  - Distributed
    - 235.32TB
    - 36.31% Utilized
  - DS8800= $3.7M
    - 143.04TB
    - 59.73% Utilized
- 3 Yr Labor
  - DS8800 saves 76% over Distributed
- Annual Cost/Active GB
  - Distributed = **$71.07**
  - DS8800 = **$46.84**



The Storage Performance Dilemma…

To address performance problems we are purchasing more drawers and spindles, and this is contributing to my storage sprawl.

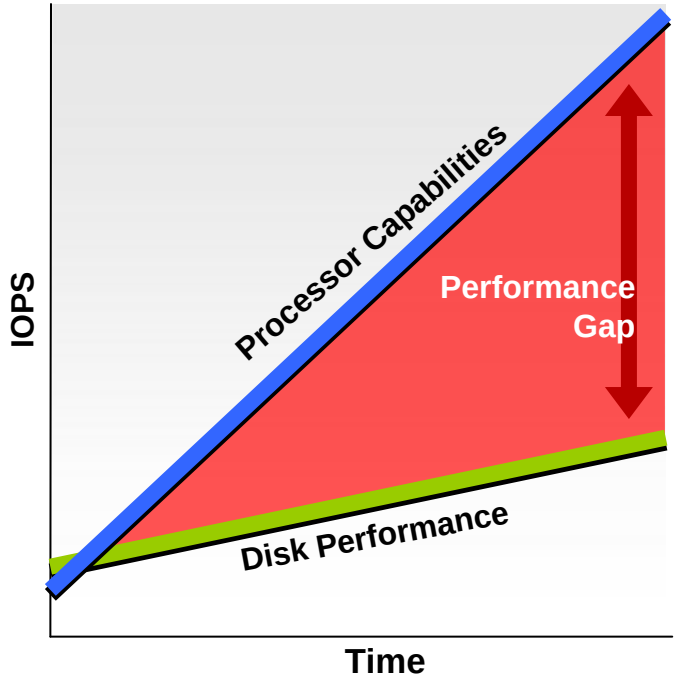
CIO

Our Easy Tier capability allows you to make use of Solid State Drives to increase performance and reduce your storage footprint. Let's show you how it's done.

IBM

Performance Constrained By Current Drive Limitations

- Processor capabilities are out-stripping disk drive and RAID controller performance (rotational speed and IOPS)
- As a result, servers and storage systems become more unbalanced between CPU/controller capability and storage performance
- Clients add more drive spindles to improve performance



Performance gains through HDDs has become ineffective and wasteful

Solid-state Drives (SSDs) Positioned To Address Performance Gap

New Tier-0 drives for high priority, time-sensitive applications

Potential client benefits

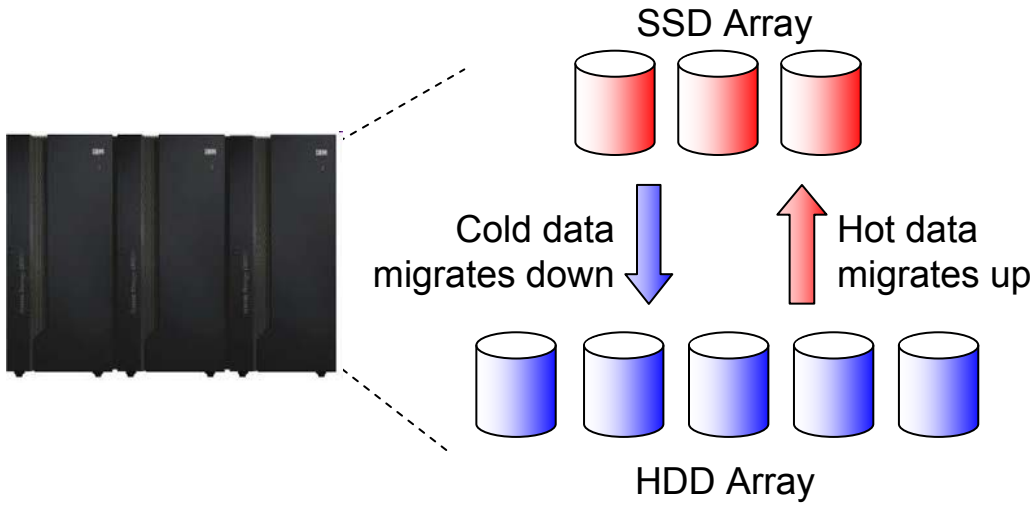
- Increase revenue opportunities
  - More transactions in less time
- Reduce storage infrastructure costs
  - Reduce acquisition and operating costs
- Reduce server infrastructure costs
  - Smaller servers, DRAM memory capacity, cost and power
- Improve availability
  - Lower component failure rates and faster error discovery
- Enable new capabilities
  - New functions and applications become feasible

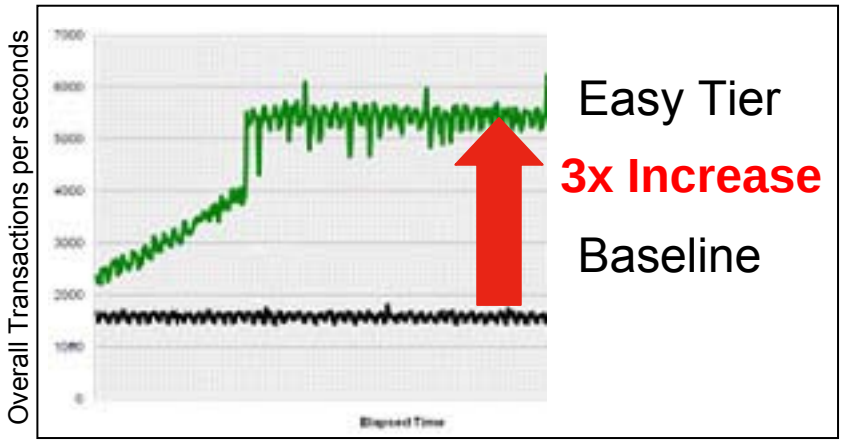
Solid-state drives

- Random access storage
- Non-volatile, semiconductor (NAND flash)
- No mechanical parts
- No rotating parts
- Same form factor as traditional HDDs

Easy Tier In DS8800 Optimizes Use Of SSD Across Shared Workloads

- Migrates data extents between SSD and HDD in the same pool
  - Automatic hotspot detection
- Virtualized SSD is shared across all workloads using the pool
- More cost effective use of SSD vs. ad hoc dedicated assignment
  - Use less SSD to achieve the same overall performance benefits
- Transparent to applications, no code changes required



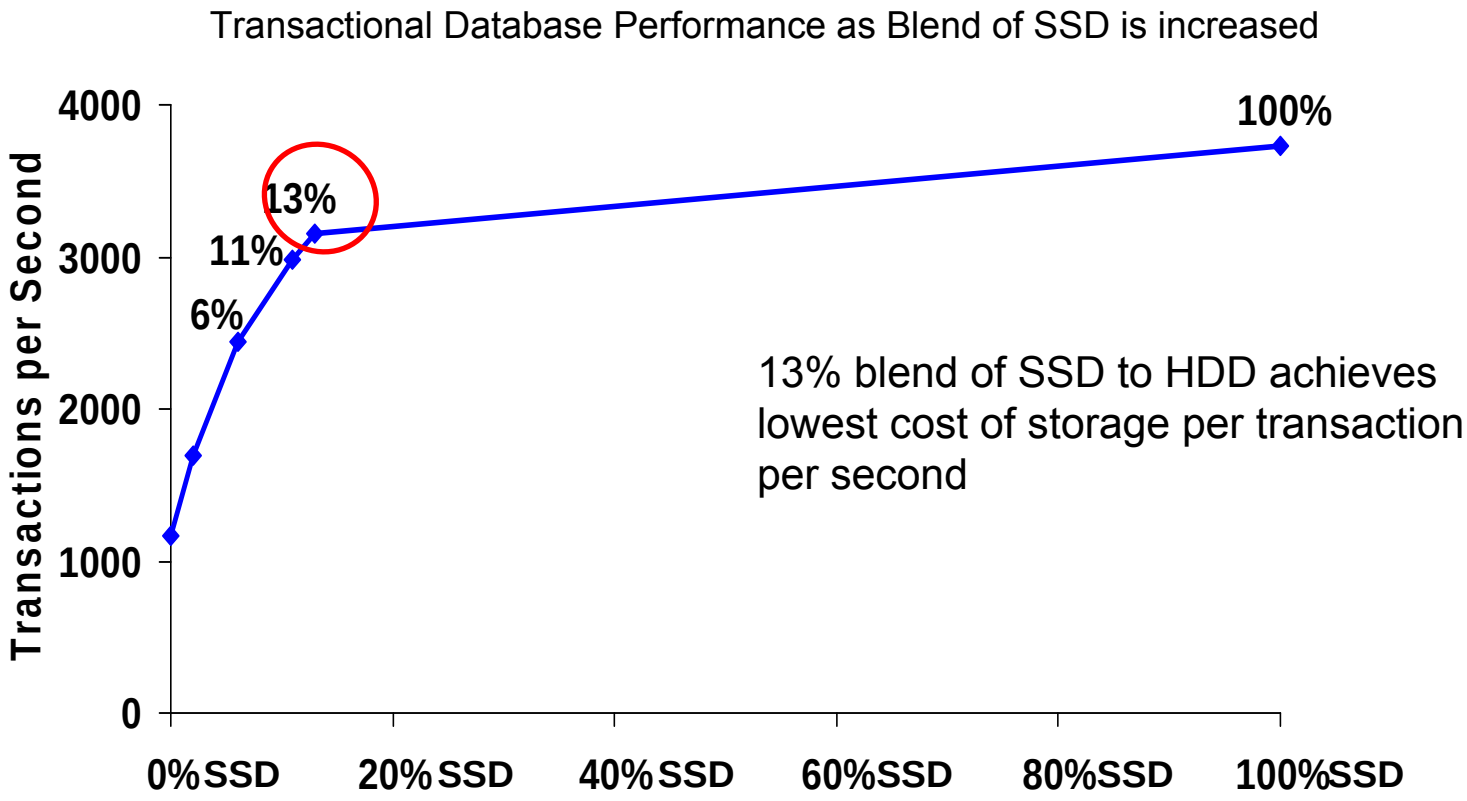


Example: Complex database transactional workload

New: Easy Tier migrates from HDD to HDD in same pool

Small Amounts Of Optimally Managed SSD Can Improve Storage Price/Performance

Easy Tier achieves 78% of the maximum SSD performance potential with just 13% blend of SSD



Source: IBM Internal Study of Benchmark Factory transactional database workload performance as Easy Tier migrates data to SSD. The performance data contained herein was obtained in a controlled, isolated environment. Actual results that may be obtained in other operating environments may vary.

Another Technique For Improving I/O Performance

I/O Priority Manager Automatically Applies Resources to High Value Workloads

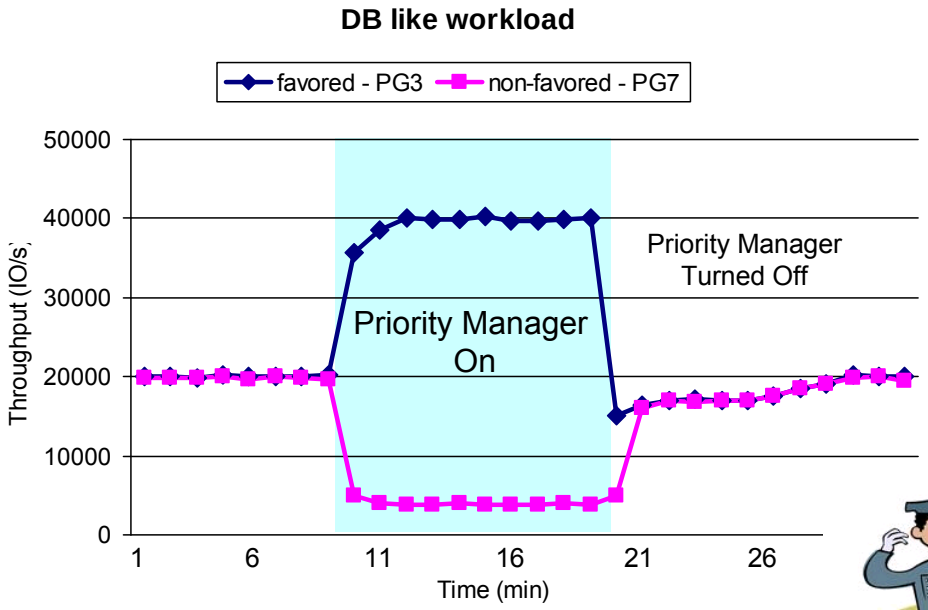
- Administrators select from 4 Performance Groups (service levels) to assign to each volume
  - '1' for highest; '2' for standard; '3' for low priority; '0' for no priority (default)
  - All volumes are associated with a Performance Group and all I/Os are monitored
- System resources are dynamically allocated to higher priority volumes (applications) when there is resource contention

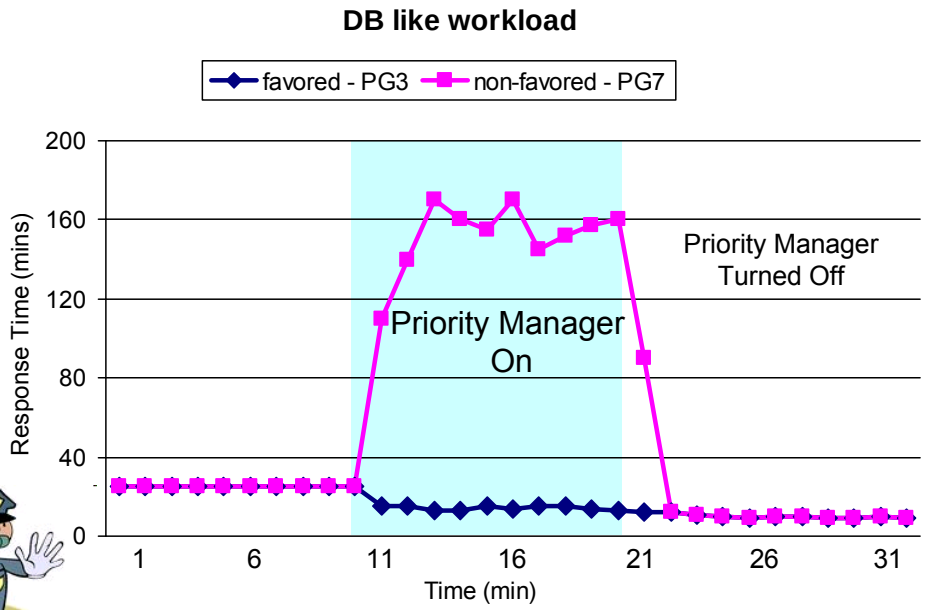
New

Automated quality of service management delivers performance when and where it's needed

Free Up Your Valuable Resources With I/O Priority Manager

- **How I/O Priority Manager works**
  - I/O Priority Manager delays the right amount of I/O from lower priority volumes, so higher priority volumes get more throughput
  - Automatic and only when there is contention for a resource between multiple volumes





Easy Tier Enhancements *(2nd Generation)*

- Easy Tier automatic mode now supports migration between any two tiers

- Automatic *extent* rebalancing within a tier
  - Easy Tier automatic mode redistributes extents within a tier whenever:
    - It shows I/O skew
    - When new capacity is added or when capacity is removed
  - Keeps performance optimized when capacity changes

Superior volume management leads to higher efficiency and flexibility

Where Is The Competition? Lost In The Sprawl

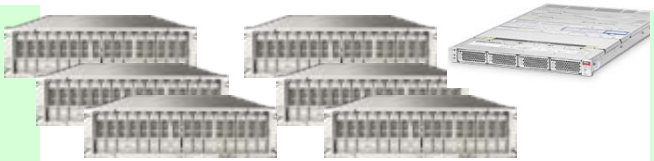
- EMC FAST does not support System z or System i data.
- EMC does performance rebalancing with its Symmetrix Optimizer feature:
  - Charged feature
  - Difficult to use and may not help much.
- Optimizer moves data around to attempt to reduce disk hot spots, but this is *reactive* based on long-term trends (e.g., multiple days).
  - DS8000 Storage Pool Striping *does this proactively and now supplements that with extent rebalancing.*
- EMC FAST VP is disabled by default.
  - Users must create multiple objects and parameter values and maintain these as workloads change.
- EMC provides a GUI wizard
  - Their documentation recommends the wizard be used on only relatively simple FAST VP environments
- FAST is priced
  - There are initial charges
  - Incremental charges as drive capacity is added to the system
  - Post-warranty maintenance charges

System z And IBM System Storage Synergy

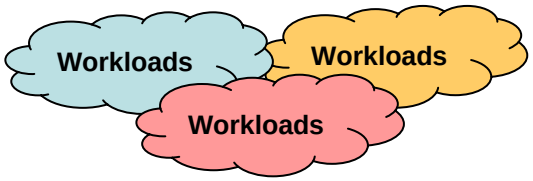
- System z and IBM System Storage have a unique relationship
  - Collaborate
  - Comprehensive testing in zSeries lab
  - Share cross support by skilled resources
- This helps IBM System Storage and System z development to:
  - Better design products that work well together
  - Implement streamlined, efficient, integrated product offerings
- This provides value to System z and IBM System Storage customers by helping to:
  - Verify product reliability
  - Speed implementation
  - Reduce risk

zEnterprise And IBM DS8800 Synergy

Get the best utilization through storage virtualization and consolidation



Centralized Storage platform
and structured practices minimize labor costs



Efficiently use solid state disk to Increase performance up to 300% on critical apps.

Incremental Add of Storage
minimizes cost of acquisition

Tivoli Management Tools
for environment improves productivity