



# **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**

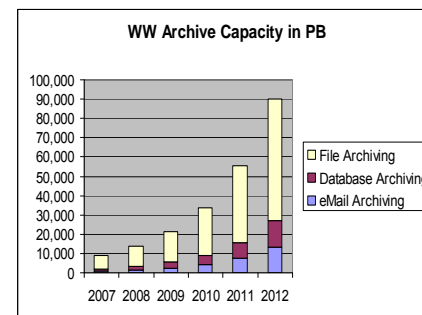
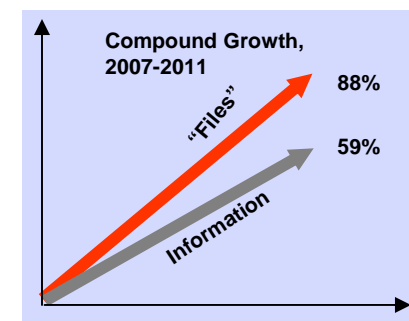
You can virtualize and consolidate it all on DS8000.



**IBM**

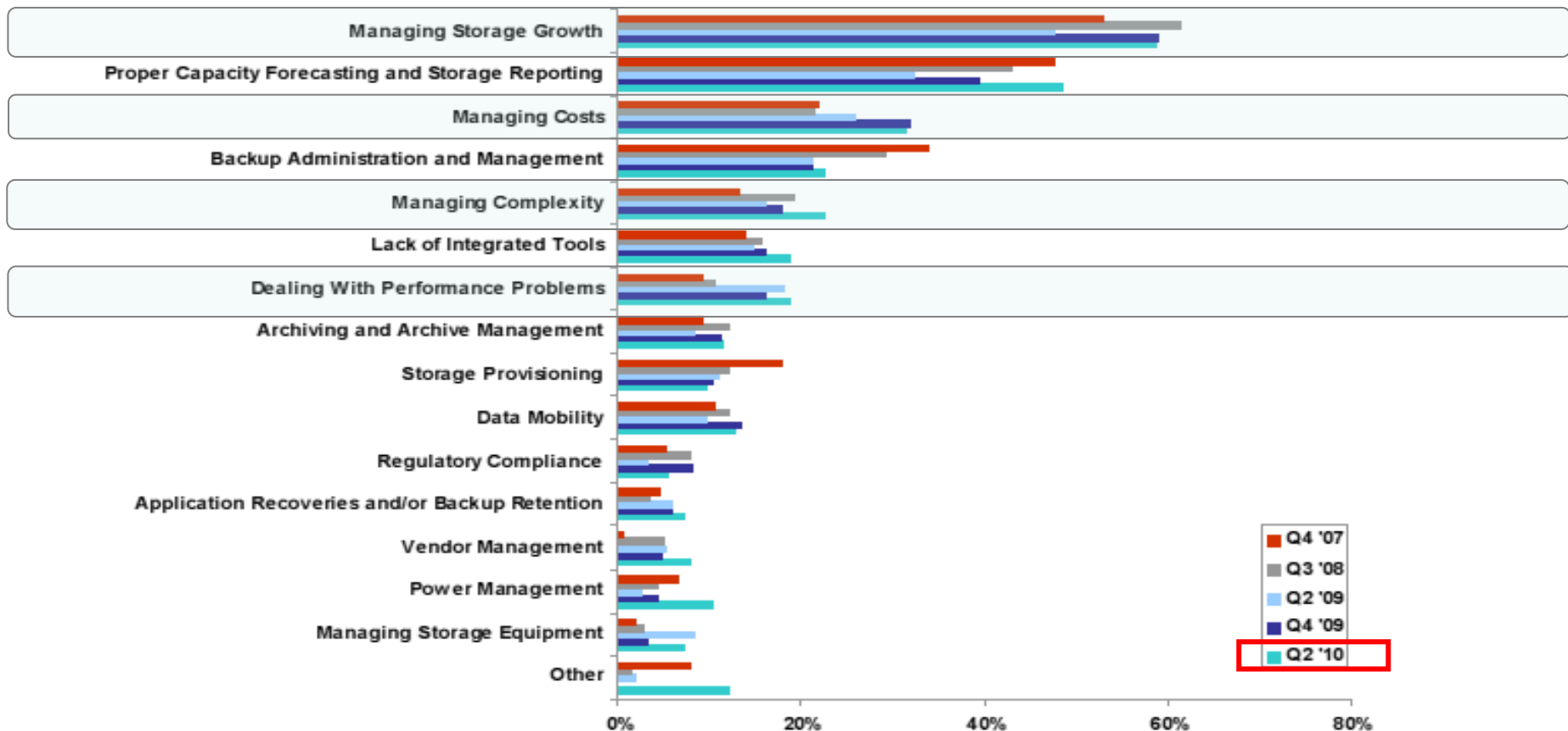
# Storage Administrators Face Problems Similar To Server Administrators

- 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*

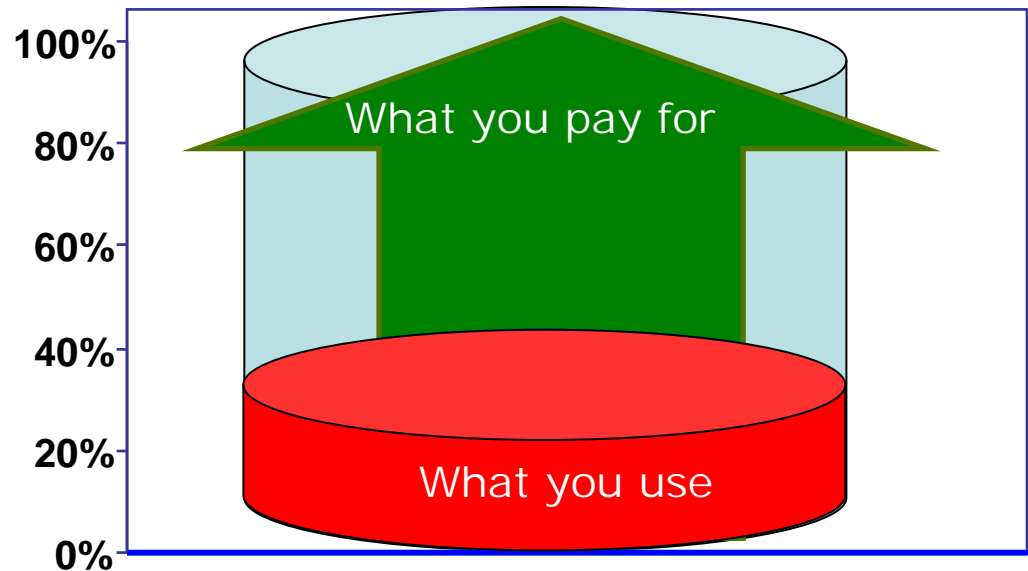


# Low Disk Utilization Drives Up Cost

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

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

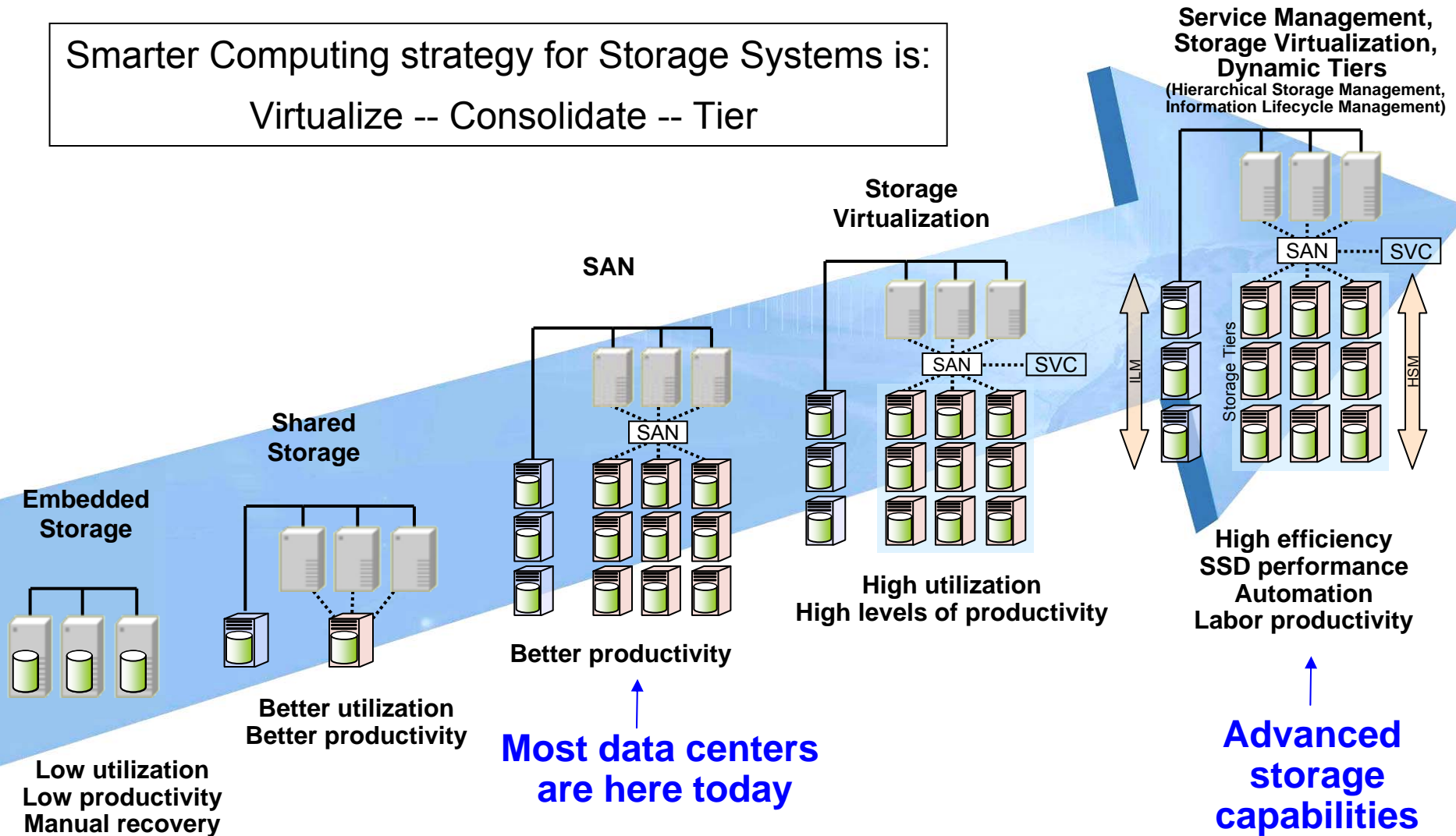
- System spins disks that are mostly empty
- Configuration planned for I/O peaks
- Configuration planned for Data growth



***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

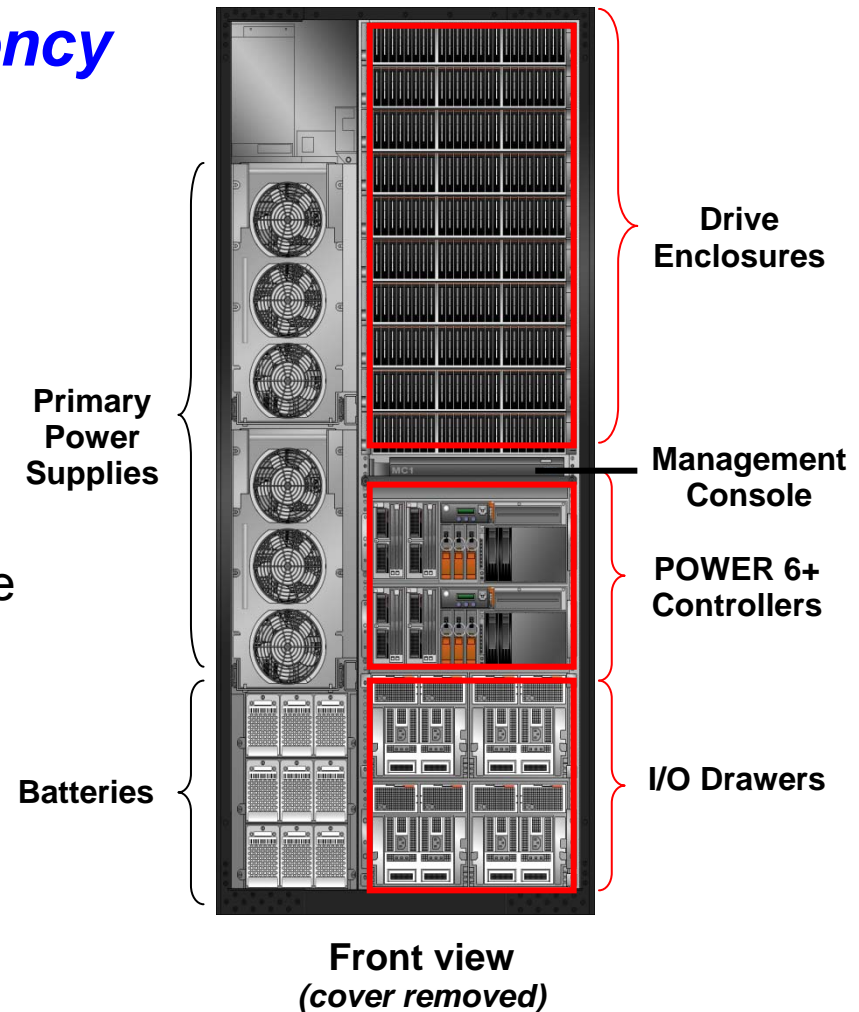
- In addition to its advanced hardware design, the DS8000 *is* smarter storage
  - ▶ Evolution from manual configuration and tuning to automation and efficiency
  - ▶ Automation and efficiency are imperatives for multi-tenancy environments, such as cloud computing
  - ▶ It all starts with our volume 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 high 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





# 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

24 Sun Fire X4170 Servers  
38 Sun T3-1B Blades

2 Sun Storage  
6180 Arrays

28 Sun Storage  
6180 Arrays

44 Sun F5100 Storage  
Flash Arrays

95 Sun Fire T4470 Servers



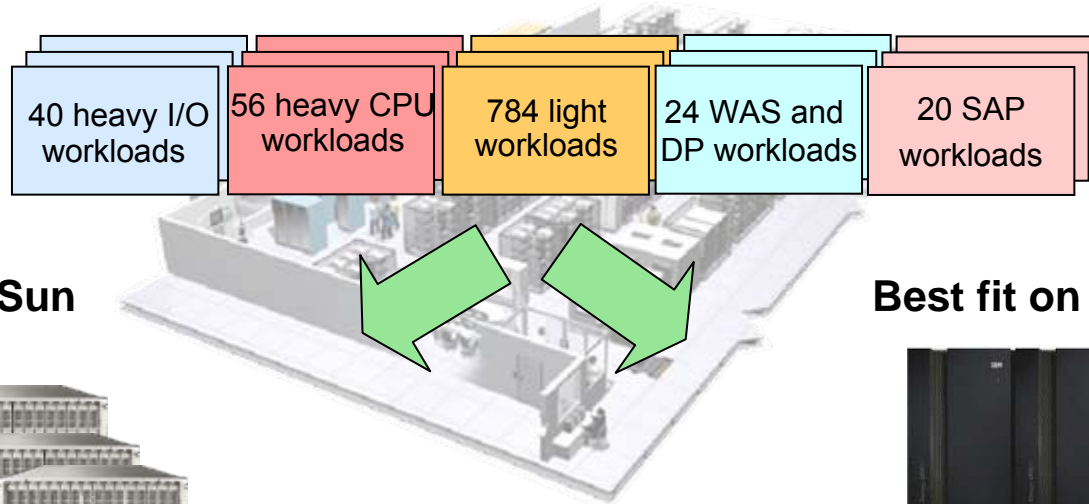
Best fit on zEnterprise



Incremental add  
on DS8800

- 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
- 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

**234.6TB** embedded storage

36.31% utilization  
74 points of admin

**\$7.8M**  
3yr TCA

Best fit on zEnterprise



Incremental add on DS8800

**142.5TB** embedded storage

59.73% utilization  
1 point of admin

**\$4.6M**  
3yr TCA

**41% less**

75GB/240GB active storage required per workload

# Consolidating Storage With DS8800 Saves 41% Over Distributed

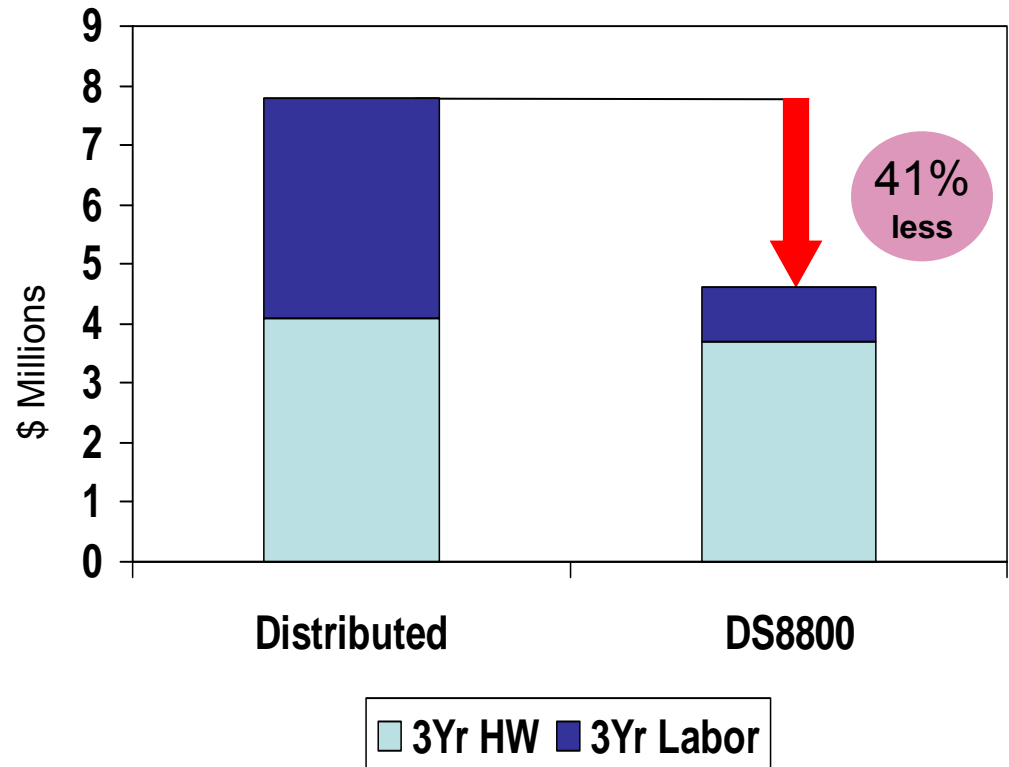
## ■ Hardware

- ▶ DS8800 saves 10% over distributed
  - Distributed= \$4.1M
    - 234.6TB
    - 36.31% Utilized
  - DS8800= \$3.7M
    - 142.5TB
    - 59.73% Utilized

## ■ Labor

- ▶ DS8800 saves 76% over distributed
  - Distributed = \$3.7M
  - DS8800 = \$0.9M

zEnterprise Storage Consolidation Cost Savings



# The Storage Performance Dilemma...

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



**CIO**

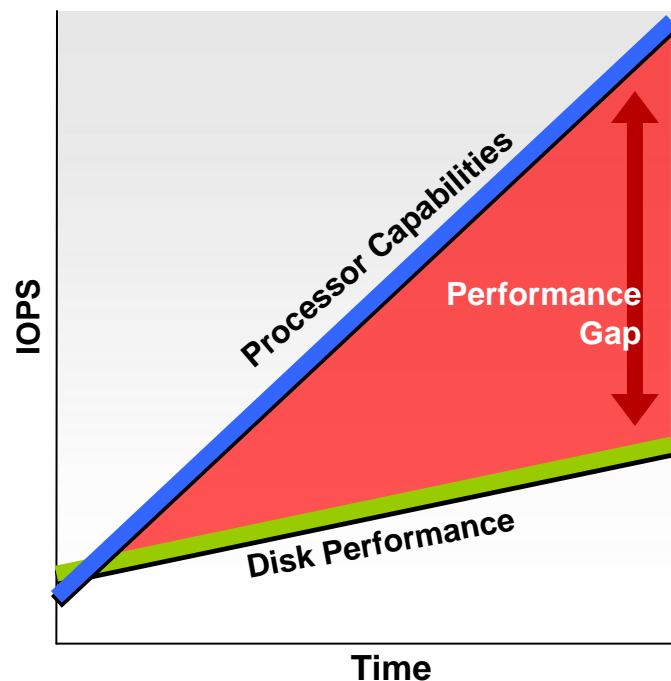
Our Easy Tier capability allows you to make use of Solid State Drives to increase performance and reduce your storage footprint. Let's show you how it's done.



**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



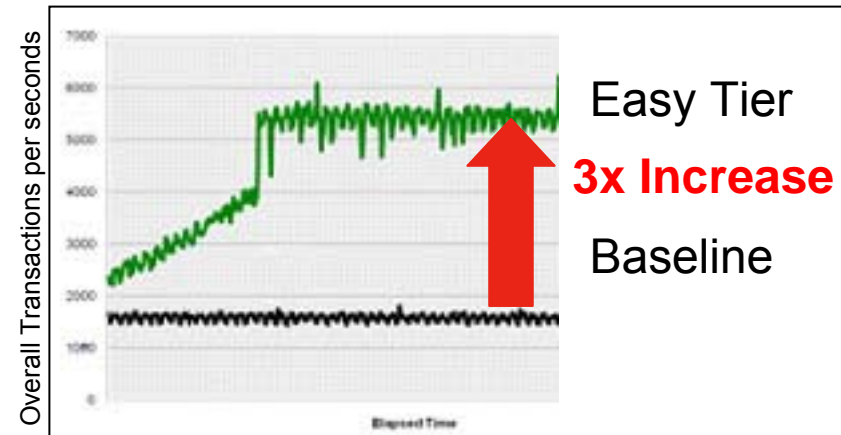
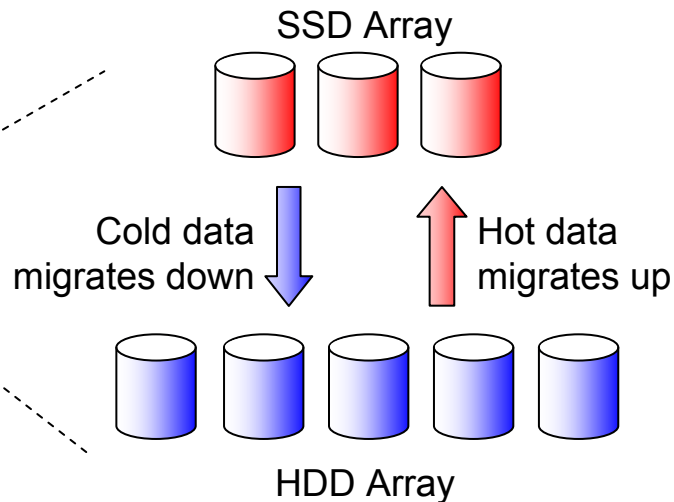
## Solid-state drives

- 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

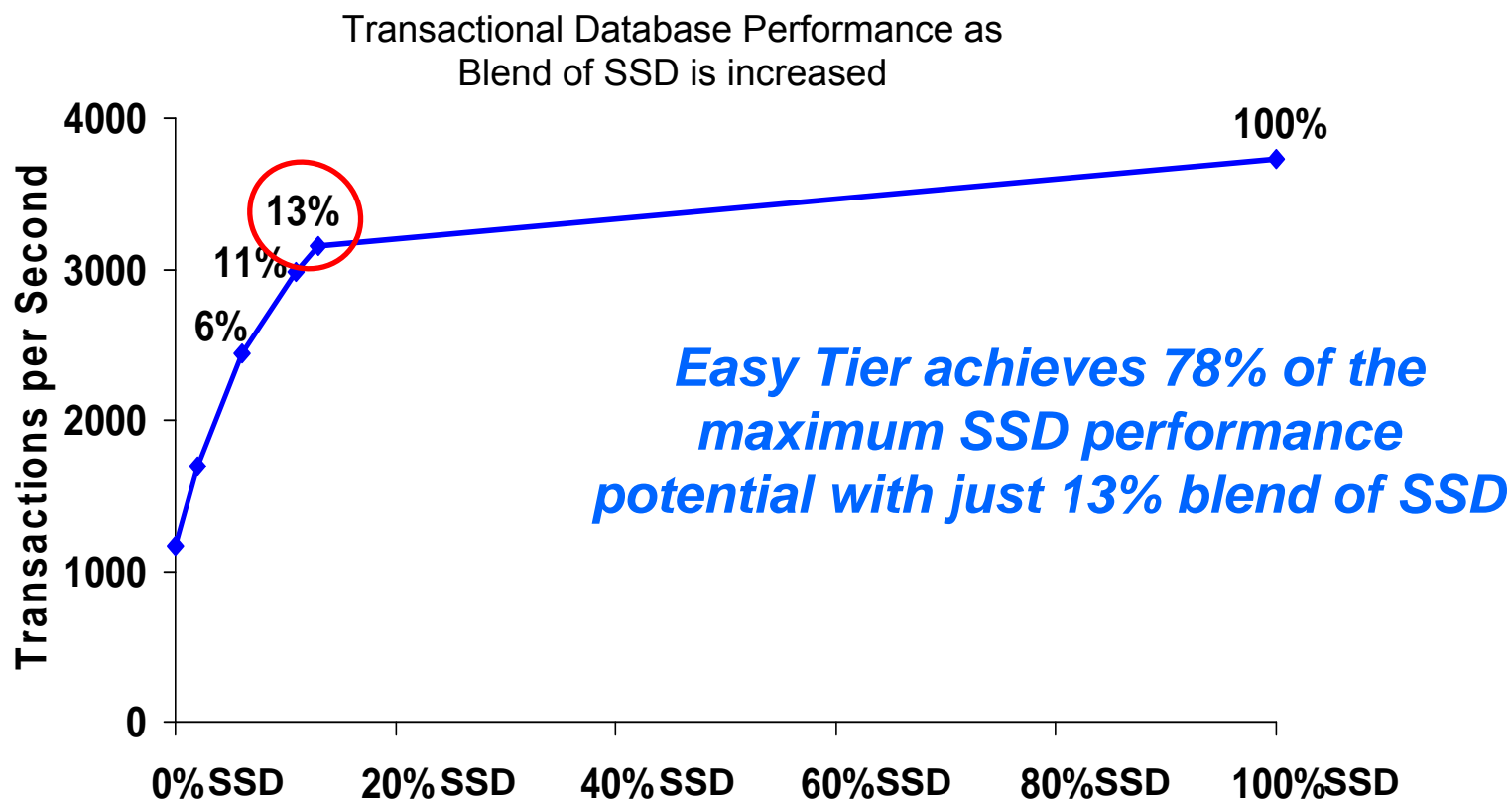
- Migrates data extents between SSD and HDD in the same pool
  - ▶ Automatic hotspot detection
- Virtualized SSD is shared across all workloads using the pool
- More cost effective use of SSD vs. ad hoc dedicated assignment
  - ▶ Use less SSD to achieve the same overall performance benefits
- Transparent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



Example: Complex database transactional workload



# Small Amounts Of Optimally Managed SSD Can Improve Storage Performance



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



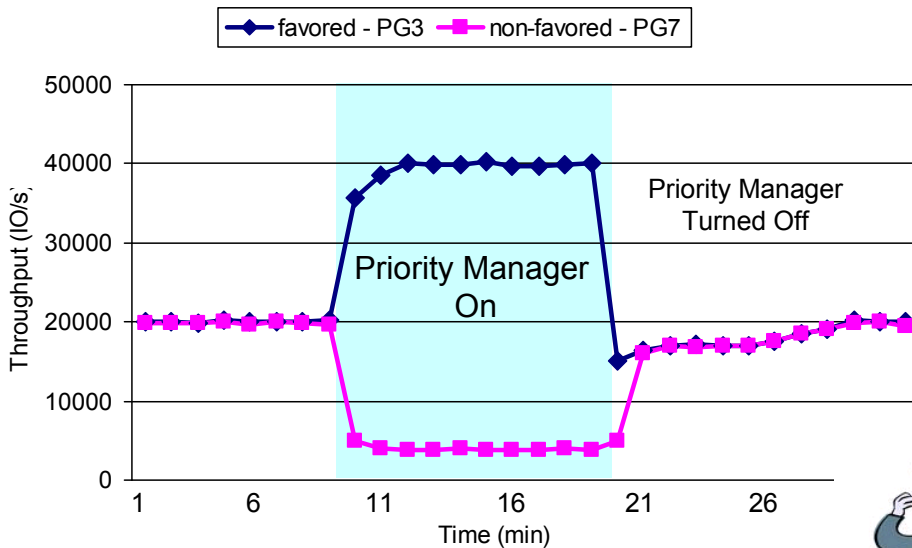
***Automated quality of service management delivers performance when and where it's needed***

# Free Up Your Valuable Resources With I/O Priority Manager

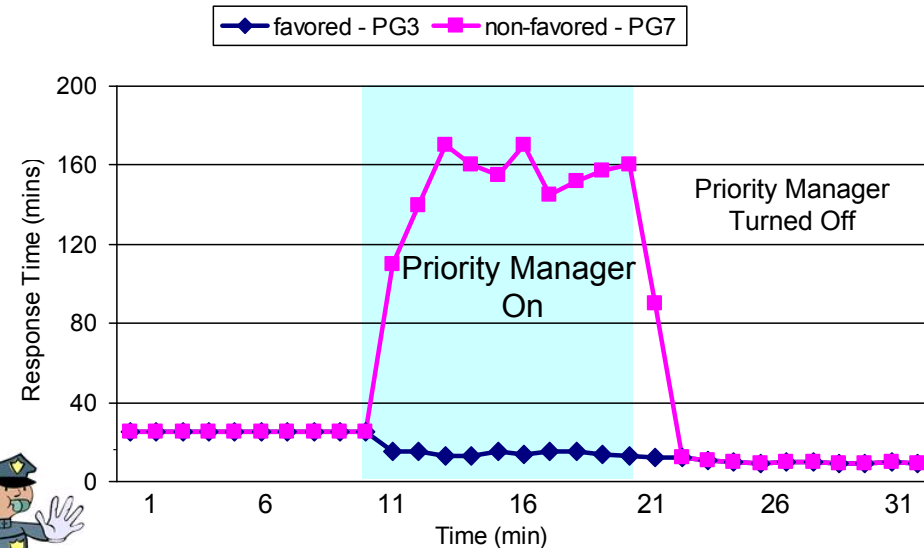
## How I/O Priority Manager works

- 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

DB like workload



DB like workload



# Easy Tier Enhancements (2<sup>nd</sup> Generation)

- Easy Tier automatic mode now supports migration between any two tiers
  - ▶ Supports migration from HDD to HDD in the same pool
- 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



**Easy Tier is Free**

# System z And IBM System Storage Synergy

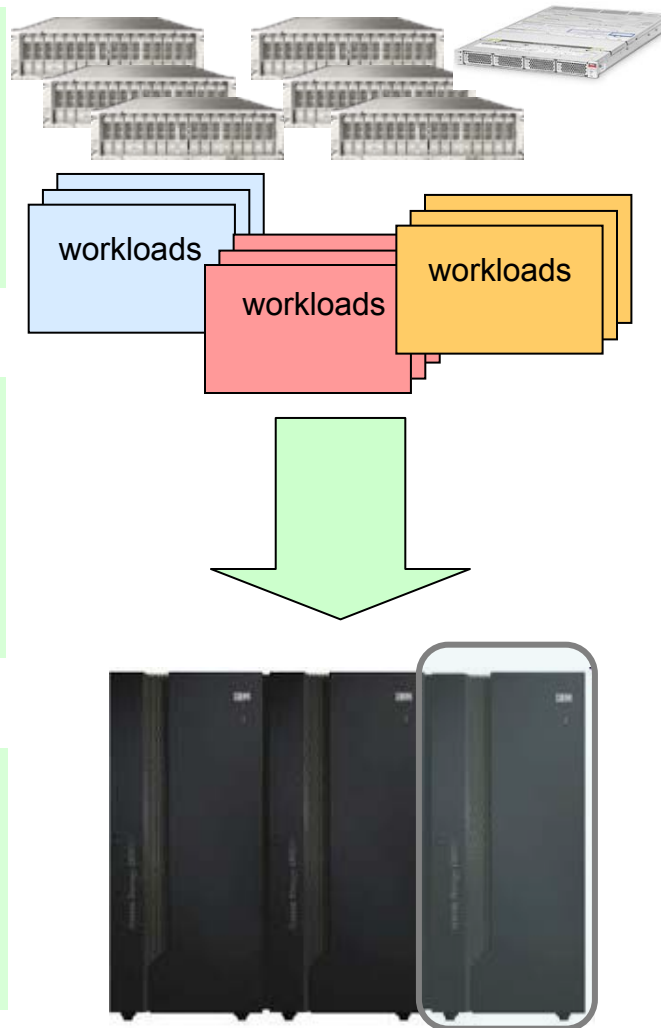
- System z and IBM System Storage have a unique relationship
  - ▶ Collaborate
  - ▶ Comprehensive testing in zSeries lab
  - ▶ Share cross support by skilled resources
  
- This helps IBM System Storage and System z development to:
  - ▶ Better design products that work well together
  - ▶ Implement 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

**Maximize utilization** through storage **virtualization and consolidation**

**Efficiently use solid state disk** **increases performance** up to 300% on critical apps

**Incremental addition of storage** minimizes **cost of acquisition**



**Centralized storage platform** and structured practices minimize **labor costs**

**Tivoli management tools** improve **productivity**