Information Infrastructure for today and tomorrow

IBM System Storage and IBM System z Together

Robin Edwards
IBM UKISA

Innovation that matters

IBM Systems

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Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

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Why IBM System Storage?

- **Heritage of Distinction**
  - 50+ years in storage business
  - Innovation leadership - Invented many of the storage technologies employed today
- **Leadership in Storage Today**
  - Over $5 billion revenues
  - Leading and growing market share
  - Over 5,000 people
  - In 170 countries
  - Over 1,000 IBM Business Partners
- **Research for a Bright Future**
  - 15 development labs worldwide
  - Over $500 million in R&D annually
  - More US patents than any other vendor
  - Acquiring new technologies to augment in-house innovation

- **#1 Total Storage Hardware**
- **#1 Total Disk**
- **#1 Tape**
- **#1 Storage Services**
- **#1 Archive & HSM solutions**
- **#1 Enterprise Content Management**
- **#2 WW external Disk**
  - **#1 in SW IOT**
  - **#1 in AP**
  - **#1 in 15 regions**
- **#2 Data protection & recovery**
- **Fastest growth in Storage SW**

Source: IDC Storage Tracker, latest full year, 2006

Note: full year 2007 data not yet available

IBM System z & System Storage: A Winning Combination

- **IBM System Storage™ DS8000™ shows continued strong demand and world wide acceptance**
  - More than 1,000 systems shipped in Q407!
  - Over 7,000 installs to date
  - IBM DS8000 attach rates[1] (On rolling 4Q basis) IBM maintained:
    - Leadership in mainframe-attached external disk
    - #2 position in UNIX
    - Grew share and outgrew EMC and HP in Windows disk
- **Advanced function software is broadly used**
  - More than 50% installs with FlashCopy
  - More than 50% installs with remote mirroring
  - PAV on most System z-attached DS8000s and HyperPAV shipping on 25%
  - Tight collaboration between System z and storage enables IBM storage innovations for System z that competitors may have only after delay

1. Source: IDC Worldwide Quarterly Disk Storage Systems Tracker for IBM portfolio, Q207

" We are seeing the number of terabytes of video delivered doubling every three months," says Alan Ramadan, a top executive at Macromedia...

USA Today

"We are only able to access 10% of the data we need."

CIO of major insurance carrier

The current infrastructure is becoming overwhelmed

UPMC

Between 2004 and 2010 we expect a 900-fold increase in disk for digital entertainment content.

Coughlin Associates

The amount of worldwide information is projected to grow from 161 exabytes in 2006 to 988 exabytes in 2010.

WebWorkerDaily

Reality Check:
the current state of BC/DR plans

- ✓ Only about 50% of firms have a comprehensive business continuity plan.
- ✓ Half of firms without a continuity plan will have damaged their competitiveness in case of a disaster.
- ✓ 43% of firms that suffer a massive data loss will never re-open.
- ✓ Revenue loss *per hour* of downtime ranges by industry from $330K to $2.8M USD – **average loss is $1.01M.**

Help Your Clients Realize Business Innovation

IBM enables its clients to get the most value from information …

… through products and services that provide an intelligent infrastructure for securely managing information…

…so that employees can leverage insights and realize business innovation.

The IBM Storage Information Infrastructure Delivers

Information Security

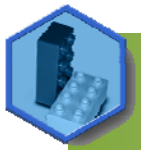
- Protect “data in motion”
- Control access
- Implement encryption

Information Compliance

- Discover and classify data
- Implement classes of service
- Support data governance policy

Information Retention

- Establish tiered storage
- Policy-based archival
- Indexing and long term retention



Information Availability

- Support recovery scenarios
- Virtualize for high availability
- Simplify Management

Grow into the future on information infrastructure you can trust.

Helping our clients manage information availability, integrity, security, and growth

IBM System Storage innovations designed to support the growth and protection of mission critical information

- **Data protection with enhanced function, automation and reduced cost**
  - z/OS Global Mirror Multiple Reader
  - Extended Distance FICON
  - z/OS Global Mirror enabled for zIIP
  - z/OS Metro/Global Mirror Incremental Resync
  - IBM Basic HyperSwap
  - IBM System Storage FlashCopy SE
  - IBM System Storage Tape Encryption
  - IBM System Storage TS7700 enhancements
- **Growth into the future**
  - IBM Extended Address Volumes for IBM System z
  - IBM System Storage DS8000 performance enhancements
  - IBM System Storage DS8000 Dynamic Volume Expansion
  - IBM system Storage SAN768B

IBM System Storage offers a full range of outstanding enterprise storage products

Virtualization and direct attachment options

TS1120 C06

TS7700

TS7700 GRID

Advanced tape automation and drives

TS3500 Library

TS3400 Library

TS1120 Drive

- ✓ ***Solutions support System z as well as major open system platforms***
- ✓ ***Advanced Management tools support automated data management***
- ✓ ***Support virtualization to help reduce TCO and improve operational efficiencies***
- ✓ ***Designed to provide enterprise class reliability to help support continuous operations***

Enterprise Disk Systems

DS8000

DS6000

IBM SAN Options

Fabric switches

Enterprise directors

DS8000 optimizes for performance without all the work

IBM System Storage DS8000 Simplifies and Optimizes!

No special tuning required for high performance data placement. Means less work for the storage administrator

- Storage Pool Striping (rotate extents) enables high performance data placement without special tuning
- Reduces storage administrator work needed to optimize for performance

- **Option to select one of two volume allocation algorithms**
  - Rotate LUNs (current default)
  - Rotate Extents (new default to enable Storage pool striping)
    - When create volume, select next rank after one used for first extent on last volume
    - Rotate volume's extents through ranks (skip full ranks)
    - Result is striping a volume's data across arrays in the storage pool to maximize performance

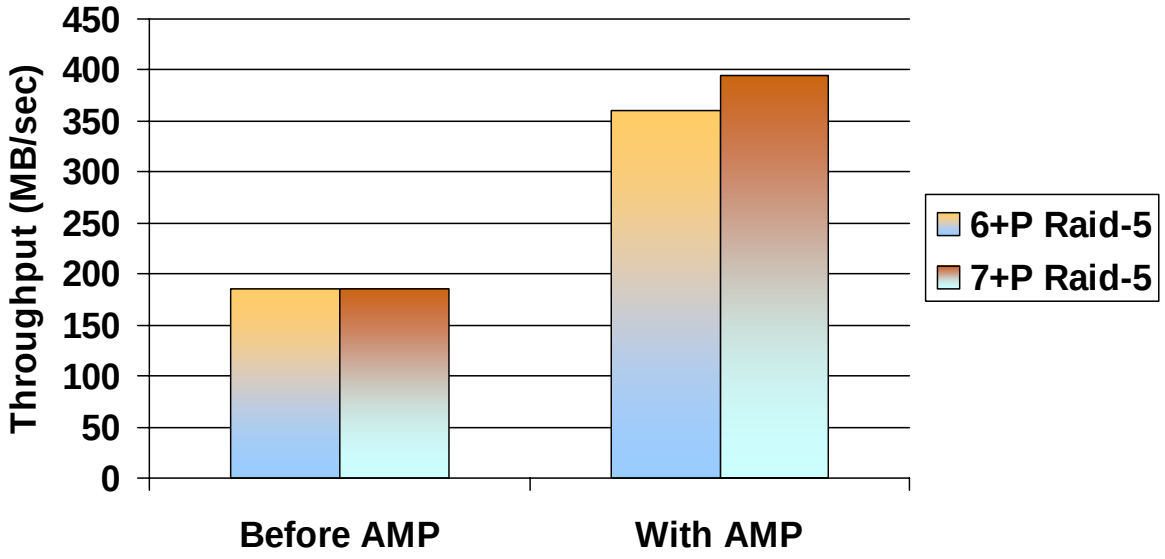
GA: Dec. 2007

IBM System Storage extends performance leadership for current and new clients.

DS8000 AMP enables *Up to Double the Throughput for Batch, Backup Workloads!*

IBM System Storage DS8000 Performs! Faster backups, faster processing

- **DS8000 function may mean less time for backups, batch processing, BI/DW and streaming media**
- **Enabled through break-through caching technology from IBM Research, AMP (Adaptive Multi-stream pre-fetching)**
- **Up to double the throughput for RAID5 sequential read workloads**
- **Can improve sequential read performance for smaller configurations and single arrays**

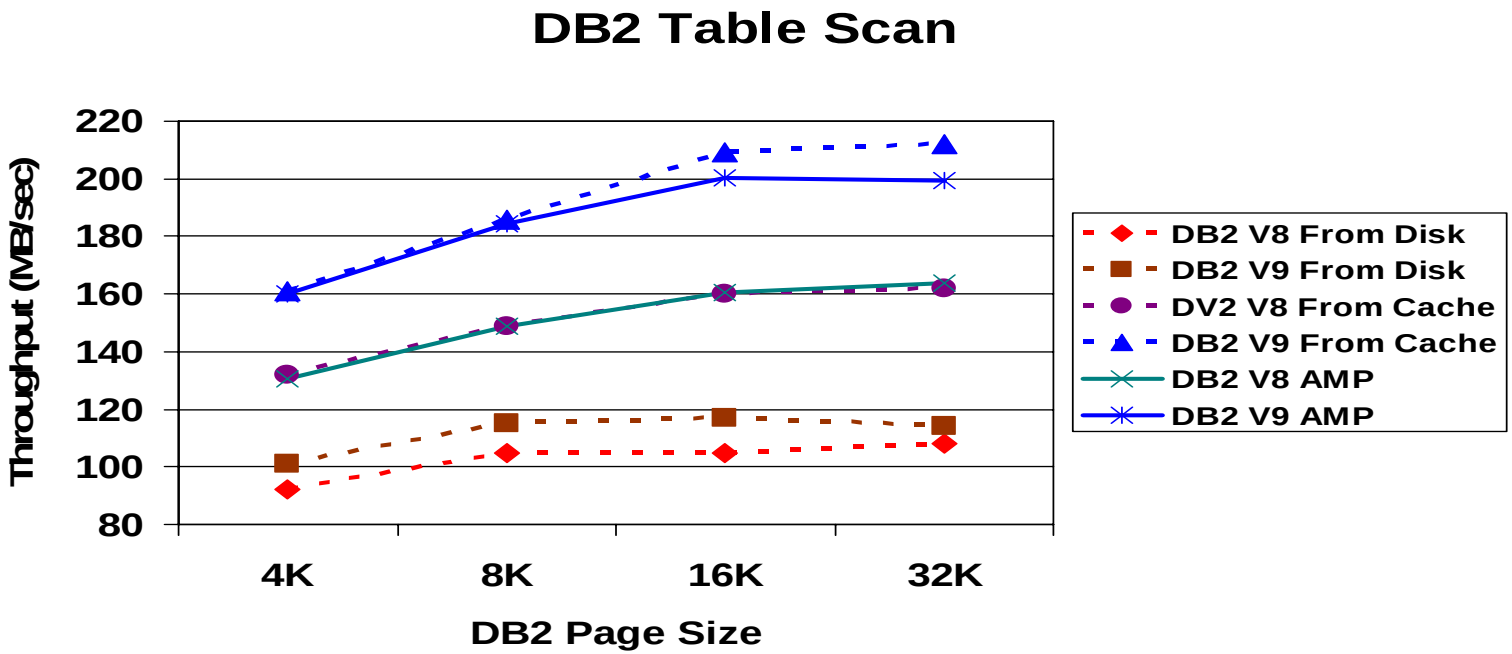


GA: Dec. 2007

IBM System Storage extends performance leadership for current and new clients.

AMP enables DB2 table scan from disk to perform like that from cache!

DB2 Sequential Pre-fetch with AMP



z9, FICON Express4, DS8300 Turbo, z/OS 1.8, Extended Format Data Sets

- **Significantly better throughput of DB2 Table Scan using AMP**
- **Improvement seen with DB2 V8 and V9**
- **Lines for AMP and cache are right on top of each other – AMP almost mirrors throughput seen when reading directly from cache!**

GA: Dec. 2007

Innovation that *Matters*! for Storage Clients and the Planet

IBM System Storage DS8000 Turbo provides new ways to simplify and increase efficiency

IBM FlashCopy SE space efficient snapshot capability can lower costs by significantly reducing disk capacity needed for copies.

- Uses space to save just source data being updated
- No longer need to allocate target copy capacity to match full source
- Thinly provisioned target copies reduce capacity needed

Using less capacity means

Fewer drives

Less power

More GREEN

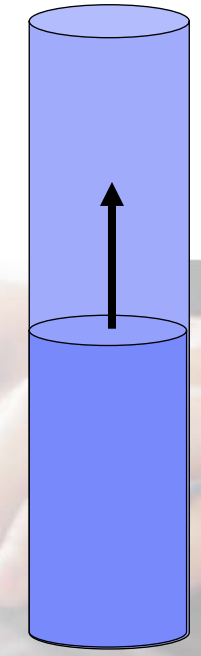
GA: Dec. 2007

Innovation that *Matters*! Grow with Ease Using Online Expansion

IBM System Storage DS8000

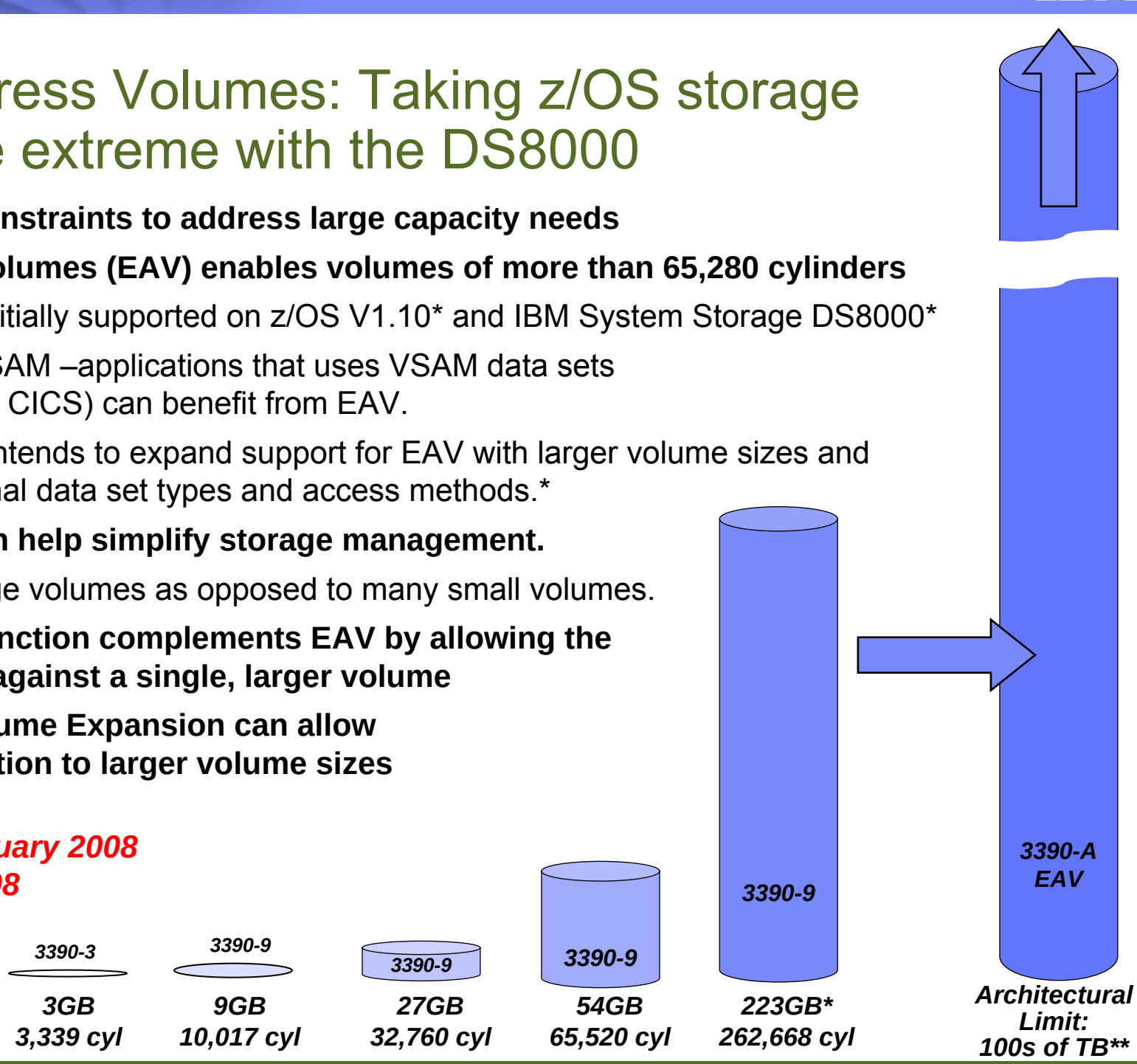
Dynamic Volume Expansion

- Simplifies management by enabling easier, online, volume expansion to support application data growth.
- Yields more highly available, simplified volume expansion
  - No longer need to backup data, bring volume offline, delete and recreate volume to expand it
  - Can be done on-line with a single command or GUI screen
  - Copy services relationships must be removed before volume expansion
  - Some operating systems-specific actions may be needed on server side before applications can see larger volumes
  - Can be used to non-disruptively migrate from smaller to larger z/OS volumes



Extended Address Volumes: Taking z/OS storage volumes to the extreme with the DS8000

- **EAV helps relieve constraints to address large capacity needs**
- **Extended Address Volumes (EAV) enables volumes of more than 65,280 cylinders**
  - 223 GB volumes initially supported on z/OS V1.10* and IBM System Storage DS8000*
  - First exploiter is VSAM –applications that uses VSAM data sets (including DB2 and CICS) can benefit from EAV.
  - In the future, IBM intends to expand support for EAV with larger volume sizes and support for additional data set types and access methods.*
- **In the future, EAV can help simplify storage management.**
  - Manage fewer, large volumes as opposed to many small volumes.
- **DS8000 HyperPAV function complements EAV by allowing the scaling the I/O rates against a single, larger volume**
- **DS8000 Dynamic Volume Expansion can allow non-disruptive migration to larger volume sizes**



* When available.
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IBM Data Mobility Solutions

Dynamically move data, without business interruption, regardless of hardware, platform, or distance

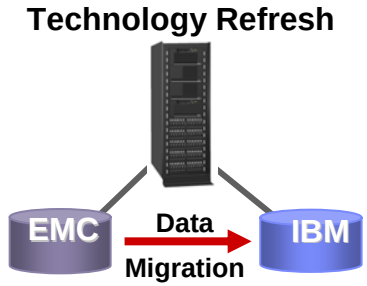
A Unified Approach to Moving Data

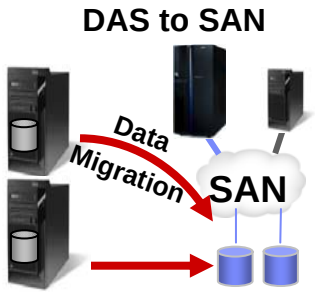
Softek TDMF

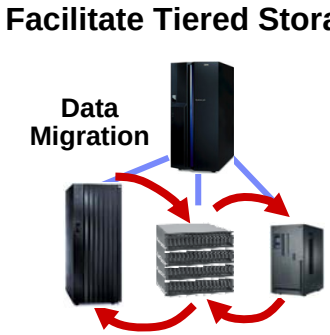
- **Volume level migration**
  - Move data between heterogeneous vendor hardware
  - Move data with no application outage
  - Standardize data movement across IT infrastructure
  - Consolidate volumes in z/OS non-disruptively
  - Linux, UNIX, Windows, z/OS

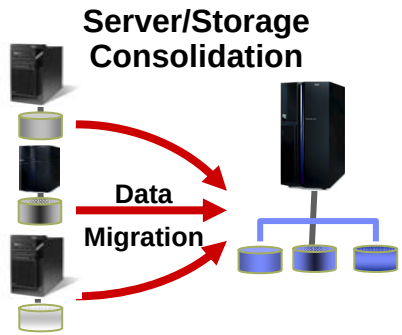
- Softek LDMF
  - **Dataset level migration**
    - Compliments volume level migrations

- Softek Data Mobility Console for z/OS
  - **Centralized migration management**
  - **Automates assessment and planning**





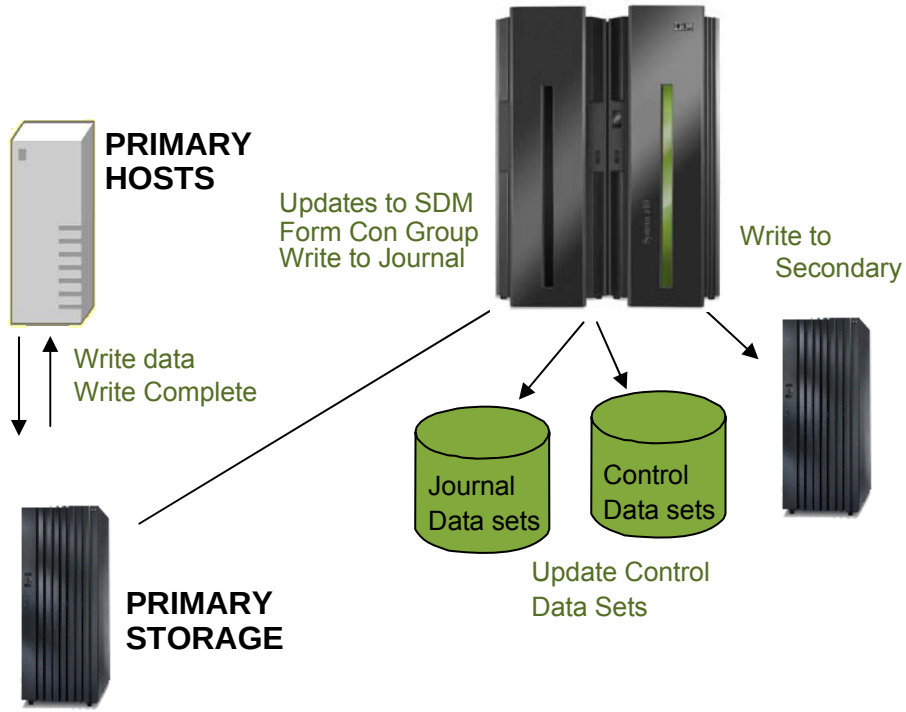




z/OS Global Mirror (XRC) - a Premium Business Continuity Solution Gets Even Better

Designed to Provide:

- **Premium performance & scalability**
  - Data moved by System Data Mover (SDM) address space(s) running on IBM system z
- **Unlimited distances**
- **Time consistent data at the recovery site**
  - RPO within seconds
- **Supports System z and Linux for z data**



Evolution!

- **Reduced Cost**
- **Greater Throughput**
- **New Function**

z/OS Global Mirror clients include:

- **Over 300 installation worldwide**
- **Major Banks in Germany, Scotland, Italy, Turkey, Greece**
- **Major US Banks/Brokerages/Insurance Co's**
- **Major Banks in Taiwan, Japan, China, Thailand, Korea**

z/OS Global Mirror Multiple Reader for DS8000 enhances throughput

Extends the unique IBM DS8000 Optimization for System z

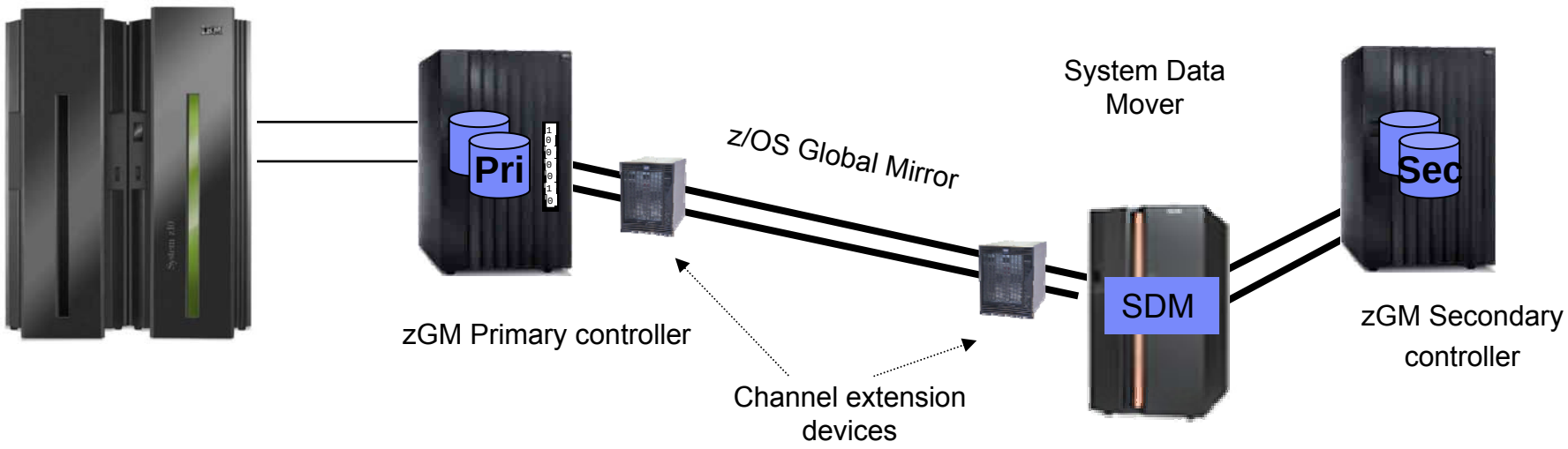
- z/OS Global Mirror Multiple Reader implements parallel processing for higher performance
  - IBM System z server can do many write I/Os in parallel
  - z/OS Global Mirror sidefile can fill quickly, but SDM has only one reader per sidefile
    - If emptying of zGM Sidefile falls behind, zGM can slow
  - Multiple Reader enables sidefile to be divided into multiple “sub-sidefiles”, for increased parallelism in processing i/Os
- Improves throughput for IBM z/OS Global Mirror
- Can better sustain peak workloads for a given bandwidth
- Can increase data currency over long distances
- Can replicate more capacity while maintaining same recovery point objective
- Helps avoid potential host impacts, slowdowns or suspends that could occur if I/Os are not processed fast enough

z/OS Global Mirror with DS8000 Extended Distance FICON enables protection at less cost

DS8000 Extended Distance FICON is designed to help

- IBM System z10™ and DS8000 enhance the FICON pacing to increase the number of commands in flight
- Enables communication over greater distances without substantial reduction to effective data rate
- Support increased link utilization
- Reduce the cost of remote mirroring over FICON for z/OS Global Mirror (XRC) solution
  - May eliminates need for more expensive 3rd party protocol-specific channel extenders

New! Announce Feb. 2008
Planned GA March 2008



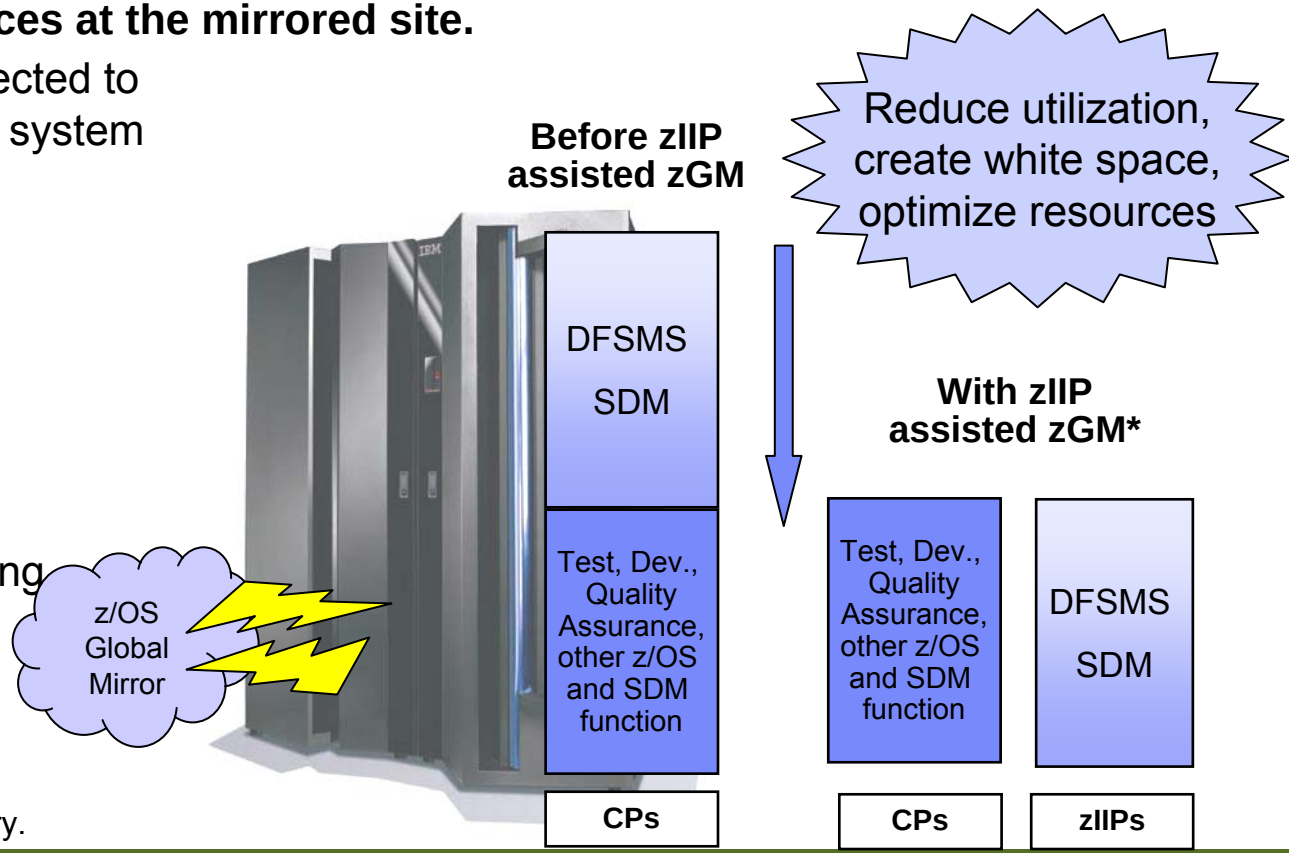
zIIP Assisted z/OS Global Mirror: a cost effective mirroring solution

- **z/OS Global Mirror (XRC) is enabled for the zIIP**
  - z/OS DFSMS allows most System Data Mover (SDM) processing associated with z/OS Global Mirror (XRC) to be eligible to run on the IBM System z10™ Integrated Information Processor and IBM System z9™ Integrated Information Processor (zIIPs)

- **zIIP assisted z/OS Global Mirror function, can help provide better price performance and improved utilization of resources at the mirrored site.**
  - DFSMS SDM processing is redirected to a zIIP processor which can lower system utilization at the mirrored site.

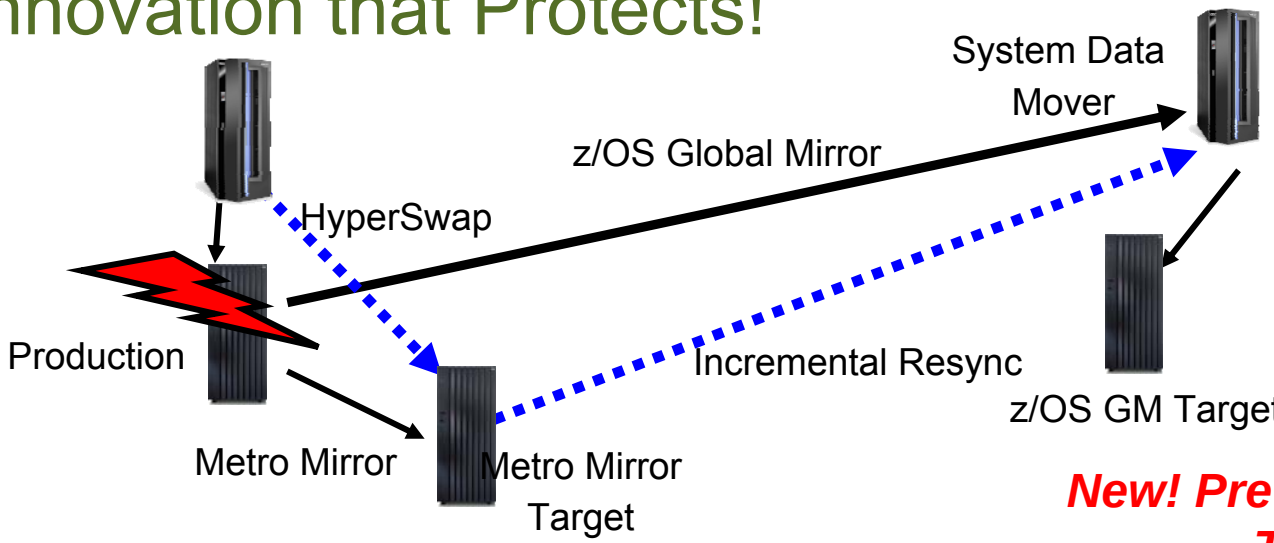
- **Available with:**
  - z/OS V1.10 (when available), or z/OS V1.9 and V1.8 with PTF for APAR #OA23174
  - IBM System Storage DS8000, or any storage controller supporting DFSMS SDM

New! Announce Feb. 2008
Planned GA March 2008



* For illustrative purposes only, your results will vary.

IBM System Storage DS8000, IBM System z, and GDPS: Innovation that Protects!



New! Preview February 2008
Target 2H08

IBM System Storage z/OS Metro/Global Mirror Incremental Resync - Preview*

- A three or two site remote mirroring solution providing protection from data loss for z/OS environments
  - Uses IBM System Storage Metro Mirror, z/OS Global Mirror (XRC) and GDPS
  - Production and Metro Mirror copy can be at different sites or in the same site for local/nearby HA/ DR and out of Region DR
  - Note: Three site mirroring with incremental resync using IBM Metro/Global Mirror (PPRC) for modular(unix, windows, etc.) and System z is already available and is supported by TPC for Replication
- Enables High Availability GDPS HyperSwap and Disaster Recovery - swap is automated, seamless and FAST
- Incremental resync swaps zGM session volumes & reconnects to remote volumes on a HyperSwap.
- Helps to speed resynchronization if outage occurs
- Reduces amount of data transmitted - only sends changes from Metro Mirror Target to z/OS Global Mirror Target after HyperSwap

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IBM Basic HyperSwap: An integrated solution to help enable cost effective data availability protection

IBM Basic HyperSwap

- **Help provide single site, high availability storage function**
- **Can seamlessly swap between primary and secondary disk volumes**
  - Protects from unplanned disk outages
  - Enables planned fail-over (testing)
  - Management is in z/OS
- **Consists of several products working together:**
  - IBM System Storage Metro Mirror (DS8000, DS6000, ESS)
  - z/OS V1.9 with APAR, or z/OS V1.10.
  - New product planned* : IBM TotalStorage Productivity Center for Replication (TPC-R) Basic Edition for System z
  - New product planned*: IBM System Services Runtime Environment for z/OS, or can use WebSphere 6.1.0
  - DB2 V8 (or later). Customers without DB2 may use Apache Derby (planned to be available with TPC-R for Basic Edition media).
- **GDPS/PPRC HyperSwap and/or HyperSwap Manager also available**
  - Robust single or multiple site, continuous availability and DR solutions

New!
Preview February 2008
Target 2Q08

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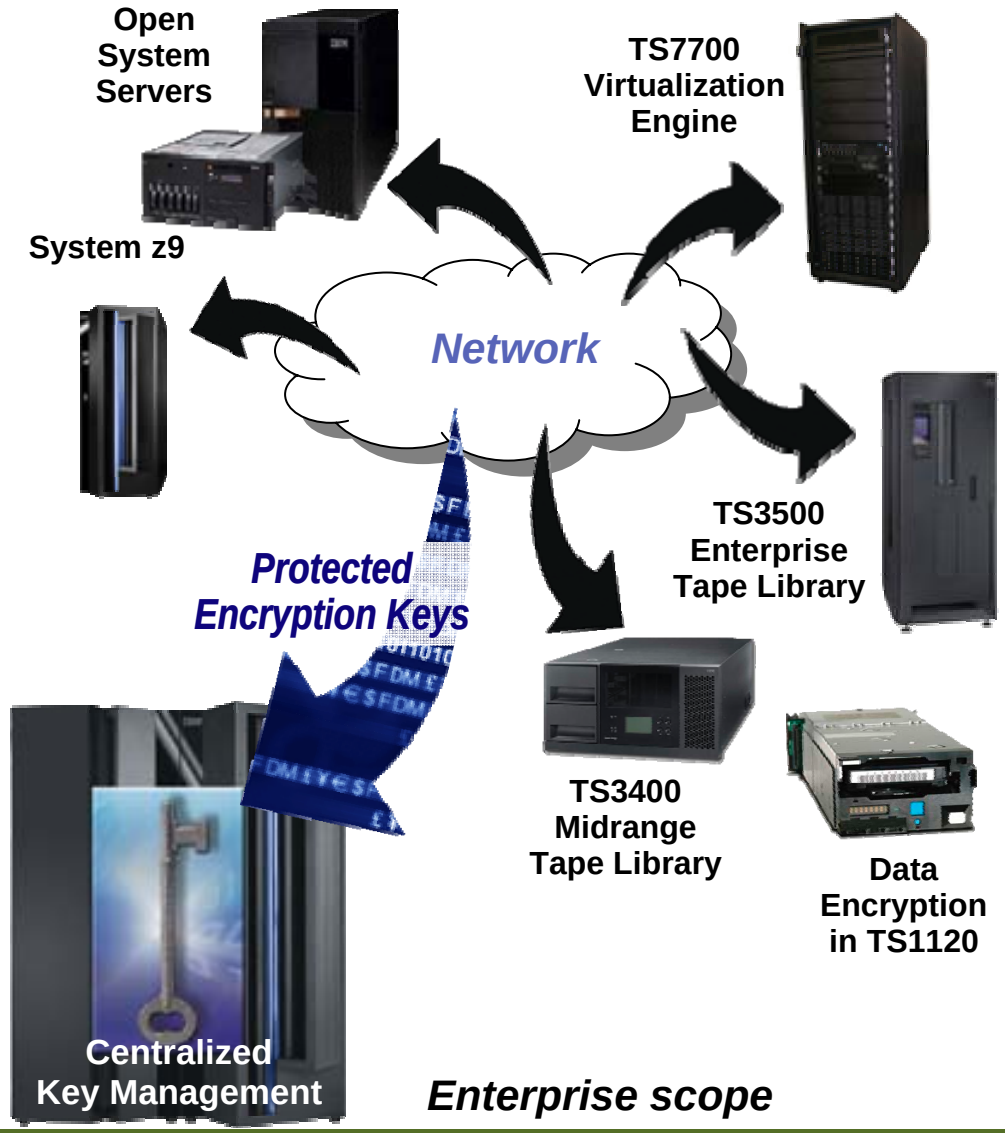
The System z and System Storage encryption solution delivers integrated security

z/OS Centralized Key Management

- **Can help to protect and manage keys across entire enterprise**
  - Highly secure and available key data store
  - Long term key management
  - Disaster recovery capabilities
  - Access control and audit-ability
- **Single point of control**
- **Leverage robustness of z/OS and IBM System z with over a decade of production use**



System Storage Tape Encryption

- **Designed to provide:**
  - z/OS encryption controlled via Data Policy (SMS) and user Policy (JCL)
  - Open systems encryption controlled via data source, VolSer or drive
  - Avoid Host MIPS overhead
  - Minimize impact to existing processes and applications

IBM Tape Brings Innovation to Manage Risk!

IBM System Storage TS7700 Virtualization Engine Releases 1.3 and 1.4

- **Innovation that protects. New three Site GRID configuration automatically copies tape data to remote sites for enhanced business continuity**
  - IBM System Storage TS7700 GRID can expand to three clusters
- **Innovation for improved disaster recovery with new Copy Export function**
  - Allows export of a copy of the data from a TS7700 used for disaster recovery, while the original data still accessible by production site
- **Innovation that simplifies storage management with new Host Console Request function**
  - Allows an z/OS operator to perform basic problem determination without having to access a Web-based specialist
- **Innovation that improves control with Host Copy Control**
  Allows host control of logical volume copying on a cluster basis
- **Innovation for enhanced operations with Dynamic Grid Network Balancing**
  - Compensates for unbalanced customer network performance
  - Controls GRID performance in adverse conditions

GA: Nov. 2007

IBM System Storage SAN and IBM System z: Innovation that Scales

IBM System Storage SAN768B

- **New "super-director" fabric backbone for next-generation enterprise datacenter fabrics**
  - ▸ Supports 4Gbps for current SANs
  - ▸ introduces 8 Gbps link speeds for future
    - ● 10 Gbps FCP switch blade for ISLs and distance extension
    - ● Planned support both FICON and FCP (useful for Linux on z)
      - – Advanced Security feature no longer needed for FICON Cascading
    - ● Designed to support future 10 Gbps Fibre Channel (FCP and FICON) over ethernet (FCoE) standard
- **New Intelligent Power Distribution Unit options for 2109-C36 Rack to support "green" datacenter initiatives**

IBM System Storage SAN768B (2499-384)

New! Announce Feb. 2008
Planned GA February 2008

IBM Storage Information Infrastructure *for IBM* System z

Trusted to deliver scalable, innovative solutions for over 50 years

- **Innovative: Consistently lead the industry in storage innovation for System z**
  - EAV support, z/OS Global Mirror enhancements, Encryption, HyperPAV, HyperSwap
- **Simplified Management: System z and System Storage products – architected, designed and tested to work Better Together**
- **Greener: High performance, efficient technology and functions with low Total Cost of Ownership**
- **Availability: designed for round the clock operations**
- **Trust: Extraordinary IBM support and service**

Most of all, you matter.

Thanks

Innovation matters

Availability matters

Trust matters