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MANAGE RISING DISK PRICES WITH STORAGE VIRTUALIZATION

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Manage Rising Disk Prices with Storage Virtualization

Technical Session: Learn how storage virtualization can reclaim existing storage on the floor. Extend thin provisioning to existing storage to increase disk utilization and defer capital purchases. Take advantage of zero page reclaim and write same to reclaim storage reclamation. Use the Hitachi Dynamic Provisioning overprovisioning capability for automatic optimum storage utilization. We'll also cover dramatic enhancements to the Hitachi Switch IT On III program that make this extremely attractive and affordable. Come to this WebTech and learn from Hitachi experts how to use these technologies to increase your customer satisfaction and sales despite impending increases in disk prices.

Attend this session to learn

- Thin provisioning options for storage reclamation and expectations that depend on customer environments
- How to reclaim storage from existing systems using storage virtualization
- Details of the Hitachi Switch IT On III enhanced program



February

- **The Economics of Storage Virtualization**, February 1, 9 a.m. PT, 12 p.m. ET
- **Reduce Costs by Eliminating Backups and Dependence on Local Storage at the Edge**, February 8, 9 a.m. PT, 12 p.m. ET
- **Improve Cloud Adoption with Converged Infrastructure Solutions from Hitachi Data Systems and Brocade**, February 22, 9 a.m. PT, 12 p.m. ET

March

- **Lower Your Virtual Machine Costs with an Economical New Framework**, March 14, 9 a.m. PT, 12 p.m. ET
- **Flexible Options to Simplify Cloud Deployments**, March 28, 9 a.m. PT, 12 p.m. ET

Please check www.hds.com/webtech for

- Links to the recording, the presentation and Q&A (available next week)
- Schedule and registration for upcoming WebTech sessions



- Capacity efficiency problem
- Solutions
- How-tos
- Successes
- Services and promotions
- Q&A session

**IT IS CHEAPER FOR YOU TO VIRTUALIZE AND RECLAIM
THAN TO PURCHASE THAT CAPACITY**

- Unprecedented geological event causing worldwide disk shortage, resulting in
 - Limited availability and increased price of HDD
 - Compromised growth and business disruption
 - Forecasting challenges
 - Missed sales and revenue targets
- *Shortage may persist into 2013*, creating immediate need for increased capacity efficiency worldwide, via
 - Increased storage utilization
 - Capacity purchase deferral
 - Capacity reclamation
 - Extension of useful life of existing assets

- Increase storage utilization
 - Use more of existing and new assets
- Capacity purchase deferral
 - Reduce need to purchase capacity in step with business growth
- Capacity reclamation
 - Free up high-performance capacity for future use
- Extend useful life of existing assets
 - Reduce migration period to allow for extended use of systems
- Repurpose existing assets
 - Manage heterogeneous storage capacity as a single pool that inherits the benefits of parent array
- Take advantage of cost savings features, such as thin provisioning and dynamic data mobility, with existing storage systems, not just new ones

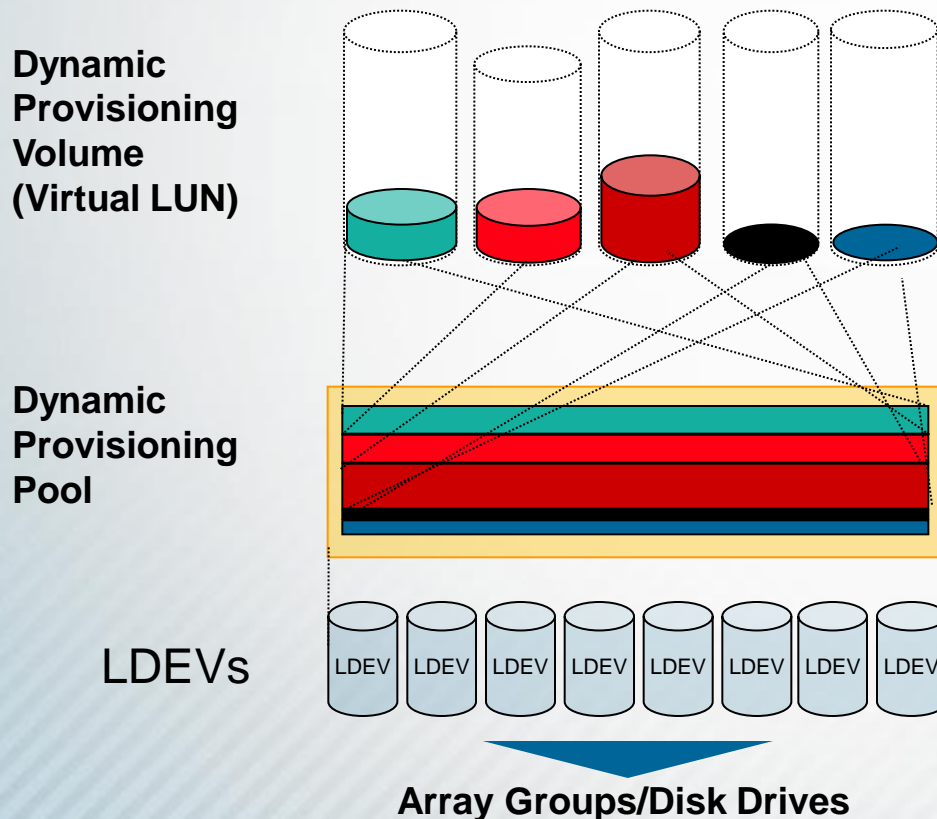


REDUCE NEED, RECLAIM EXISTING CAPACITY AND DEFER PURCHASES

- Storage pooling and thin provisioning
- Virtualization
- Tiered storage and dynamic tiering
- Disk configuration optimization: RAID 5 and 6 vs. RAID 10; high vs. low density
- Storage reclamation: ZPR and write same
- Thin replication
- Copy-on-write
- Service catalogs and chargeback Information
- Intelligent archiving (compression, deduplication and single instancing)

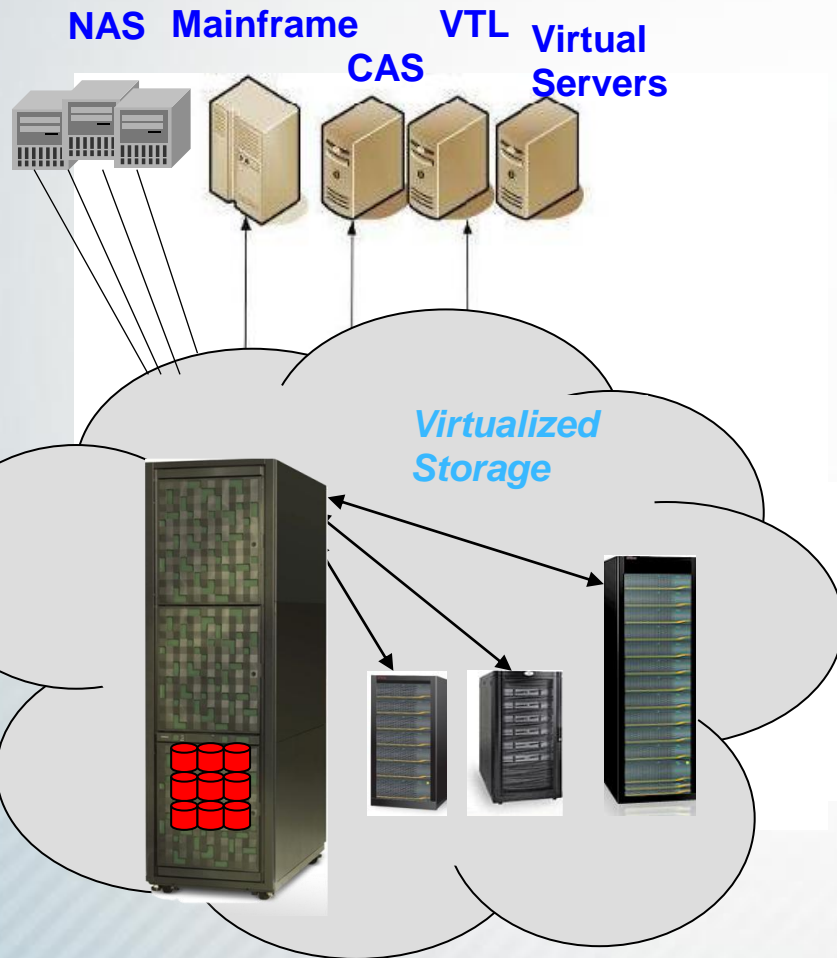
Thin provisioning reduces **wasted allocated capacity**, provides improved performance with wide striping, and enables **storage reclamation**

Host Servers



Thin Provisioned Volumes

Actual storage capacity is assigned only when host writes data to a LUN



Virtualization infrastructure impact

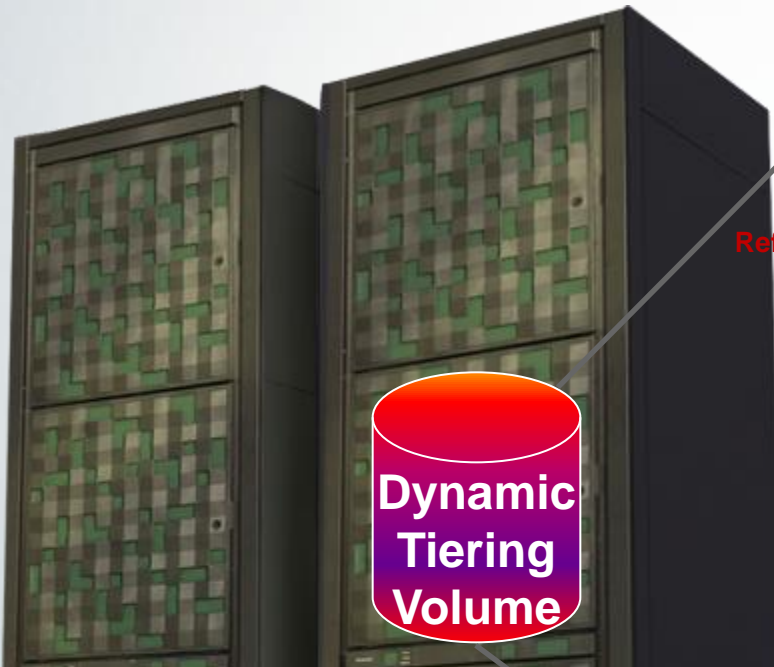
- Aggregates enterprise storage services for agile, scalable, service level-based delivery
- Reduces complexity, reclaims capacity, simplifies management, improves integrity and reliability, lowers operations costs
- Leverages existing investments, improves ROA

Information storage impact

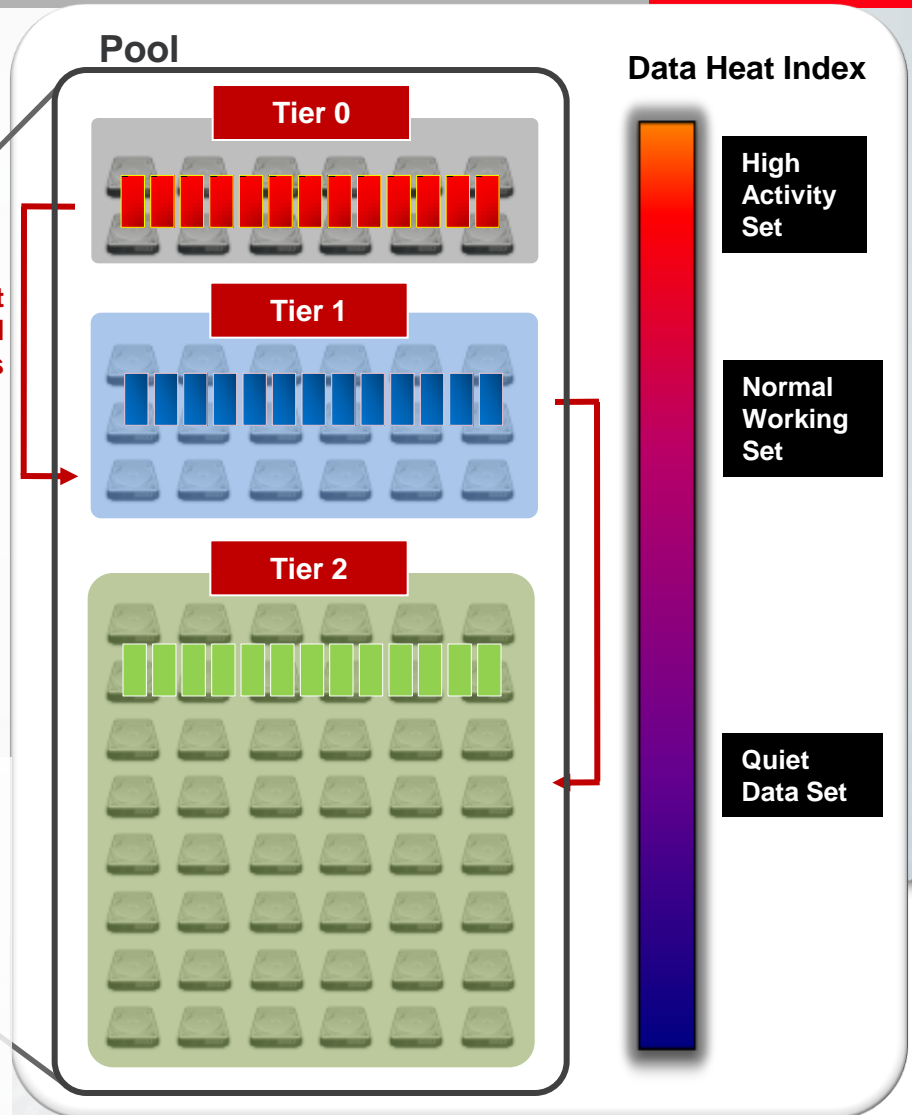
- Solves content problems, provides application and media independence

Virtualization outside the box

- Enables seamless integration of new and future capabilities
- Enables cloud storage, data migrations, lifecycle management, media migration, integration of data across applications



Least Referenced Pages

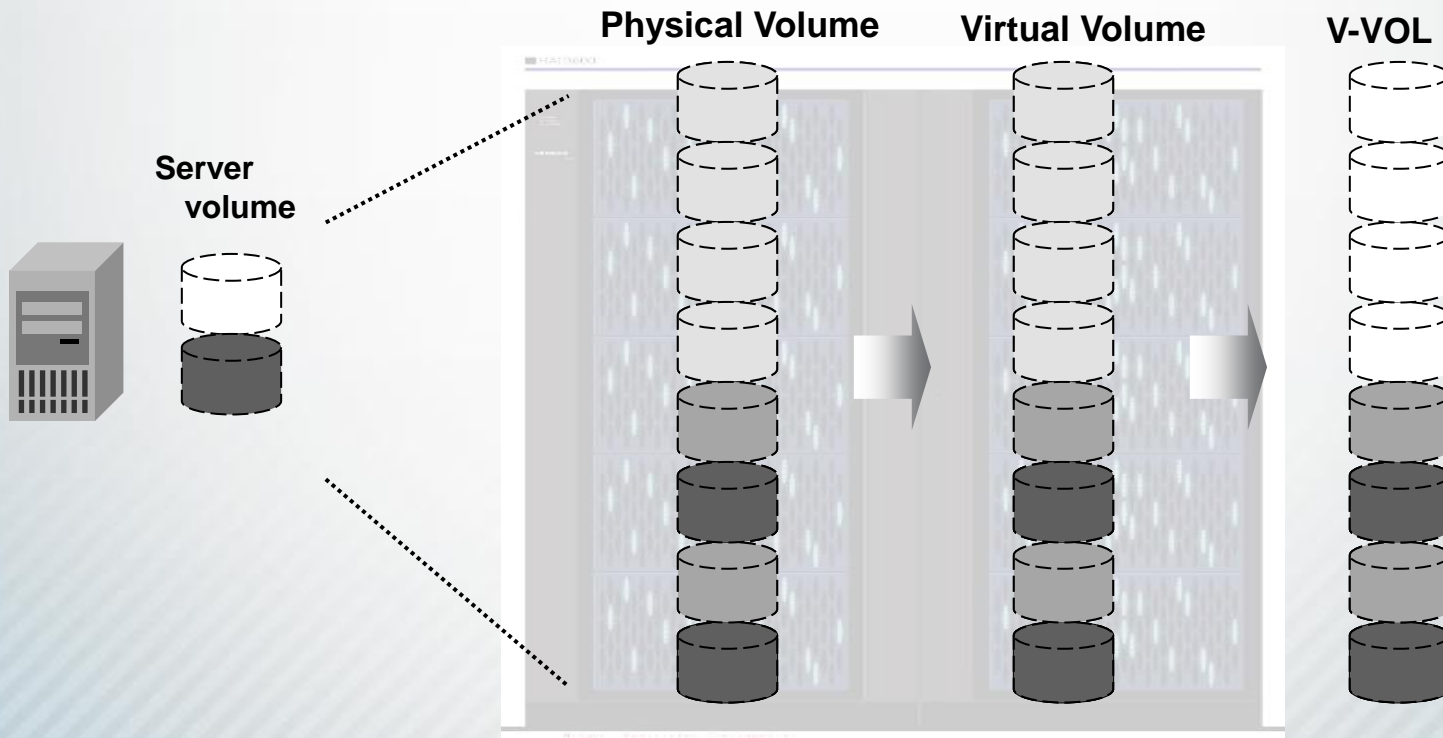


Dynamic Tiering Volume

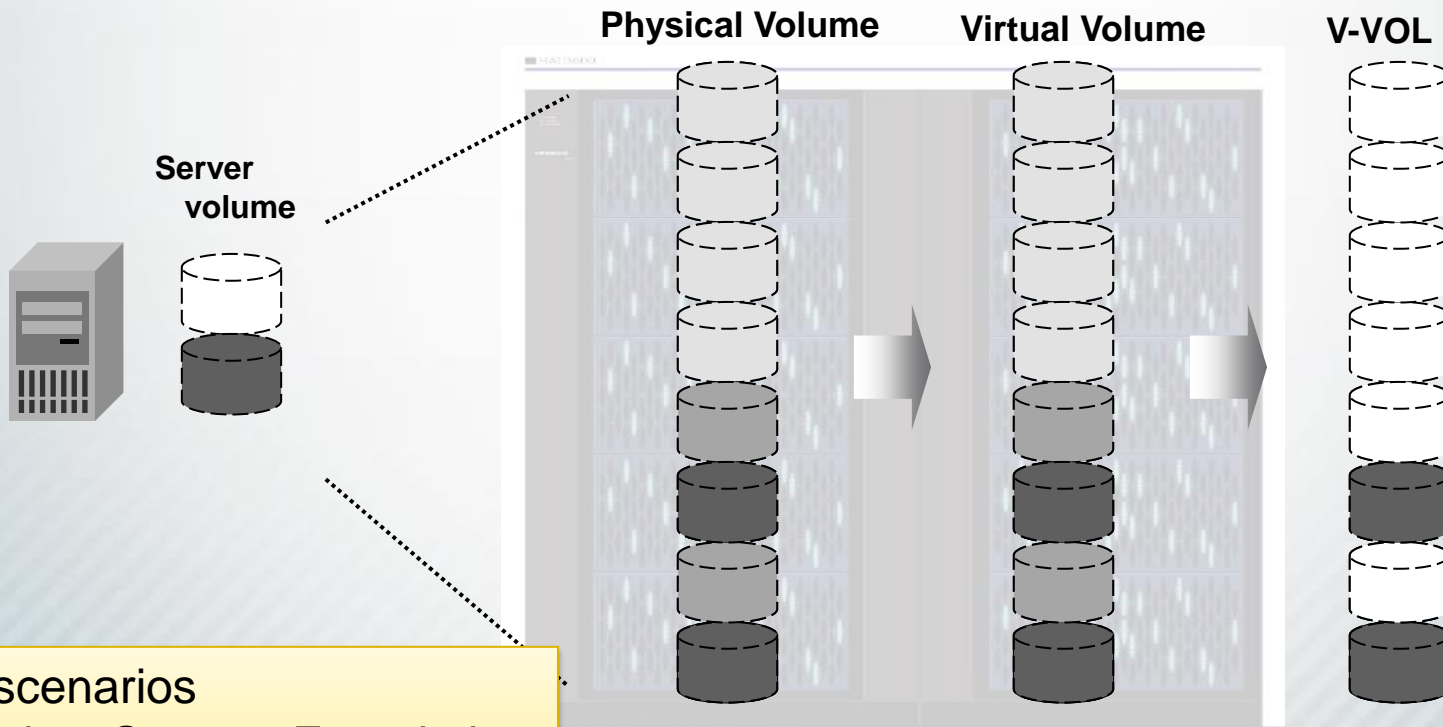
- Dynamic provisioning saves capacity
- Dynamic tiering optimizes cost and utilization
 - Choose tier policy on each LUN
- Finer control is available through HDT auto-tiering solutions

- With traditional volumes, Raid 5 and 6 have the power for all but the most demanding applications
- With Hitachi Dynamic Provisioning, wide striping often allows you to use raid levels with higher efficiency in more scenarios
- With Hitachi Dynamic Provisioning, wide striping may allow you to consider higher density drives
- With Hitachi Dynamic Tiering, optimum storage automatically delivers the most cost-effective use of your assets

- Returns unused storage to pool
 - Runs on storage, scans virtual volume for zero pages, returns any empty pages to pool free space
 - Cannot know where “data” is a deleted file



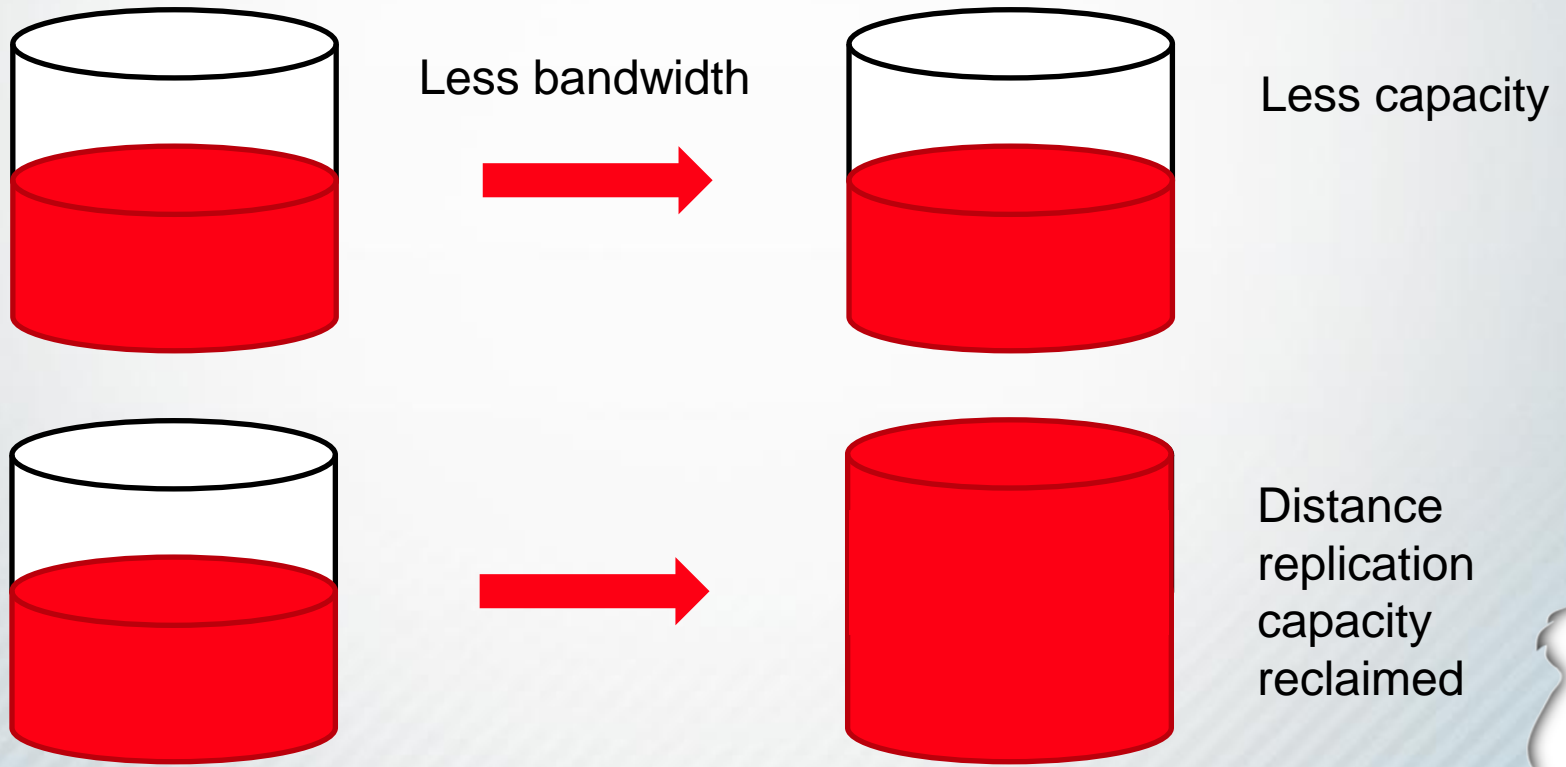
- Returns unused storage to pool
 - Runs on server, scans file system for free space *and deleted files*, sends command to return pages to pool free space
 - Only server software can know if “data” is a deleted file



Two scenarios

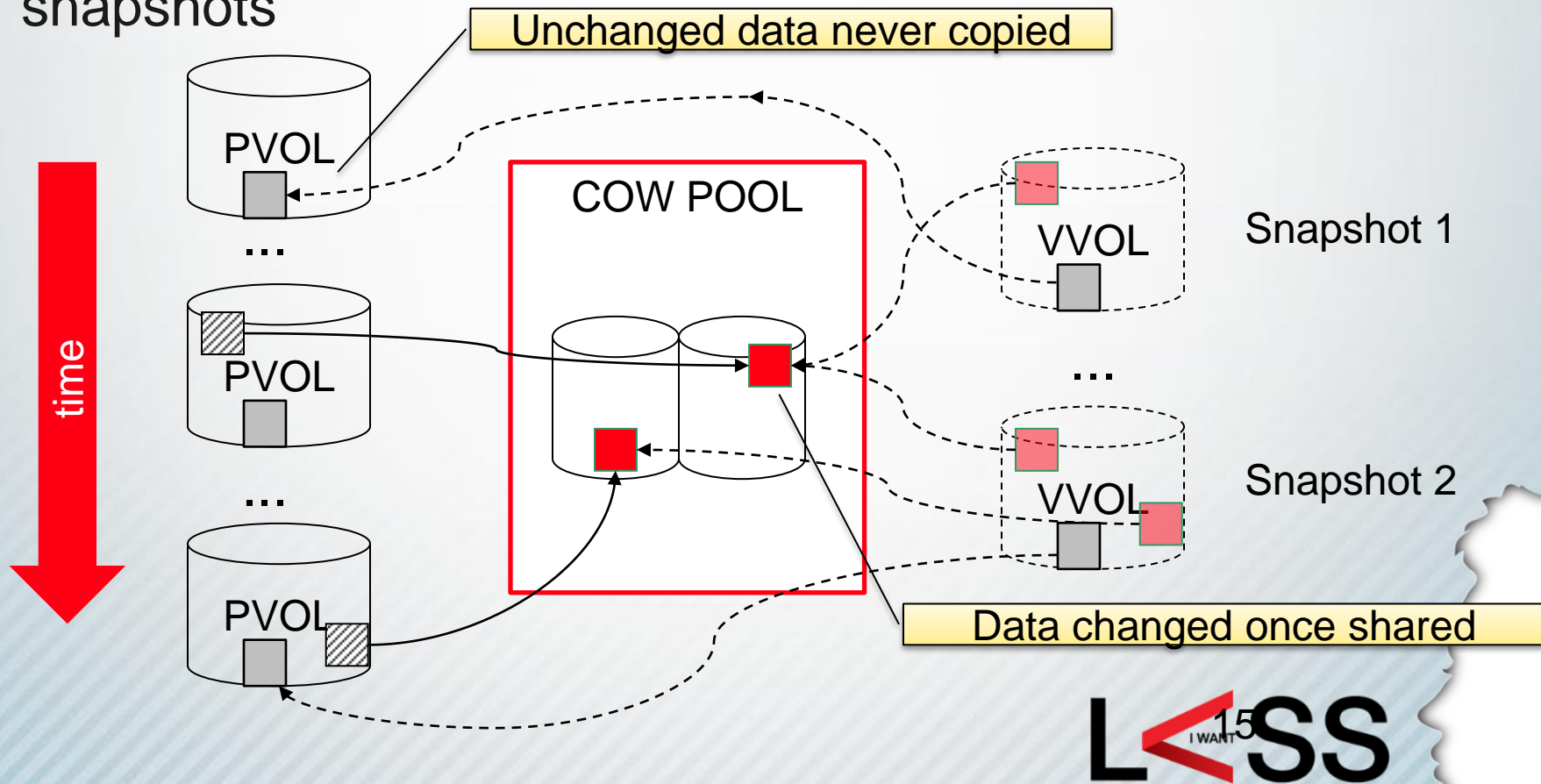
- Veritas Storage Foundation
- VMWare VAAI

- All Hitachi replication is thin-aware
- Savings made at the primary are also made at the secondary



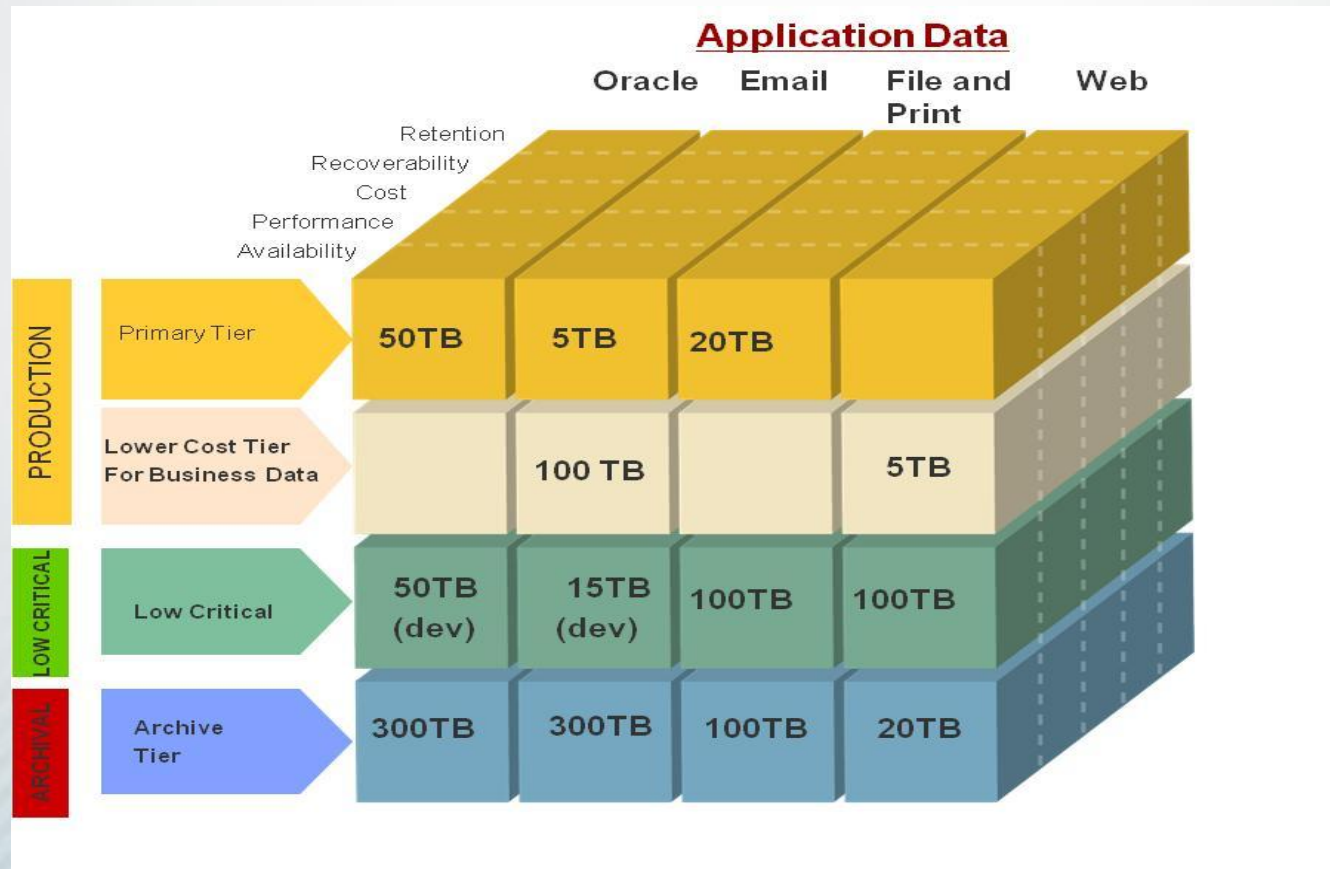
Minimal use of disk space

- Copies only changed data to a copy-on-write pool
- Shares the data between multiple generations of snapshots



SERVICE CATALOGS AND CHARGEBACK INFORMATION

Control user **behavior** with **service catalogs**, chargeback and showback reports, and basic consumption metrics



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Control user **behavior** with **service catalogs**, chargeback and showback reports, and basic consumption metrics

Application Storage Allocation by Tier

Date	Application	LG Path	Capacity	Tags	Tier
2012-01-15 00:00	HR File Shares	/NY/IT Operations/HUS-FO/HR File Shares	110.00 GB	-	-
2012-01-14 00:00	HR File Shares	/NY/IT Operations/HUS-FO/HR File Shares	110.00 GB	-	-
2012-01-15 00:00	Hyper-V	/Sydney/Hyper-V	40.00 GB	-	-
2012-01-15 00:00	Hyper-V	/Sydney/Hyper-V	36.00 GB	-	TSM_VSP@172.17.45.3/Silver E-Banking
2012-01-15 00:00	Hyper-V	/NY/Hyper-V	40.00 GB	-	-
2012-01-15 00:00	Hyper-V	/NY/Hyper-V	36.00 GB	-	TSM_VSP@172.17.45.3/Silver E-Banking
2012-01-15 00:00	Hyper-V	/Santa Clara/Hyper-V	40.00 GB	-	-
2012-01-15 00:00	Hyper-V	/Santa Clara/Hyper-V	36.00 GB	-	TSM_VSP@172.17.45.3/Silver E-Banking
2012-01-15 00:00	Hyper-V	/London/Hyper-V	40.00 GB	-	-
2012-01-15 00:00	Hyper-V	/London/Hyper-V	36.00 GB	-	TSM_VSP@172.17.45.3/Silver E-Banking
2012-01-14 00:00	Hyper-V	/Sydney/Hyper-V	40.00 GB	-	-
2012-01-14 00:00	Hyper-V	/Sydney/Hyper-V	36.00 GB	-	TSM_VSP@172.17.45.3/Silver E-Banking
2012-01-14 00:00	Hyper-V	/NY/Hyper-V	40.00 GB	-	-
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2012-01-14 00:00	Hyper-V	/Santa Clara/Hyper-V	40.00 GB	-	-
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2012-01-14 00:00	Hyper-V	/London/Hyper-V	40.00 GB	-	-
2012-01-14 00:00	Hyper-V	/London/Hyper-V	36.00 GB	-	TSM_VSP@172.17.45.3/Silver E-Banking
2012-01-13 00:00	Hyper-V	/Sydney/Hyper-V	40.00 GB	-	-
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2012-01-13 00:00	Hyper-V	/Santa Clara/Hyper-V	40.00 GB	-	-

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- Can cut down backup costs and move stale data to a lower-cost tier for retention or immutability requirements
 - Compression (Hitachi Content Platform)
 - Deduplication and single instancing (HCP – especially useful on archival storage because data is less active and return on deduplication is high)

SUCCESSFUL STORAGE RECLAIM

- We've been making recommendations for thin-provisioning best practices since first launching Hitachi Dynamic Provisioning
- But “best practice” implies you can
 - start from a blank sheet
 - strip everything down and start again
- Real-life environments migrate and evolve, best practices change and mistakes are made
- Global Solution Services storage reclaim service
 - employs techniques developed to recover storage
 - actively seeks opportunities to recover storage



- But only where it make sense
- You can achieve zero waste with unlimited effort
 - One extreme – strip it all out and build it again
 - The other extreme – “opportunistic” zero page reclaim
- Consider the cost and benefit
 - One day to recover 50% of 100GB – probably not worth it
 - One day to recover 5% of 10TB – worth evaluating
- Cost includes management and outage

- Different for every file system, operating system and application – combinations must be considered
- Many of you have discovered some techniques
- Containers: Data is stored in nested containers like Russian dolls
- Example: Oracle ASM – a table, in a tablespace, in a data file, in a DISKGROUP, in DISK(s), in LUN(s)



- Data \cong LUN – don't waste effort
- Data \ll LUN – may work...
- Data \ll LUN – may not work – deleted data
 - Can you zero data; will zero work?
 - Some approaches recover a lot but take time
- Do you understand **all** the containers?



- Older file system that hogs all the space even when empty (e.g., UFS, HFS)
- Some reclamation but rebuild may be the only option
- But is this cost effective?



Nothing here has impact

- Sometimes the problem is deep
 - For maximum impact, engage all levels and classes of administration
 - This can be a challenge



Tablespace or table

Rows Deleted



Tablespace Shrunk



ASM Reclaimed



- Try to shrink ASM and you hit a challenge with ASM layer
- PDFs on www.hds.com
 - Using ASM Storage Reclamation Utility from Oracle and Zero Page Reclamation Utility from Hitachi to Reclaim Storage Capacity
 - Reclaiming Unused Storage Capacity on a Hitachi Virtual Storage Platform with ASM Storage Reclamation Utility from Oracle and Zero Page Reclamation Utility from Hitachi

DELIVER COST SAVINGS



STORAGE VIRTUALIZATION LEADER

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External Storage Virtualization Leader

- >19,000 virtualization controllers shipped
- >40% of customers actively use external storage virtualization
- Best infrastructure migration solution in the world

Storage Virtualization Management Leader

- 2010 Hitachi Dynamic Provisioning penetration rate >50%
- >500PB storage under management, 50% virtualized
- One enterprise platform for all data





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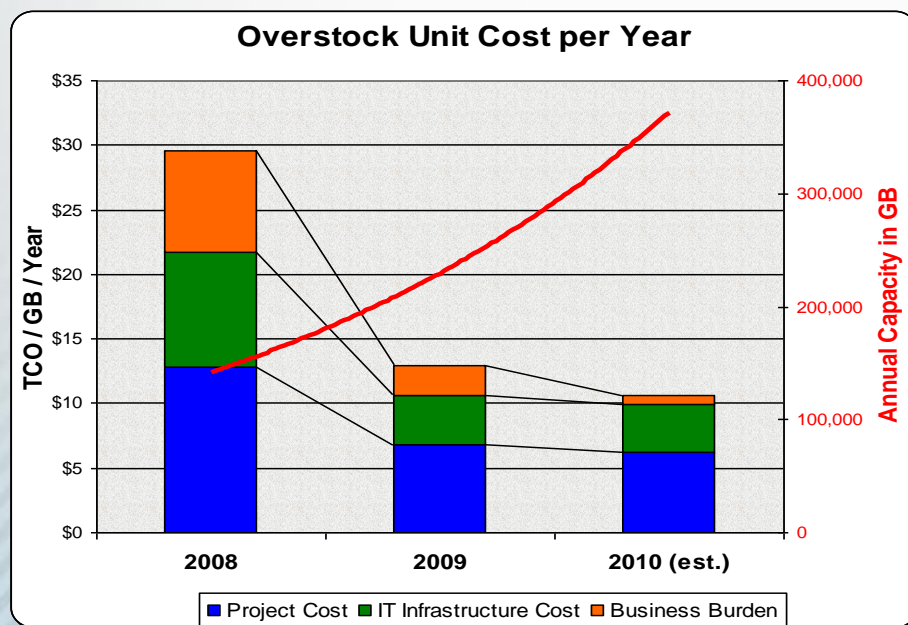
“With Hitachi virtualization technologies, we've seen storage capacity savings of 50% on some arrays, now provision storage in 25% of the time, and have increased utilization rates by over 30%. Overall, we've reduced our capital and operating costs for an improved return on our storage investment”.

– Carter Lee
Vice President of IT Operations, Overstock.com

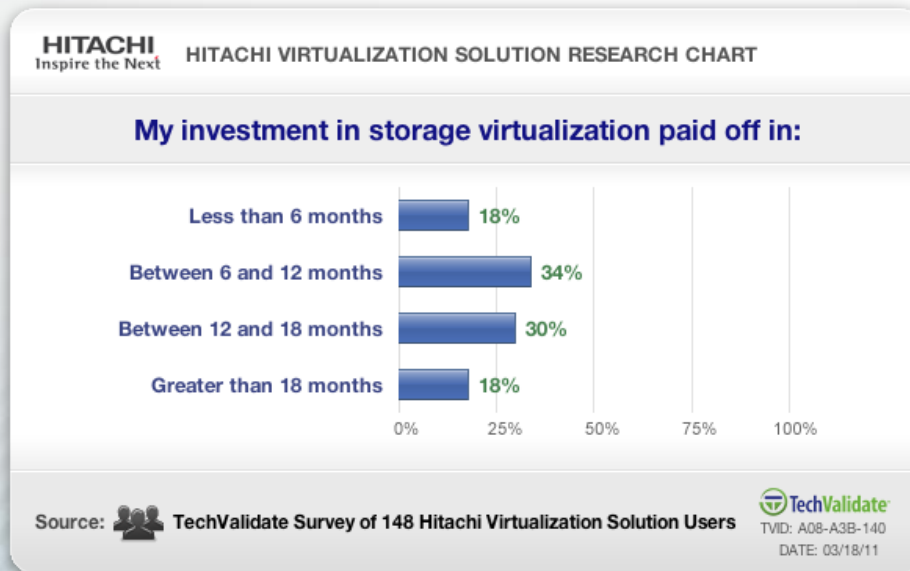


STORAGE VIRTUALIZATION ECONOMICS: OVERSTOCK.COM

Element	Before	After
Number of Storage Arrays	8	4
Usable Capacity in TB	133	236
Tiers, RAID	Tier 1 (75%) RAID 10 Tier 2 RAID 5 Software tiering	Tier 1 5% RAID 10 Tier 2 55% RAID 5 Tier 3 40% RAID 6
Management	3 people, planning to hire 4th	3 people
Migration	Very disruptive, time consuming and complicated	Done in 30 minutes
Provisioning time	2-3 hours per incident	30 minutes per incident
Volumes	Thick	Thin, ZPR in the future



- HUK Coburg reclaimed 30% capacity on IBM DS4800 using dynamic provisioning
- A global financial organization reclaimed 40-65% of its capacity through dynamic provisioning, saving in excess of US\$4M
- Fidelity National reclaimed their entire investment in less than a year with a ROI of 188% (even after paying for the software)



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Case Study: Large Enterprise Consumer Products Company

Challenges

- Chose Hitachi Storage Virtualization for the following reasons:
 - Consolidate and simplify their storage environment
 - Reduce storage costs
 - Leverage existing investment in storage infrastructure
 - Access low-cost storage

Use Case

- Virtualized the following storage using Hitachi Storage Virtualization:
 - Hitachi
- Virtualized 100 TBs of usable storage capacity with their Hitachi Virtualization Solution.
- Stores the following application data with their Hitachi Virtualization Solution:
 - Oracle
 - Exchange
 - SQL Server

Results

- Reported that external storage was much easier to manage once virtualized with their Hitachi Virtualization Solution.
- Reported that virtualized storage performance is faster with their Hitachi Virtualization Solution.
- Increased its storage utilization by greater than 40%.
- Rated Hitachi support for virtualization of external storage as excellent.

Testimonials

“Hitachi Virtualization offers more efficient use of storage and deployment.”

SOURCE:
TechValidate Survey of a Large Enterprise Consumer Products Company


TVID: 3D5-4FC-4DA

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HITACHI Inspire the Next **Case Study: Medium Enterprise Health Care Company**

Challenges

- Chose Hitachi Storage Virtualization for the following reasons:
 - Consolidate and simplify their storage environment
 - Reduce storage costs
 - Leverage existing investment in storage infrastructure
 - Access low-cost storage
 - Create new functionality on old storage

Use Case

- Virtualized the following storage using Hitachi Storage Virtualization:
 - Hitachi
 - Sun/Oracle
 - HP
- Virtualized 60 TBs of usable storage capacity with their Hitachi Virtualization Solution.
- Stores the following application data with their Hitachi Virtualization Solution:
 - Exchange
 - SQL Server
 - Sharepoint

Results

- Reported that external storage is easier to manage once virtualized with their Hitachi Virtualization Solution.
- Reported that virtualized storage performance is faster with their Hitachi Virtualization Solution.
- Increased its storage utilization by between 11% and 25%.
- Paid back their investment in between 12 and 18 months.
- Rated Hitachi support for virtualization of external storage as very good.

Testimonials

“Hitachi Virtualization helped us reach our goal of no down time, easy management and lower cost.”

SOURCE:
TechValidate Survey of a Medium Enterprise Health Care Company

 **TechValidate**
TVID: 1C1-E8D-856

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Hitachi Storage Virtualization Case Study: Computer Services Company

Challenges

- Chose Hitachi Storage Virtualization for the following reasons:
 - Consolidate and simplify storage environment

Use Case

- Virtualized the following storage using Hitachi Storage Virtualization:
 - Hitachi
 - EMC
- Virtualized 300 TBs of usable storage capacity with their Hitachi Virtualization Solution.
- Stores the following application data with their Hitachi Virtualization Solution:
 - Oracle
 - SAP
 - Exchange
 - SQL Server

Results

- Reported that external storage was much easier to manage once virtualized with their Hitachi Virtualization Solution.
- Reported that virtualized storage performance is much faster with their Hitachi Virtualization Solution.
- Increased its storage utilization by more than 40%.
- Paid back their investment in less than 6 months.
- Rated Hitachi support for virtualization of external storage as excellent.

Testimonials

“The Hitachi Storage Virtualization solution was very good to use.”

SOURCE:
**TechValidate Survey of a Small Business Computer
Services Company**





Hitachi Storage Virtualization Case Study: Global 500 Insurance Company

Challenges

- Chose Hitachi Storage Virtualization for the following reasons:
 - Consolidate and simplify their storage environment
 - Reduce storage costs
 - Leverage existing investment in storage infrastructure

Use Case

- Virtualized the following storage using Hitachi Storage Virtualization:
 - Hitachi
- Virtualized 1000 TBs of usable storage capacity with their Hitachi Virtualization Solution.
- Stores the following application data with their Hitachi Virtualization Solution:
 - Oracle
 - Exchange
 - SQL Server
 - Sharepoint

Results

- Reported that external storage was easier to manage once virtualized with their Hitachi Virtualization Solution..
- Increased its storage utilization by between 26% and 40%.
- Paid back investment between 6 and 12 months.
- Rated Hitachi support for virtualization of external storage as very good.

Testimonials

“Hitachi Storage Virtualization offer consolidation of storage, ease of management and cost reduction by providing lower cost storage with the same user interface.”

SOURCE:
TechValidate Survey of a Global 500 Insurance Company



- Storage reclamation service
 - Assessment tools and services to gauge reclamation potential
- Customer offer: Switch IT On III
 - Available to both current and new VSP customers for virtualizing 3rd-party storage
 - Includes incentives for value-added software

SWITCH IT ON III ENHANCED OFFER

FOR VIRTUAL STORAGE PLATFORM

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Switch **IT** On.

Through June 30, 2012, when you purchase a new Hitachi Virtual Storage Platform, or for an existing system that is not already virtualizing external storage, in order to virtualize external storage behind it you can

- Get a 100TB capacity Basic Operating System (BOS) license block for the price of 50TB¹
- Offer applies to both software license and maintenance
- With the program, required BOS V license is discounted 75%
- Minimum of 25TB of external storage must be attached

And you can “super-size” the offer with matching 100TB capacity license blocks at the price of 50TB of capacity¹ for any of the following

- Hitachi Dynamic Tiering
- Hitachi Tuning Manager
- Hitachi Tiered Storage Manager
- Hitachi Command Director

Also, under the program if you add the following products on the VSP, you can get them at a 50% reduction in price

- Hitachi Disaster Recovery bundle
- Hitachi In-System Replication bundle

¹ conditions apply – see www.hds.com/go/free-storage-virtualization for additional details



IT IS CHEAPER FOR YOU TO VIRTUALIZE AND RECLAIM THAN TO PURCHASE THAT CAPACITY

- Investing in storage virtualization through VSP adds another dimension to storage efficiency by extending these new capabilities to existing storage systems
- If your current storage system does not provide thin provisioning, which can reclaim 20-40% or more of allocated but unused capacity, you don't need to rip and replace it
- Just by attaching it behind VSP, VSP can see your existing LUNs and move them into a dynamic provisioning pool where the unused pages in the LUN can be reclaimed while your application is running



QUESTIONS AND DISCUSSION

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