

STORAGE ECONOMICS – 2012

SUSTAINABLE ARCHITECTURES AND PLANS
THAT CAN WEATHER AN ECONOMIC STORM

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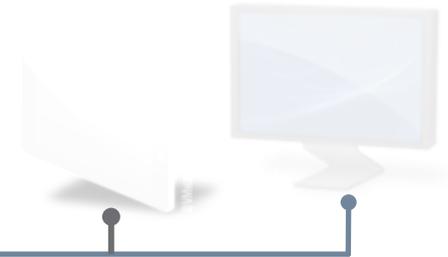
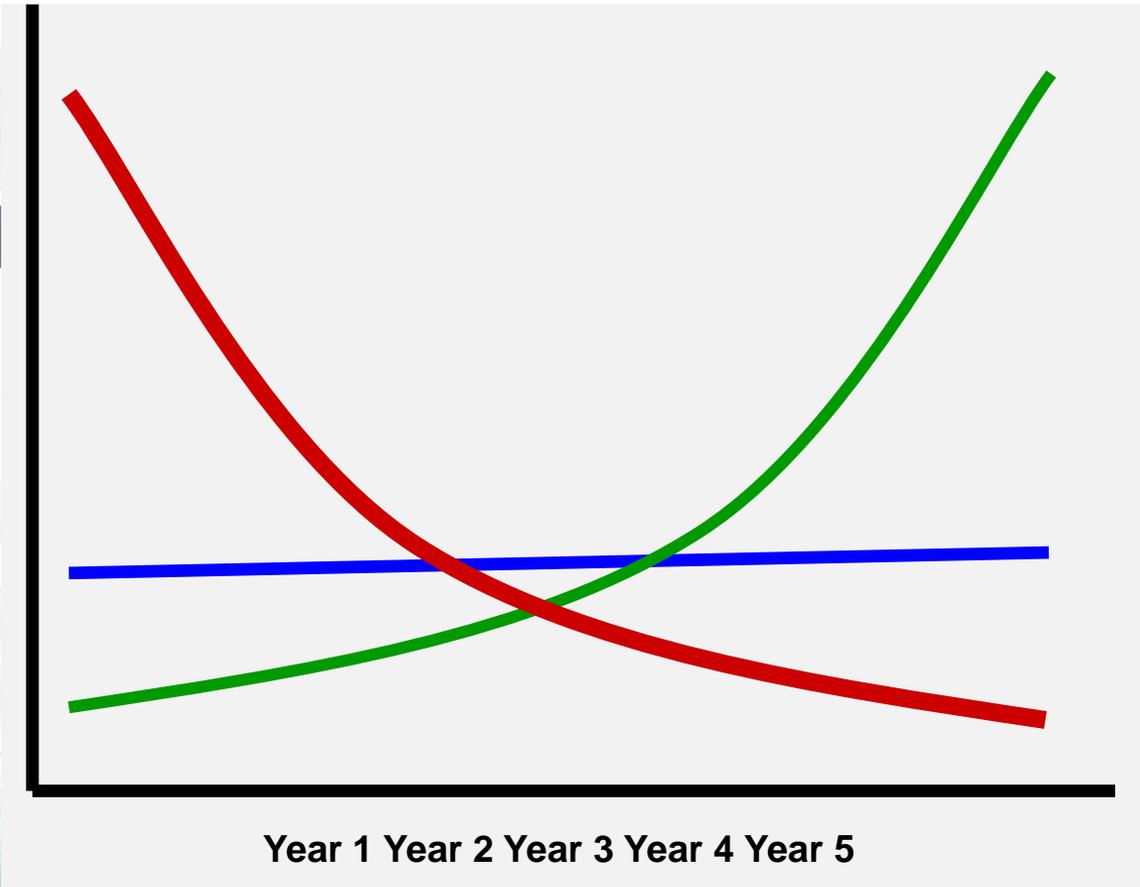
<http://blogs.hds.com/david>

- Have you heard these requests?
 - *You have to reduce OPEX this quarter*
 - *IT capital budget is cut for this next year*
 - *You need to do more with less*
 - *We've no funds for new initiatives, let's just keep the lights on*
- You need to develop a business perspective and financial dimension to your IT technology roadmap and strategy
 - Cloud and virtualization are key ingredients in the plan
 - After we've done consolidation and virtualization, **Convergence** will be the next big thing to impact OPEX
 - Capital vs. contract for IT acquisition
- **IT Economics from HDS can provide such a framework (or template) for economic transformation**

INFORMATION ANYWHERE, ANYTIME, ALL THE TIME...FOREVER



- HIGH GROWTH
- ALL DISCOVERABLE AND SEARCHABLE
- DATA INDEPENDENT OF APPLICATION
- INDEPENDENT OF MEDIA
- GOVERNED and KEPT FOREVER



- Budgets are flat or declining
- Demand is growing
- How to reconcile?
- **Address and reduce UNIT COST**

HDS HAS A PROVEN ECONOMIC FRAMEWORK TO ASSIST YOU RIGHT NOW

- IT Pressures on CAPEX and OPEX will continue for several years
 - CAPEX: Cost of growth, cost of waste, MIPS preservation
 - OPEX: Environmentals, Labor, maintenance, backup infrastructure
- Years of experience, data points and proven techniques
 - Consultants available around the world to offer quick baseline workshops, often for free or at a very low rate
 - Experience in all industry segments
- Many case studies, white papers, tutorials, formal training and certification, and self-help are in the public domain
- **HDS thought leadership on this topic since 2002**
 - Thousands of engagements worldwide
 - Public domain content: <http://www.hds.com/go/cost-efficiency/>
 - Join the economics blog dialog: <http://blogs.hds.com/david/>

- **It is becoming increasingly essential to apply economic and financial principles to IT**
 - Architectures, roadmaps, standards
 - Operational excellence
 - Consumption behaviors
- **Use TCO to measure and compare**
- **ROI and ROA to cost-justify**
- **4 key principles of storage and IT economics**



1. **Price does not equal cost** – price is about 20% of TCO
2. **34 different types of cost** – where is your sensitivity?
3. There are **economically superior** IT architectures
4. **Econometrics** – “You cannot improve what you cannot measure”

Identify

- Choose from the 34 types of cost that are relevant
- Get CxO and technical agreements on cost areas
- Apply this process to storage, VM, VDI, cloud infrastructure

Measure

- Calculate and measure the unit cost baseline
 - By tier, by platform and by geography
- Isolate direct and indirect costs and determine cost owners

Reduce

- Map costs to investments that can reduce costs
- Predict unit cost reduction or ROI
- Set plans for transformation
- Measure results frequently



■ The economic triumvirate

– Storage virtualization

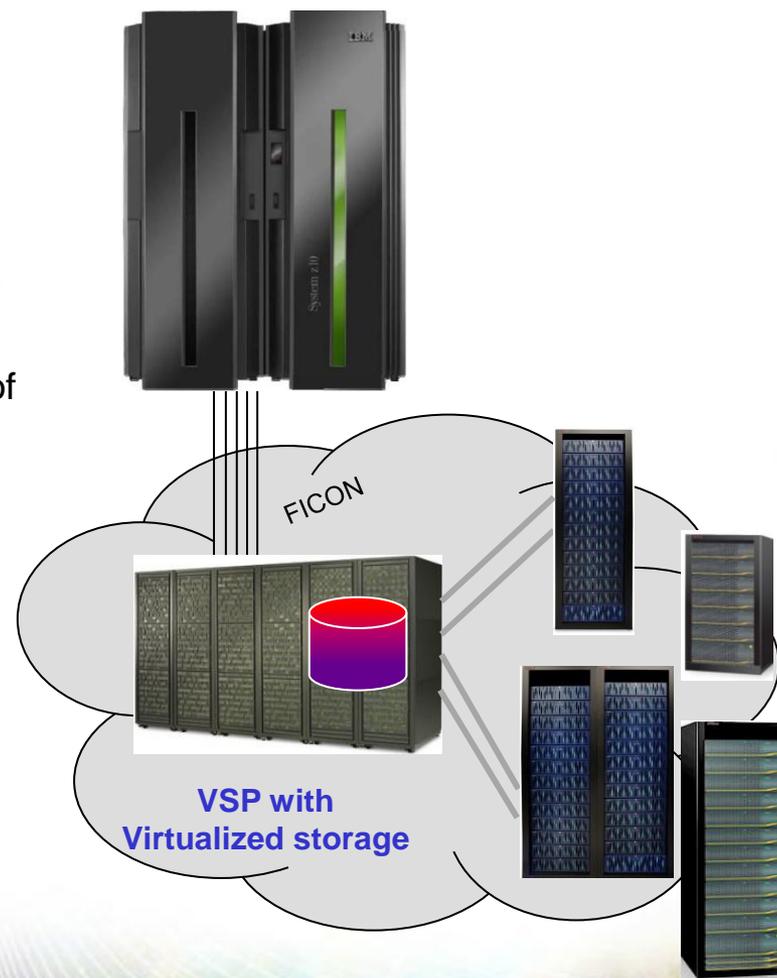
- Virtualization can present NL SAS disk to FICON connected mainframes
- Better consolidation and TB/sq meter with high density drives
- New lower cost VTL target (for existing VTL users to replace tape)
- Heterogeneous virtualization can extend useful life of some assets (sweat the asset)

– Dynamic tiering

- Tier down to lower cost (smaller environmentals) disk target for stale data in Tier 1

– Dynamic provisioning

- Removes waste associated with short-stroke, can help reclaim ~70% of usable capacity included w/ replicated and Flash Copy
- Can reduce MIPS overhead associated with migration and compression
- Performance improvements with wide striping

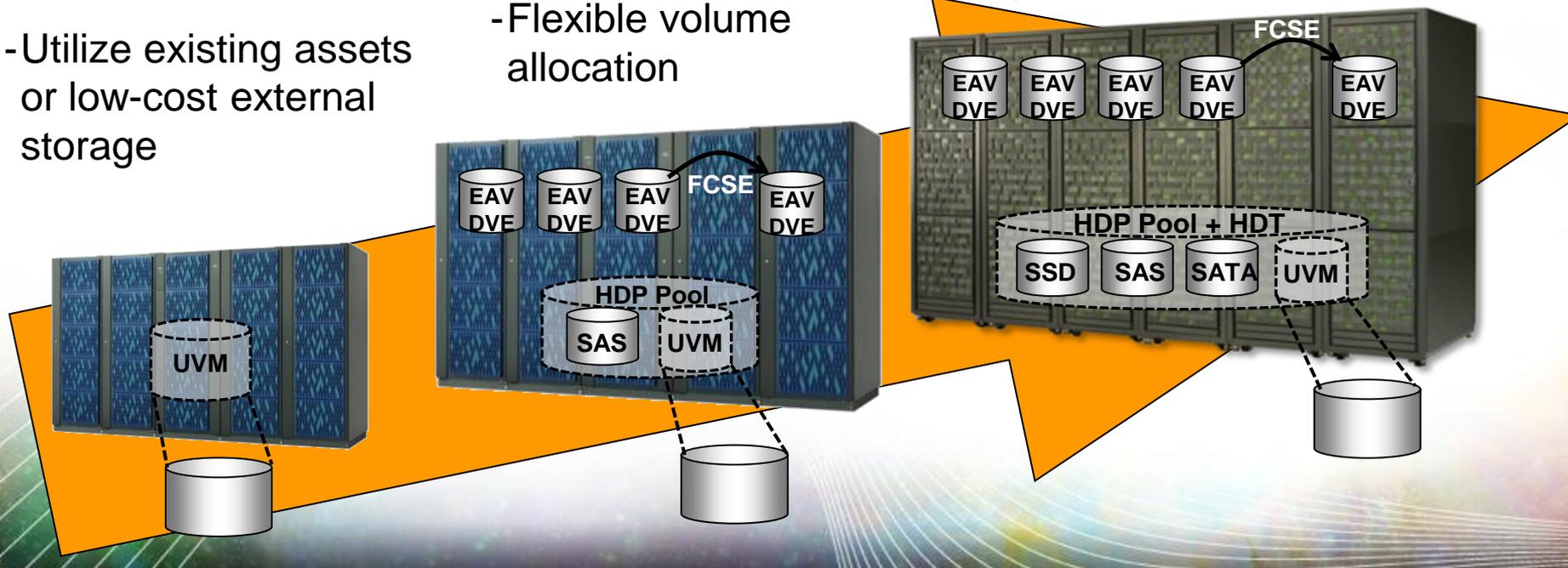


- Hitachi is bringing storage virtualization technology to the mainframe space
- HDP for Mainframe provides FCSE/DVE/EAV compatibility
- HDP is technology foundation for the next wave of mainframe virtualization

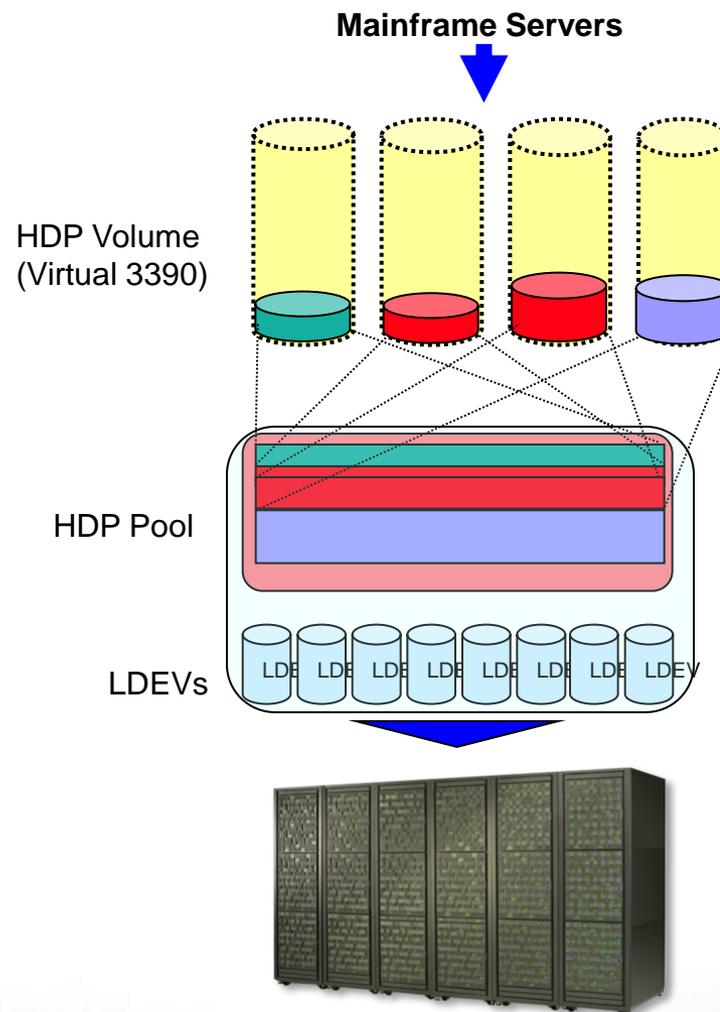
- Better space efficiency
- I/O load balancing
- Flexible volume allocation

- Automatic Dynamic Tiering
- Effective use of high-speed SSD

- Utilize existing assets or low-cost external storage



- Optimize storage performance by spreading the I/O across all available disk drives
- Optimize storage capacity by only allocating capacity that is actually used
- Achieve FlashCopy space efficiency (FC-SE) for target volumes
- Leverage DVE to seamlessly grow physical and logical capacity



Simplifies capacity expansion: no IOGEN; no documentation updates; no changes to GDPS parameters, XRC sessions, FlashCopy configs, etc.

HITACHI DYNAMIC PROVISIONING FOR MAINFRAME STORAGE

Hitachi Storage Navigator Modular 2

Settings and reference of Dynamic Provisioning are generally performed with Storage Navigator Modular 2

STORAGE NAVIGATOR

SVP

V-VOL=DP-VOL (3390-A)

Volumes that are accessed by Host and have a capacity recognized by Host but do not have physical area

Can be created with a larger capacity than the installed physical Pool-VOL

V-VOL

HOST

PORT

PORT

PORT

3390-A
A

3390-A
B

3390-A
C

Mapping management information

Management area for managing mapping information of V-VOL, pool, and Pool-VOL and monitoring free capacity

SHARED MEMORY

Mapping management information backup area

POOL-VOL

A B

C

Pool-VOL (3390-V)

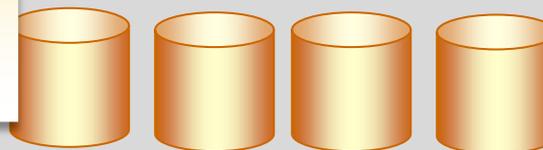
Volume in which data is stored

Necessary to have enough physical capacity for creating a Pool-VOL

Pool

Area created from 1 or more RAID Groups and in which Pool-VOLs are registered

RAID group



- Mainframe storage
 - Uses complex count key data (CKD) structure and cylinder-head-record (CCHHR) addressing
 - CKD-formatted storage contains control information even when there is no data.
 - Hitachi Virtual Storage Platform monitors existence of user records on track and maintains status in track metadata.

- Recovering space and restoring it to the Dynamic Provisioning pool when it is no longer used, making it available for use by other volumes
 - If no user records exist on track, track is eligible for reclamation.
 - All tracks in DP page must not have any user records.

- Host initiated reclaim (HIR) for mainframe storage
 - Reclaims pages that only have tracks with no user records
 - Tracks metadata used to determine if user records exist on track
 - Done during CCW execution



Decide a start-point (before a major transformation)



Select the costs that are important (from the 34)

- No right or wrong approach, but most choose 12-15 categories
- Differentiate direct and indirect



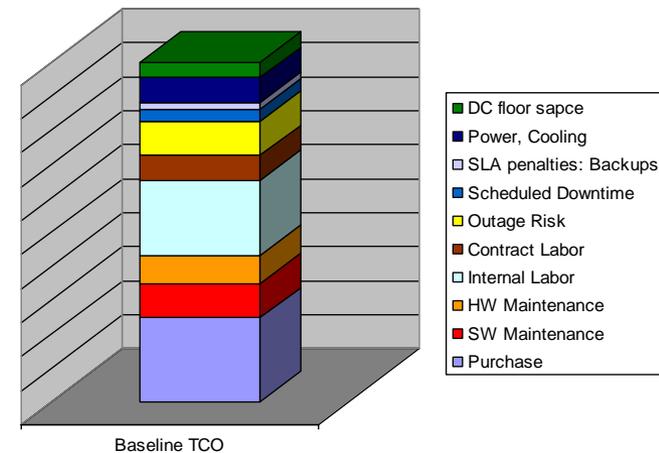
To start, we need 4 basic parameters

- Total usable capacity
- Average age of storage assets
- Recent growth rate
- Country and region

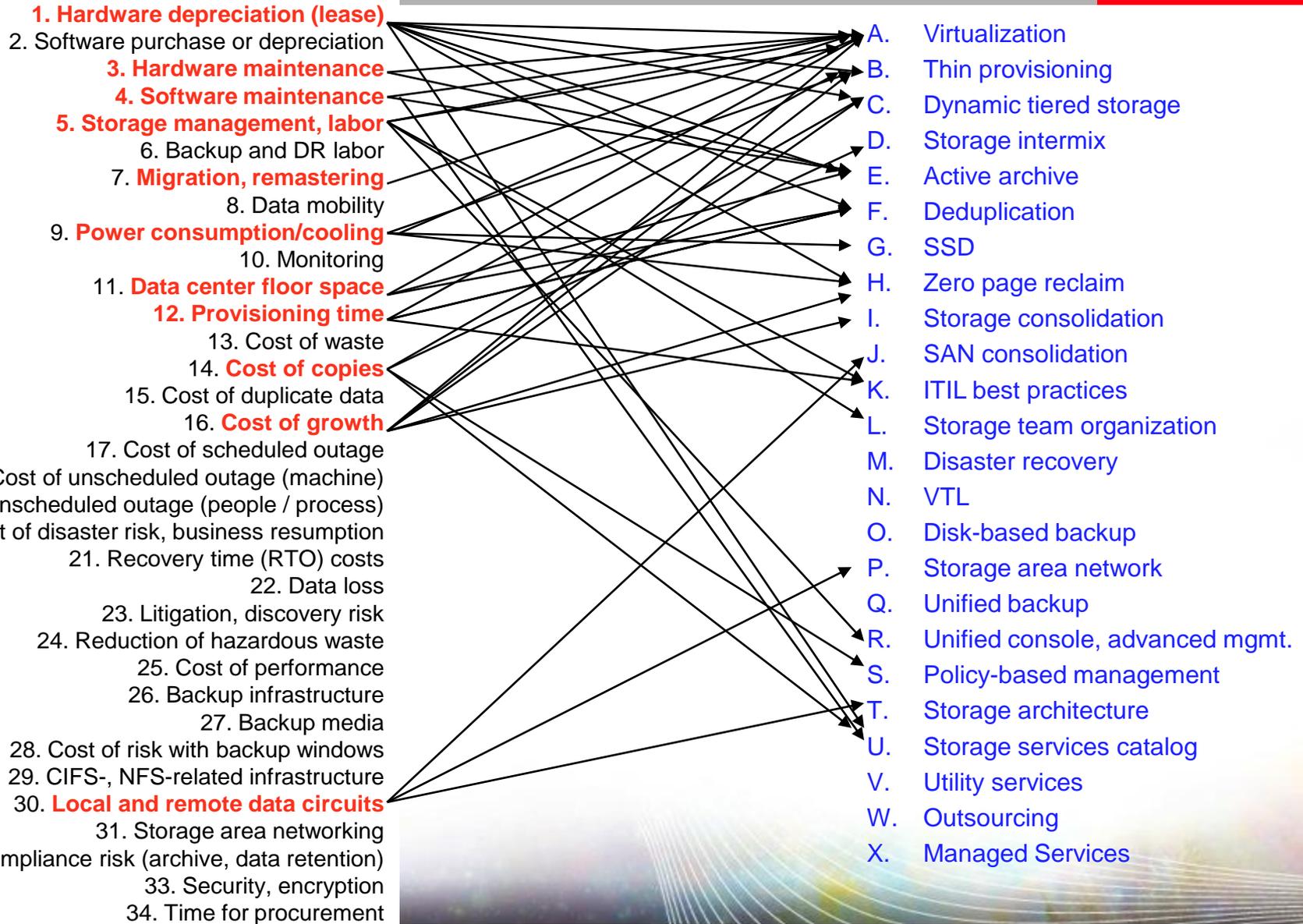


~50 more detailed questions can provide better precision

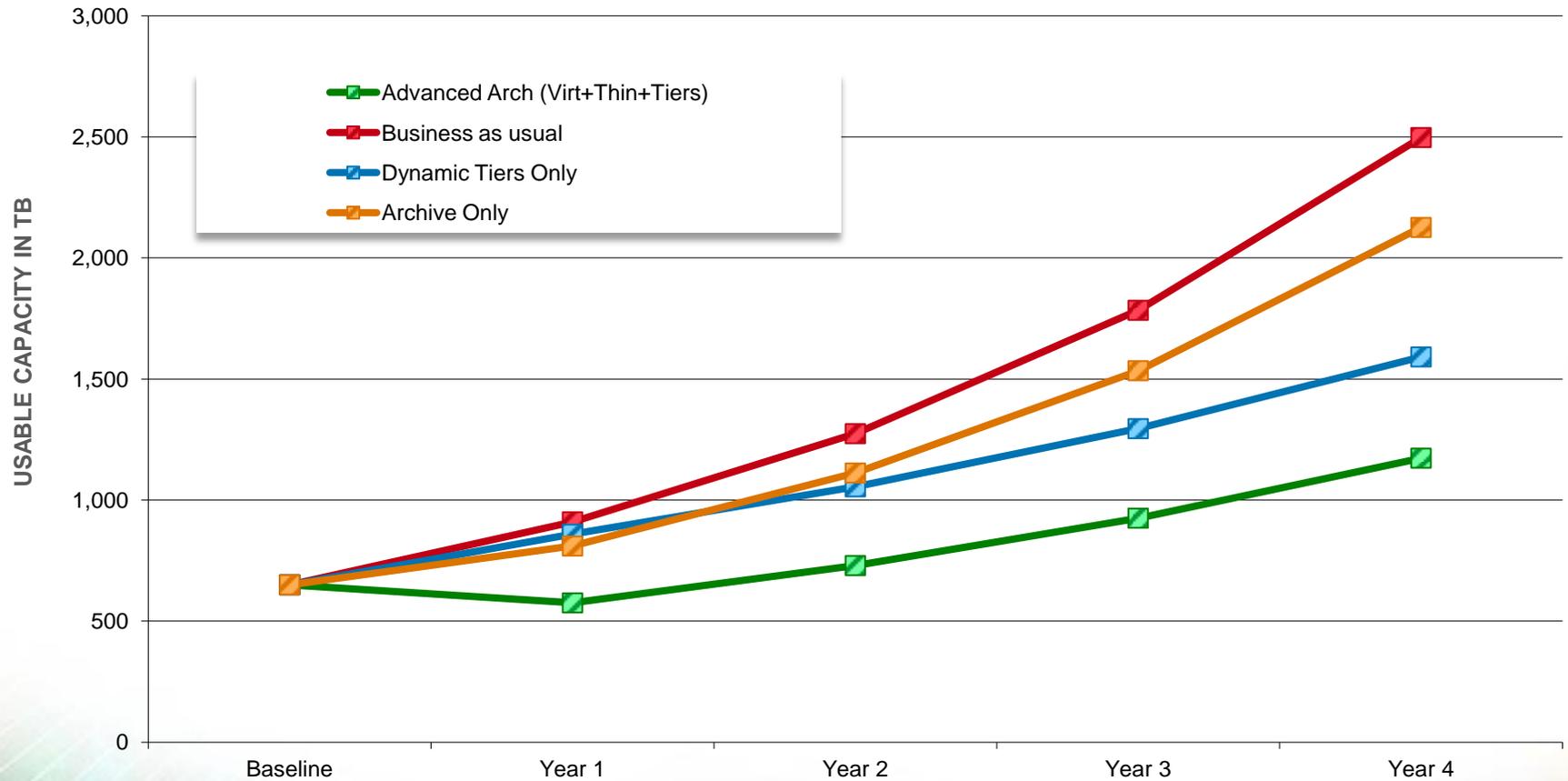
Baseline then moves to the “mapping” phase



MAP COSTS TO STORAGE SOLUTIONS



STORAGE GROWTH AND DEMAND



TOOLS FOR MAPPING, MODELING, PREDICTING

Hitachi Data Systems **HITACHI**
Inspire the Next

Hitachi Mapping Tool

Select the cost areas you would like to reduce on the left, and you will see the Hitachi solution that directly reduce those costs on the right. It's simple. It's Storage Economics.

Change Sensitivity / "Set the Bar" 38% High

- Hardware depreciation (lease); current
- Software purchase or depreciation
- Hardware Maintenance
- Software Maintenance
- Storage Management, Labor
- Backup and DR Labor
- Migration, Remastering
- Data mobility
- Power Consumption/Cooling
- Monitoring
- Data Center Floor space
- Provisioning Time
- Cost of waste
- Cost of copies
- Cost of duplicate data
- Cost of growth
- Cost of scheduled outage
- Unscheduled outage (machine related)
- Unscheduled outage (people & process related)
- Cost of disaster risk, business resumption
- Recovery time (RTO) Costs
- Data Loss
- Litigation, discovery risk
- Reduction of hazardous waste
- Cost of Performance
- Backup infrastructure
- Backup media
- Cost of risk with backup windows
- CIFS, NFS related infrastructure
- Local and remote data circuits
- Storage area networking
- Non-compliance risk (archive, data retention)
- Security, encryption
- Time and Effort in Procurement

High Impact Solutions
5 Options predicted

Active Archive

VTL

Unified Backup

Outsourcing

Public Cloud

Moderate Impact Solutions
11 Options predicted

Virtualization

Thin Provisioning

De-duplication

Zero Page Reclaim

Storage Consolidation

Disaster Recovery

Disk Based backup

Storage Services Catalog

Utility Services

Managed Services

Private, Hybrid Cloud

Email your results:

www.hds.com/calculators

Tiered Storage Economics Quick Estimator

Control Panel Save / Load Scenario Report Summary About the Quick

Primary Inputs **Current Capacity Detail** **Financial Parameters** **Tiered Storage Parameters** **Other Current Parameters**

Country / Region
United States \$

Customer Details
Customer Contact Name:
Customer Organisation Name:

Current Capacity
Total Storage Usable Capacity TB:

Solution & Investment Summary

Hardware Purchase Price	\$	<input type="text" value="500,000"/>	500,000
Software Purchase Price	\$	<input type="text" value="100,000"/>	100,000
HW Maintenance for year 4	\$	<input type="text" value="60,000"/>	60,000
Yearly SW Maint Years 2-4	\$	<input type="text" value="15,000"/>	15,000
Professional Services	\$	<input type="text" value="50,000"/>	50,000

Estimator Dashboard

Investment Appraisal Summary

Investment	\$	563,000
4 year Savings	\$	2,233,979
NPV of Savings	\$	1,817,505
Incremental IRR		106.1%

Savings Breakdown

Labor, Migrate	\$	723,910
CAPEX Avoid	\$	1,405,662
Environmental	\$	9,407
Maint Fees	\$	95,000
Total	\$	2,233,979

Payback Term: 10 Months
Return on Investment: 297%

Storage Capacity Growth Forecast

4 Year Cost of Storage (CAPEX) Upgrades

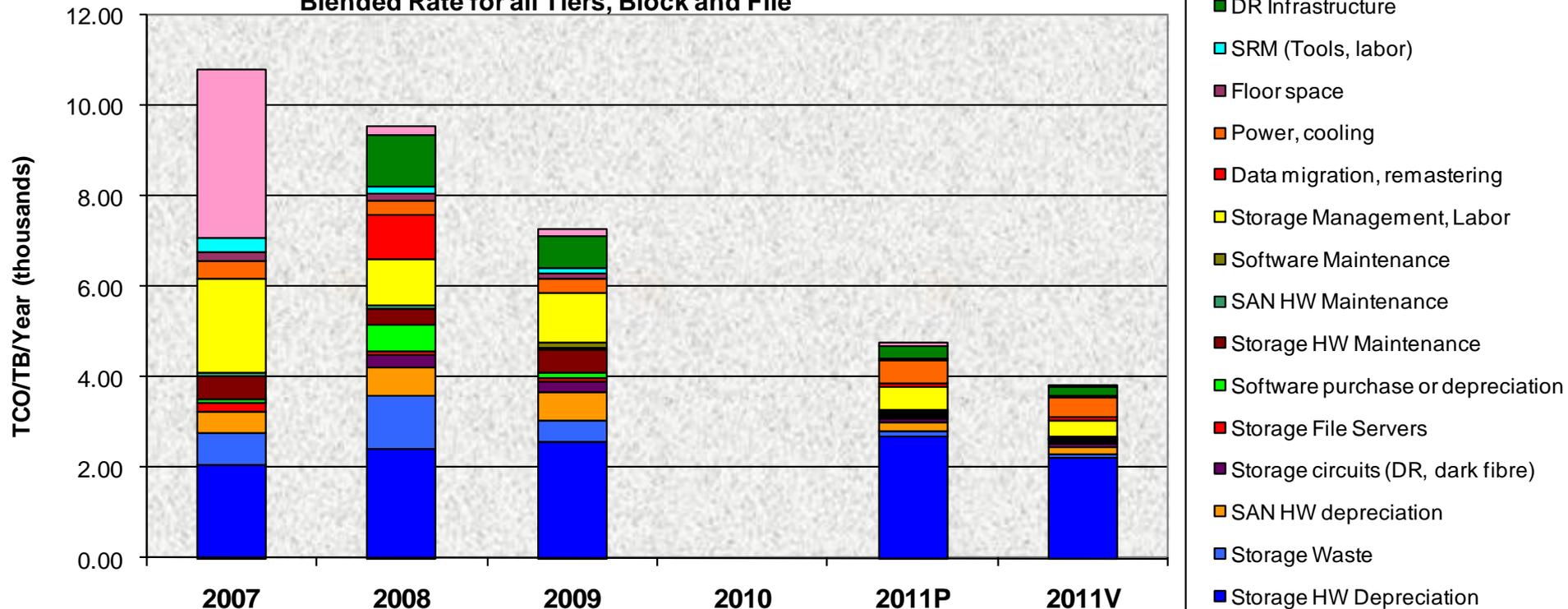
Break Even Analysis

- **Using our common methods and framework, Storage Economics can expand to other relevant areas**
- **Vertical market and specialization**
 - Health and life sciences for clinical repository
 - State and local government
 - Communication, media and entertainment
 - Environmental plus economics (green, green)
- **Research and modeling on cloud architectures**
 - RAIN: Azure, Hadoop, S3, hybrid clouds, MSU
- **Data center economics**
 - Servers, storage, networks, facilities
 - Converged solutions (VDI, Oracle, Hypervisors, Exchange, SharePoint)



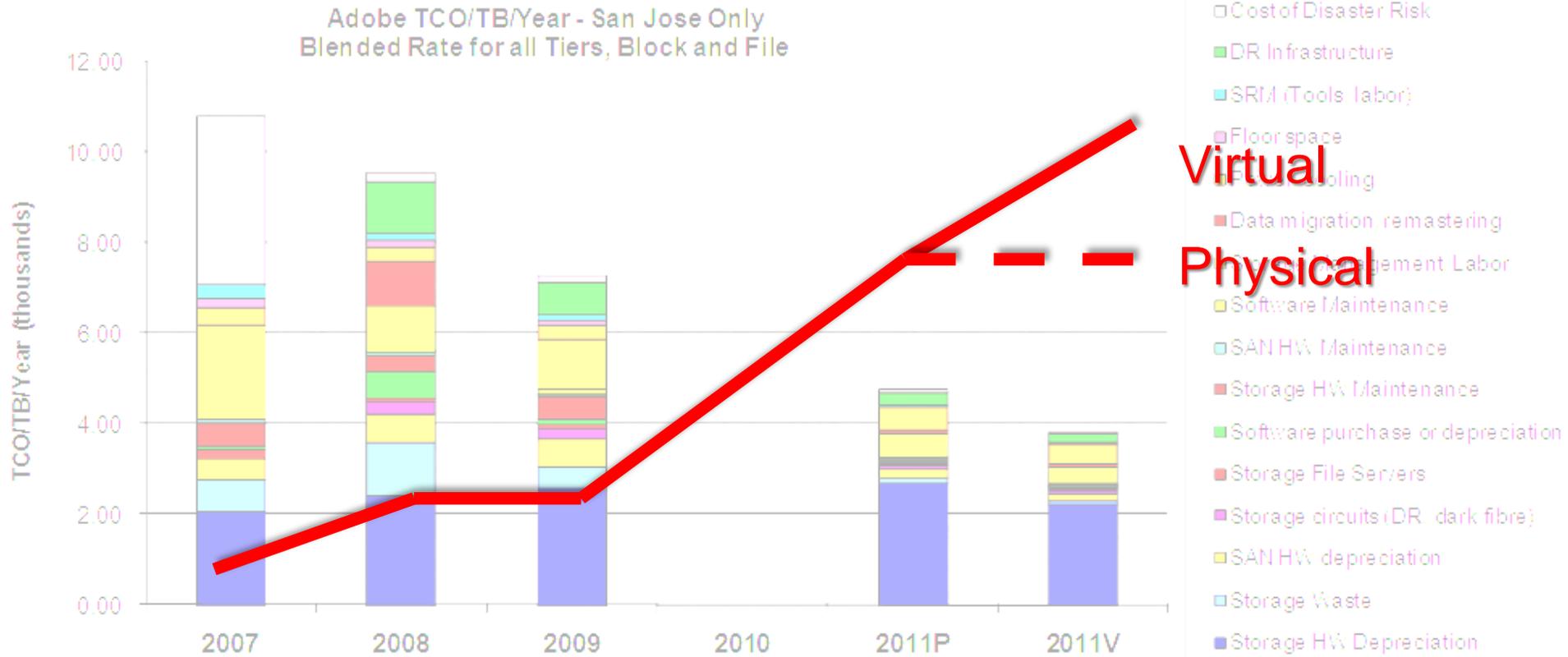
CASE STUDY – FOCUSING ON UNIT COSTS

Adobe TCO/TB/Year - San Jose Only
Blended Rate for all Tiers, Block and File



UNIT COST REDUCTION WITH 40-65% CAGR

- Storage growth from 220TB to 1.6PB



Virtual
Physical

KEY INVESTMENTS TO REDUCE UNIT COSTS

Structured, funded investment plan

