Explore the economics of IBM Storage Solutions using TCOnow!

Understand the premier Total Cost of Ownership sales tool for IBM's Storage Platform

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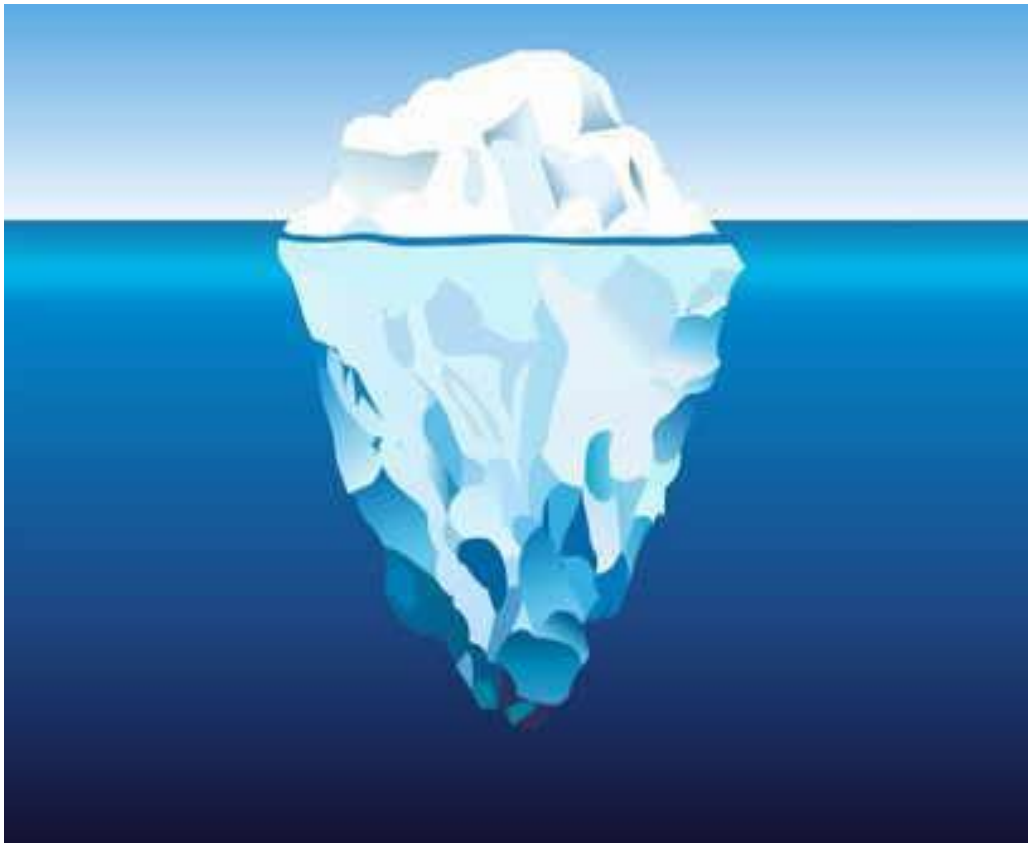
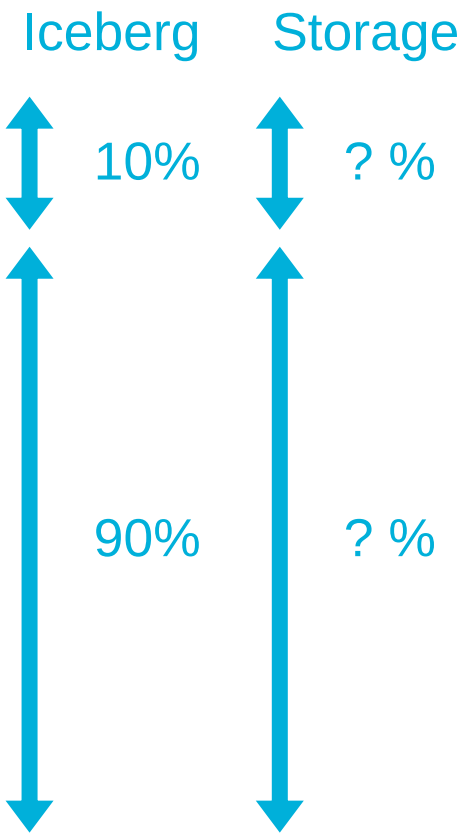
AGENDA

- Understand the importance of TCO as sales / competitive tool
- TCOnow! overview
- Seeing is believing: live case study
- How to get TCOnow!

The Storage Iceberg

Purchase Price vs. Total Cost of Ownership (TCO)



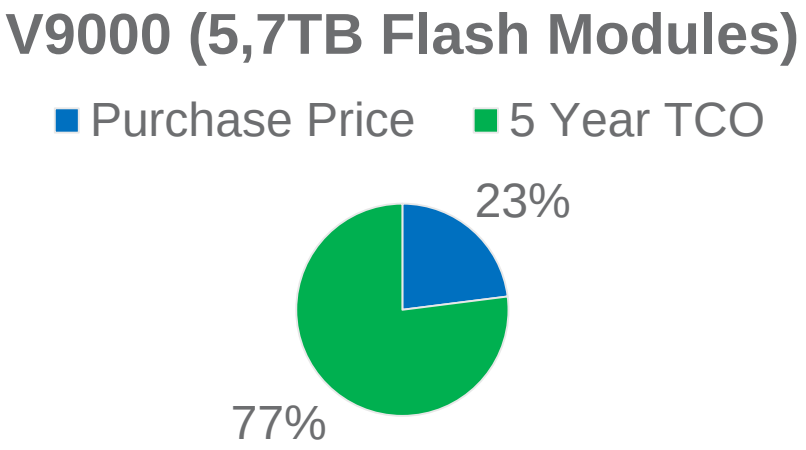


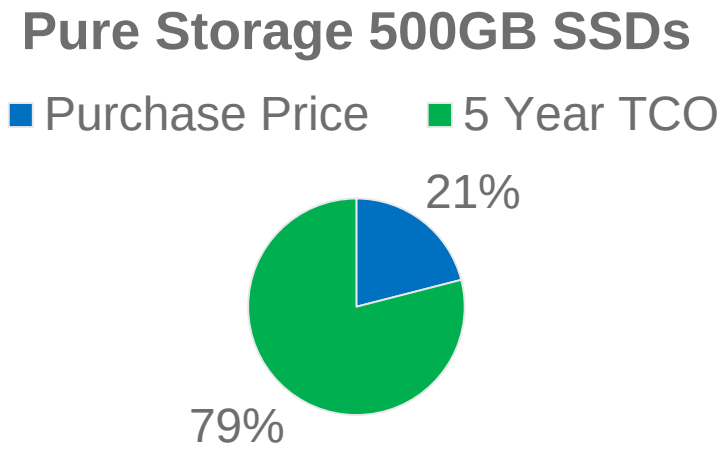
Assumptions

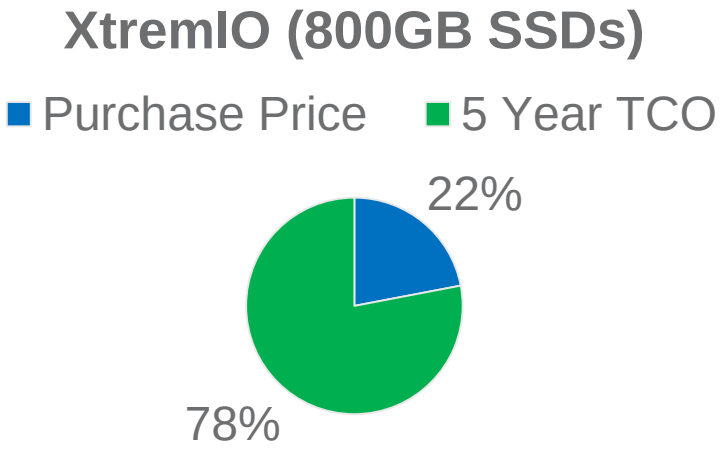
Assumptions

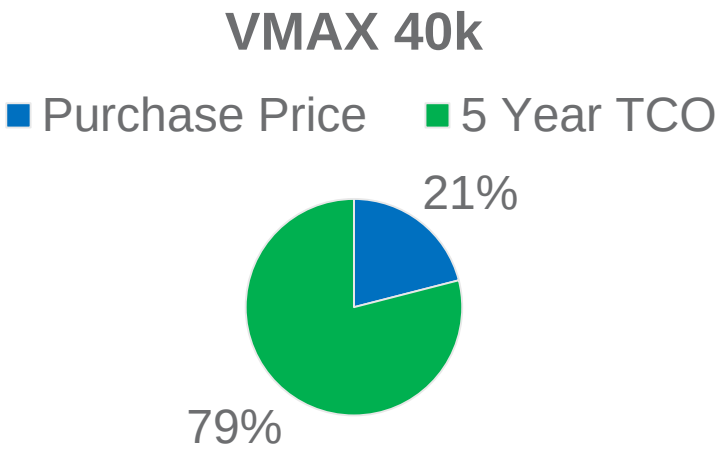
100 TB Initial Usable Capacity
25% annual growth
No Data Reduction
5 Year TCO
List Prices

Purchase Price vs. TCO





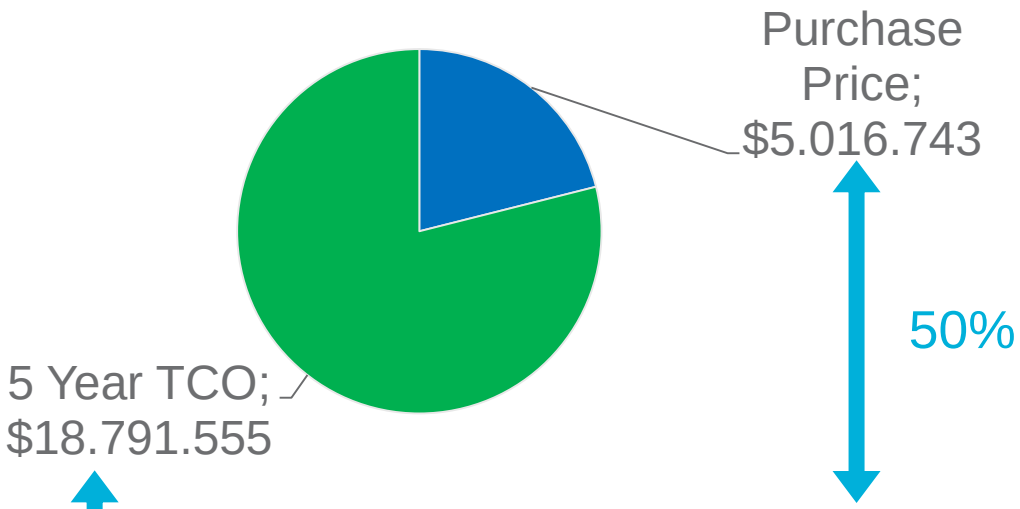




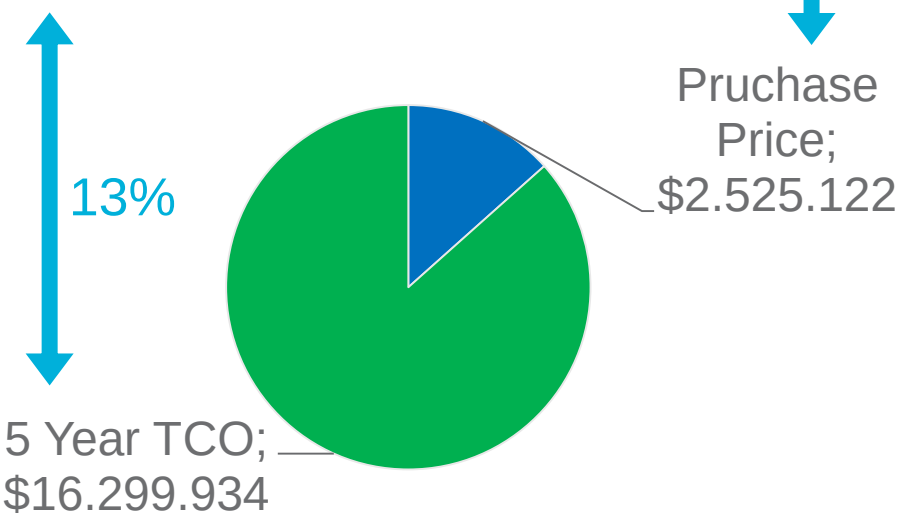
Pruchase Price 5 Year TCO

The Impact of Discount on TCO

VMAX 40K
List Prices



VMAX 40K
50% Discount



Assumptions

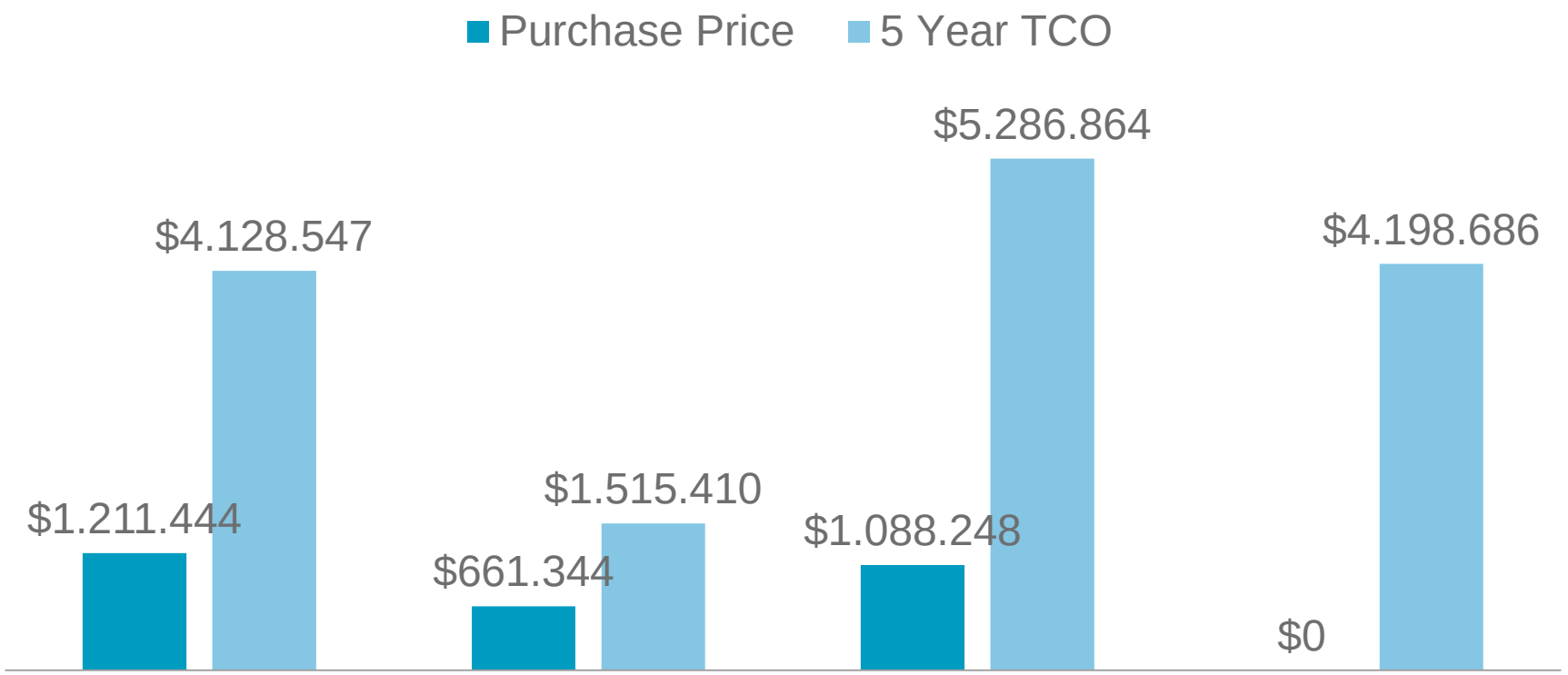
Assumptions:
100TB Initial Usable Capacity
5 Year TCO
25% annual growth

Discounts:

EMC
70% hardware
80% software
30% support and maintenance
70% services

IBM
50% off hardware and software
50% off maintenance and services

V9000 vs. VMAX vs. Free VMAX 40K



114TB Usable (initial)
No Compression
5.7TB Modules

171TB Usable (initial)
3:1 Compression
5.7TB Modules

100 TB Usable (initial)
10% 3.5" SSD 400GB
30% 3.5" FC600GB 15k
30% 3.5" SAS600GB 10k
30% 3.5 SATA 3TB 7.2k

How can I figure out this stuff …?

TCO Variables

carbon

real estate

capital threshold

hours of operation

country drive size

depreciation method rack costs

professional services exchange rate

consolidation of expansion units discounts

IT staffing requirements RAID type TCO period

growth in number of servers array utilization rate

second site requirements financial assumptions warranties

software price decline assumptions index overhead utilization cap

hardware price decline assumptions employee costs cache requirements

electricity costs employee benefits parity size inflation rate assumptions

compression/deduplication cooling requirements storage set-aside floor space

cost of capital software requirements rack requirements source of electricity

initial amount of usable capacity employee salary changes over time depreciation schedule

annual storage growth rate electricity usage interest rate assumptions system design rules performance

Key TCO Variables

drive size

TCO period

array utilization rate

financial assumptions

compression/deduplication

initial amount of usable capacity

annual storage growth rate

Use TCOnow! to calculate the Total Cost of Ownership

- Use cases
  - Financial – create professional TCO calculations for IBM's storage platform
  - Solution Design – design complex solution like Spectrum Scale or Flape
  - Performance – use real performance models for IBM Flash solutions
- What is TCOnow!

  TCOnow! evaluates the complete cost of ownership of an acquisition over the life of the asset, versus just the initial or acquisition costs. This allows evaluation of the complete cash flow and current net present value of the project.
- Considerations and calculations include
  - Initial price, installation, services, etc.
  - "Apples to Apples" feature/function comparisons/pricing
  - Hardware/software Maintenance
  - Power/Cooling, Floor space
  - Personnel costs
  - Downtime costs (planned/un-planned outages)
  - Interest rates
  - Before/after tax implications
  - Client Industry specific implications

- **Use TCOnow! To get the fundamentals right!**
- **Lot's of default values help you to simplfy complex environments**

Sample Client Case V840 vs EMC VNX2

Description	IBM FlashSystem V840	EMC VNX2	Advantage of IBM Solution for Bank Client
Performance	Read: 1,153,000 Write: 1,153,000	Read: 217,000 Write: 773,000	IBM FlashSystem will maximize application performance vs. EMC VNX2 and handle increasing IOPS requirements over time
Latency / Response Time	0.5 ms	5-10 ms	Fastest response time delivered back to end user for best customer experience
Floorspace	55 Sq Ft	200+ Sq Ft	IBM FlashSystem solution takes up one fourth of the floorspace of an EMC VNX2 solution
Power / Cooling (annually)	447,000 kWh	920,000 kWh	IBM FlashSystem solution consumes less than half the power/cooling of an EMC VNX2 solution
Software Defined Storage	YES	NO	IBM Solution adheres to strategic direction of BofA CTO and Storage industry
Analytics-based Tiering across multiple systems	YES	NO	Apply the feature & functionality of V840 downstream to heterogeneous storage devices – allows for reuse of existing investments
Data Compression	YES	NO	Maximum Storage efficiency thru in-line reduction of data without performance impact
Internal and External Storage Virtualization	YES	NO	Management simplicity, maximum scalability, and non-disruptive data mobility
Snapshot w/out Performance Impact	YES	NO	Leverage snapshot for backup without cloning the entire database – significant storage savings
Total Cost of Ownership – 4 years	$10,370,795	$12,700,143	When factoring in total acquisition and ongoing cost of hardware, software, facilities, support, depreciation, and personnel, IBM Flash solution is ~$2.3 less than EMC VNX2.

IBM FlashSystem is ~$2,300,000 less than EMC VNX2 and provides world class business value to Client. Why not IBM FlashSystem for Bank Client?

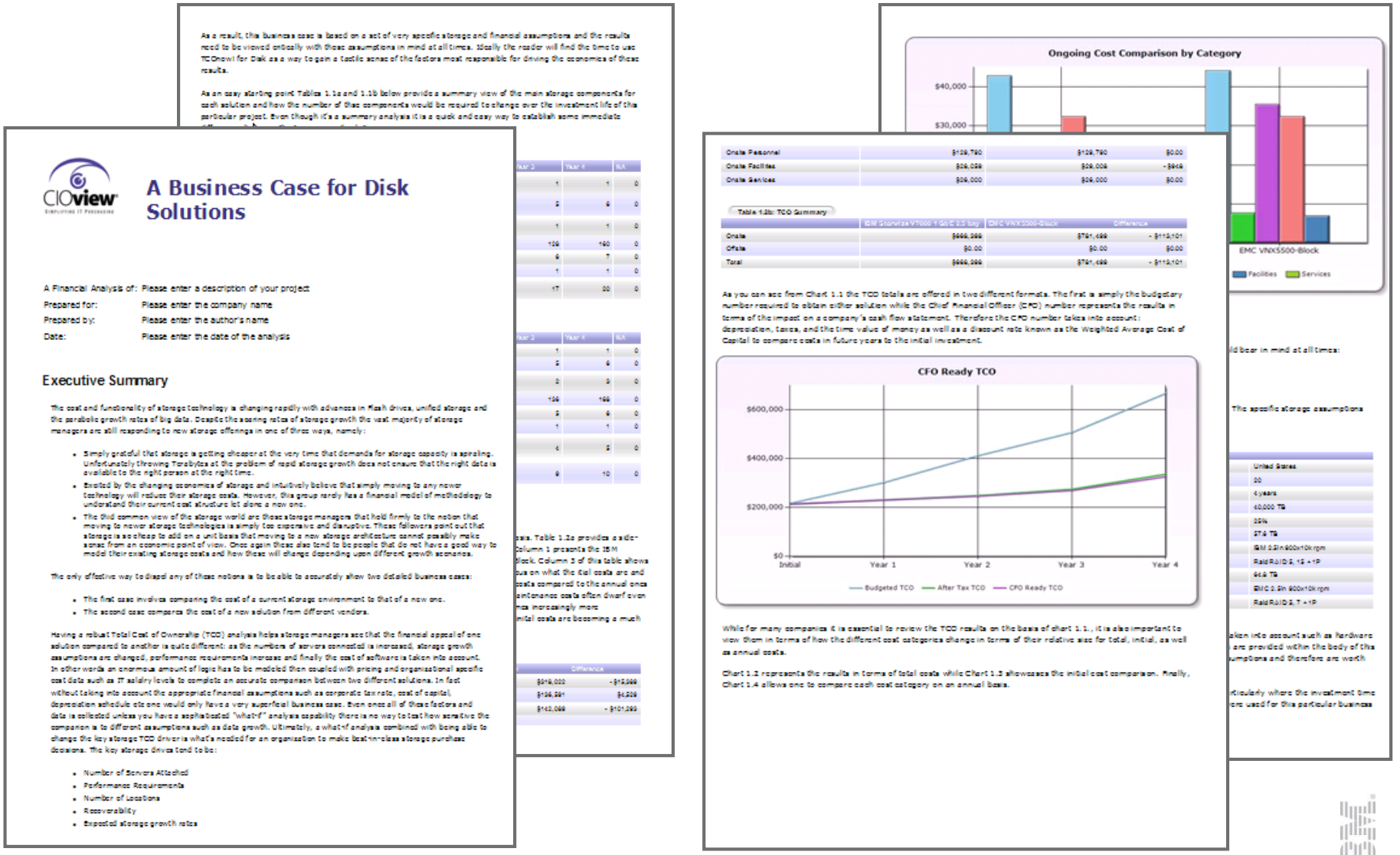
Wikibon “Flape” TCO multiple Case Study

	Disk	Disk + Small Flash	Disk + Large Flash	Tape	Flape (Small Flash)	Flape (Large Flash)
Metadata Management Software	$-	$532,000	$532,000	$-	$249,000	$532,000
Power/Space	$871,000	$930,000	$1,007,000	$195,000	$236,000	$312,000
Technology Migration	$368,000	$368,000	$368,000	$-	$-	$-
Hardware Maintenance	$1,830,000	$2,037,000	$2,305,000	$178,000	$385,000	$653,000
NAND Hardware	$-	$301,000	$666,000	$-	$301,000	$666,000
Magnetic Hardware	$2,437,000	$2,437,000	$2,437,000	$437,000	$437,000	$437,000
Total Hardware	$5,506,000	$6,605,000	$7,315,000	$810,000	$1,608,000	$2,600,000

Source: © Wikibon 2014, from Numerous Sources including Analysts, Consultants, IBM & Oracle.

IBM Spectrum Archive

TCOnow! Results: Professional Report



CIOview

A Business Case for Disk Solutions

A Financial Analysis of: Please enter a description of your project
Prepared for: Please enter the company name
Prepared by: Please enter the author's name
Date: Please enter the date of the analysis

Executive Summary

The cost and functionality of storage technology is changing rapidly with advances in flash drives, unified storage and the parabolic growth rates of big data. Despite the soaring rates of storage growth the vast majority of storage managers are still responding to new storage offerings in one of three ways, namely:

- Simply grateful that storage is getting cheaper at the very time that demands for storage capacity is spiraling. Unfortunately throwing Terabytes at the problem of rapid storage growth does not ensure that the right data is available to the right person at the right time.
- Excited by the changing economics of storage and intuitively believe that simply moving to any newer technology will reduce their storage costs. However, this group rarely has a financial model of methodology to understand their current cost structure let alone a new one.
- The third common view of the storage world are those storage managers that hold firmly to the notion that moving to newer storage technologies is simply too expensive and disruptive. These followers point out that storage is so cheap to add on a unit basis that moving to a new storage architecture cannot possibly make sense from an economic point of view. Once again these also tend to be people that do not have a good way to model their existing storage costs and how these will change depending upon different growth scenarios.

The only effective way to dispel any of these notions is to be able to accurately show two detailed business cases:

- The first case involves comparing the cost of a current storage environment to that of a new one.
- The second case compares the cost of a new solution from different vendors.

Having a robust Total Cost of Ownership (TCO) analysis helps storage managers see that the financial appeal of one solution compared to another is quite different: as the numbers of servers connected is increased, storage growth assumptions are changed, performance requirements increase and finally the cost of software is taken into account. In other words an enormous amount of logic has to be modeled then coupled with pricing and organizational specific cost data such as IT salary levels to complete an accurate comparison between two different solutions. In fact without taking into account the appropriate financial assumptions such as corporate tax rate, cost of capital, depreciation schedule etc one would only have a very superficial business case. Even once all of these factors and data is collected unless you have a sophisticated "what-if" analysis capability there is no way to test how sensitive the comparison is to different assumptions such as data growth. Ultimately, a what-if analysis combined with being able to change the key storage TCO drivers is what's needed for an organization to make best-in-class storage purchase decisions. The key storage drivers tend to be:

- Number of Servers Attached
- Performance Requirements
- Number of Locations
- Recoverability
- Expected storage growth rates

As a result, the business case is based on a set of very specific storage and financial assumptions and the results need to be viewed critically with these assumptions in mind at all times. Ideally the reader will find the time to use TCOnow! for Disk as a way to gain a tactile sense of the factors most responsible for driving the economics of these results.

As an easy starting point Tables 1.1a and 1.1b below provide a summary view of the main storage components for each solution and how the number of these components would be required to change over the investment life of the particular project. Even though it's a summary analysis it is a quick and easy way to establish some immediate

Ongoing Cost Comparison by Category

$40,000
$30,000

EMC VNX5500-Block

Facilities Services

Onsite Personnel	$139,790	$139,790	$0.00
Onsite Facilities	$29,009	$29,009	- $969
Onsite Services	$29,000	$29,000	$0.00

Table 1.2b: TCO Summary

	IBM Storwize V7000 1 GbE 2.5 Day	EMC VNX5500-Block	Difference
Onsite	$666,999	$781,499	- $113,101
Offsite	$0.00	$0.00	$0.00
Total	$666,999	$781,499	- $113,101

As you can see from Chart 1.1 the TCO totals are offered in two different formats. The first is simply the budgetary number required to obtain either solution while the Chief Financial Officer (CFO) number represents the results in terms of the impact on a company's cash flow statement. Therefore the CFO number takes into account: depreciation, taxes, and the time value of money as well as a discount rate known as the Weighted Average Cost of Capital to compare costs in future years to the initial investment.

CFO Ready TCO

$600,000
$400,000
$200,000
$0

Initial Year 1 Year 2 Year 3 Year 4

Budgeted TCO After Tax TCO CFO Ready TCO

While for many companies it is essential to review the TCO results on the basis of chart 1.1., it is also important to view them in terms of how the different cost categories change in terms of their relative size for total, initial, as well as annual costs.

Chart 1.2 represents the results in terms of total costs while Chart 1.3 showcases the initial cost comparison. Finally, Chart 1.4 allows one to compare each cost category on an annual basis.

United States	
20	
4 years	
40,000 TB	
25%	
27.6 TB	
IBM 2.5in 600x10k rpm	
Raid RAID 5, 15 +1P	
44.8 TB	
EMC 2.5in 600x10k rpm	
Raid RAID 5, 7 +1P	

TCOnow! Results: Quick View Report

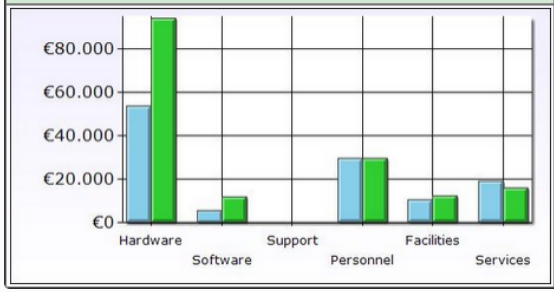
CIOview TCOnow! QuickView

New Storage Analysis

IBM FlashSystem V9000 / Capacity vs. EMC XtremIO Two X-Brick Cluster
TCO Savings: €78.163

Total Cost of Ownership over 3 Years — Chart Selection: TCO Over Time | Total Costs | Initial Costs | Annual Costs

2015 IBM FlashSystem V9000 / Capacity vs. 2015 EMC XtremIO Two X-Brick Cluster



TCO by Category

	1 IBM FlashSystem V9000 / Capacity	2 EMC XtremIO Two X-Brick Cluster
Hardware	€69.763	€122.879
Software	€6.881	€15.360
Support	€0,00	€0,00
Personnel	€38.622	€38.622
Facilities	€13.409	€15.860
Services	€24.960	€20.943

Key Assumptions:

- Initial amount of usable storage: 12 TB
- Annual storage growth rate: 25%
- TCO period: 3 years
- Utilization rate for IBM: 100%
- Utilization rate for EMC: 70%

Initial System Requirements

IBM	EMC	Future Insights
1 IBM FlashSystem V9000 / Capacity	1 EMC XtremIO Two X-Brick Cluster	The design of both storage arrays is based on 12TB of initial usable storage. The amount of raw storage needed to fulfill your usable requirement is largely a function of your: array utilization rate selected, RAID and parity choices, disk increment, file overhead, storage set-aside, spare rule and vault requirements, if any.
16,5 TB of raw flash storage	20,8 TB of raw storage	Initial requirements are 16,5 TB of raw flash storage for the IBM FlashSystem V9000 / Capacity system and 20,8 TB of raw storage for the EMC XtremIO Two X-Brick Cluster.
12,00 x IBM 1.2TB Flash Module	25,00 x XtremIO 1.6TB Flash	By the end of your 3 year analysis, the IBM solution will require 12 x IBM 1.2TB Flash Module drives while the EMC solution will require 25 XtremIO 1.6TB Flash drives.
1 x AE2 Storage Enclosure	2 x DAE	By the end of the analysis period, the IBM solution will require 1 x AE2 Storage Enclosure and the EMC solution will require 2 x DAE
2 x FC/FCoE Host Interface Card	5 x 4 x 8Gb/s Fibre Channel Pair	Based on a fan-in ratio of 10:1 you will initially require 2 ports to support your 5 servers. Each IBM FC/FCoE Host Interface Card provides 8 ports and each EMC 4 x 8Gb/s Fibre Channel Pair provides 8 ports.

Environmental Factors

IBM	EMC	Observations
1,702 Sq m	1,702 Sq m	The IBM FlashSystem V9000 / Capacity initially occupies 1 rack, while the EMC XtremIO Two X-Brick Cluster initially occupies 1 rack.
17.893 kWh	28.129 kWh	The IBM FlashSystem V9000 / Capacity initially occupies 1 rack and draws 1.032 watts of power. In contrast, the EMC XtremIO Two X-Brick Cluster initially occupies 1 rack and draws 1.622 watts of power.
11,44 metric tons of CO2	17,99 metric tons of CO2	From a pollution perspective, the baseline assumptions are a carbon cost of €28 per gross ton and the environmental cost to generate the electricity being used averages 0,64Kg of CO2 emissions per KW-hour. For the complete analysis period, the total carbon consumption is 34,33 metric tons of CO2 for the IBM FlashSystem V9000 / Capacity and 53,98 metric tons of CO2 for the EMC XtremIO Two X-Brick Cluster.

System Design Summary

IBM	EMC
You require 1 IBM FlashSystem V9000 / Capacity for the entire 3 year period. By the end of the analysis, you require the following disks: 12 x IBM 1.2TB Flash Module. This represents 50,0% of the capacity of your storage array.	You require 1 EMC XtremIO Two X-Brick Cluster's for the entire 3 year period. By the end of the analysis, you require the following drives: 25 XtremIO 1.6TB Flash. This represents 50,0% of the capacity of your flash system.

Financial Assumptions and Results

Category	Financial Results
Corporate Tax Rate	13%
Cost of Capital	9,4%
Capital Equipment Value	€76.799
Depreciation Method	Double Declining
Depreciation Years	3 years
CFO Savings	€120.266

Key Savings

Comparing an IBM FlashSystem V9000 / Capacity from an EMC XtremIO Two X-Brick Cluster will result in a 3 year TCO savings of €78.163. Your key savings are €69.162 in hardware and €11.040 in software. This analysis is based on a number of key input variables, but commonly the most dominant ones are the initial amount of storage required and the annual storage growth rate. In this case you selected 12,0TB of usable storage and an anticipated annual growth rate of 25%.

There are additional factors that will impact your TCO results, such as your selection of: drive type(s), number of locations, recoverability requirements, and the number and growth of server connections. Arguably, utilization rate is the one essential factor that is rarely modelled within a TCO analysis. For older storage arrays 55% utilization is the norm, while newer conventional storage architectures generally support 80% or slightly better. Having said this, for performance reasons, most enterprise arrays are only using 68% of capacity, and in some database applications usage is limited to as little as 15-25%. Naturally, each time utilization is lowered, more usable and an even greater amounts of raw storage has to be purchased, which greatly impacts your TCO results. IBM is currently unique in that they can run their Flash products at between 90 and 100%.

The financial assumptions on the table to the left were selected based on the country and industry choices that were made. Making changes to these assumptions will not impact the budgeted TCO (how much comes out of the storage budget), but it may dramatically alter the CFO analysis, since those numbers are post-depreciation and post-taxation results which flow into the income statement and directly hit earnings per share.

Available Modules and Positioning

- **Three kind of Modules: "TCOnow! for … " or "TCOnow!" for Enterprise …." or Web based**
  - **Compare 2 products head to head: use "TCOnow! for … "**
  - **Workload consolidation for up to 10 workloads use: TCOnow!" for Enterprise …."**
- ***Available Modules:***
- **TCOnow! for Disk with RtC**

  This content module allows you to compare the cost of a new array from IBM, to a new array from EMC, HDS, NetApp or HP. You may also compare the TCO of a customer staying with an *existing* competitive array, (EMC, HDS, NetApp or HP) compared to the TCO of a new array from IBM.
- **TCOnow! for Flash**

  This content module allows you to compare the TCO and the performance of:
  - IBM FlashSystem to a number of Flash competitors
  - IBM FlashSystem to *new* conventional arrays from EMC, HP, NetApp and HDS
  - IBM FlashSystem to *existing* environments that are using conventional arrays from EMC, HP, NetApp and HDS
  - IBM FlashSystem and V7000 or XIV as a hybrid solution compared to other Flash vendors (EMC, HDS, HP, NetApp, Pure Storage or Violin Memory) or conventional arrays

  By marrying a state of the art performance model with a robust TCO engine, customers have a truly unique opportunity, to see what the cost is for incremental performance. Suddenly, staying with a high end array can look very expensive both on a performance and TCO basis, compared to an IBM FlashSystem solution.
- **TCOnow! for Enterprise Flash**

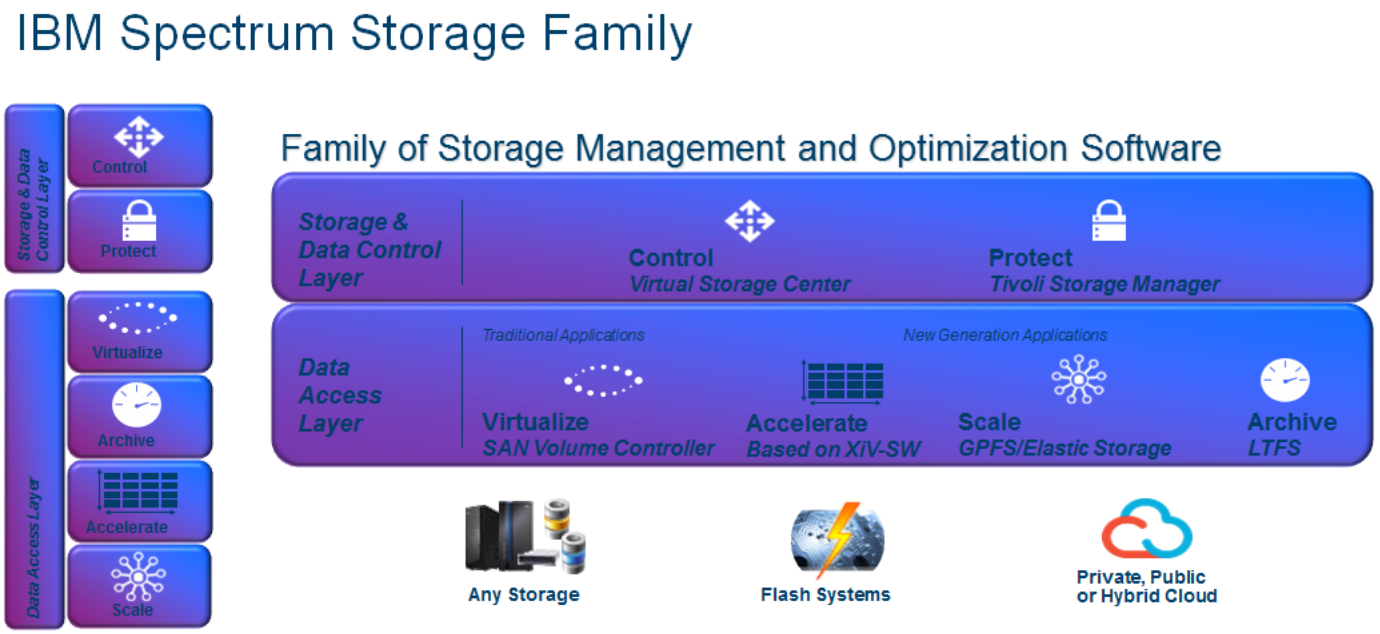
  TCOnow! for Enterprise Flash allows you to analyze the performance and TCO implications of consolidating up to 10 storage groups, into as few as one. In some cases you may wish to retain some of the existing storage infrastructure, and TCOnow! for Enterprise Flash allows you to do this. For the first time, one can analyze the TCO and performance benefits of adding Flash to an existing storage environment.
- ***TCOnow! for Tape - New***
  - TCOnow! for Tape allows you to design and compare the True or Total Cost of Ownership (TCO) of the following tape-focused customer scenarios. With this release, all scenarios are implemented:
  - Hybrid IBM Tape and IBM FlashSystem compared to a new competitor's tape system.
  - Hybrid IBM Tape and IBM FlashSystem compared to a new competitor's scale out array (NetApp or EMC Isilon).
  - Hybrid IBM Tape and IBM FlashSystem versus an existing disk array.
  - IBM Tape system (TS3500, TS4500 or TS7700) compared to a new competitor's tape system from EMC, Oracle or SpectraLogic.
  - IBM Tape system compared to a new competitor's scale out array from NetApp or EMC Isilon.
  - An existing disk array (from EMC, HP, Hitachi, IBM or NetApp), with a new IBM Tape system added and used for storage growth versus an existing a cdisk array from EMC, HP, Hitachi, IBM or NetApp.
- **TCOnow! for Spectrum Scale**

  Moving to the cloud has all the appeal of a simple solution to a complex problem. Best of all you only pay for what you use, and, on a monthly basis. What could be better? Plus on the surface, it looks like a fairly simple analysis should reveal whether the cloud or on-site storage is more cost effective. TCOnow! for Spectrum (Elastic Storage) is a robust model that ensures all cloud costs can be easily modeled, to ensure a fair comparison to a conventional storage solution. In particular, one can change key assumptions such as utilization, risk of lost data, different data retrieval rates, plus several downtime models ensure you have an apples to apples comparison.
- **TCOnow! Flash Web Tool**

  The web based TCO Flash tool allows you to perform a simplified TCO analysis for IBM Flash Systems directly on the Internet using a web browser. The website also provides mobile device support.
- **Coming soon (1Q 2017) : ROI Spectrum Control and Spectrum Virtualize Web Tool**

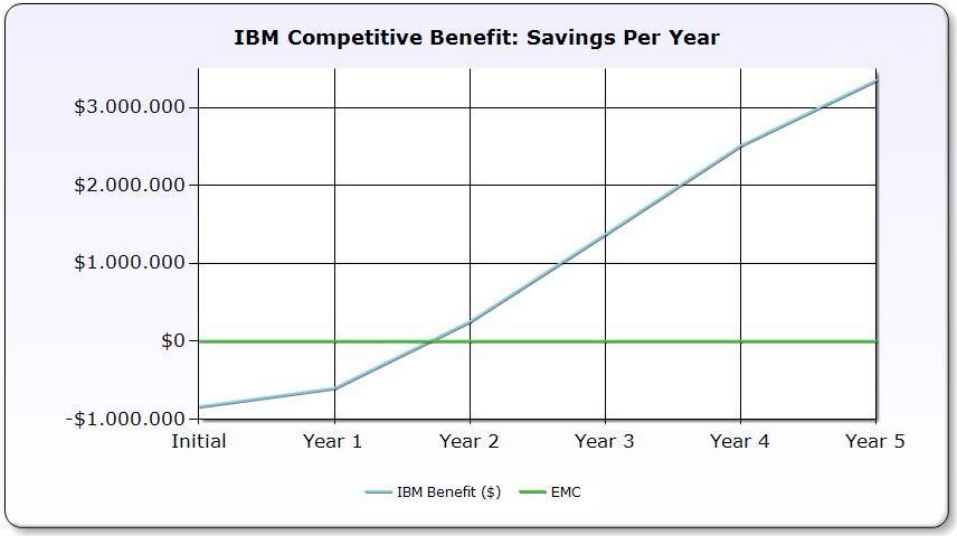
Use TCOnow! to design IBM Spectrum Storage Family IT Architectures

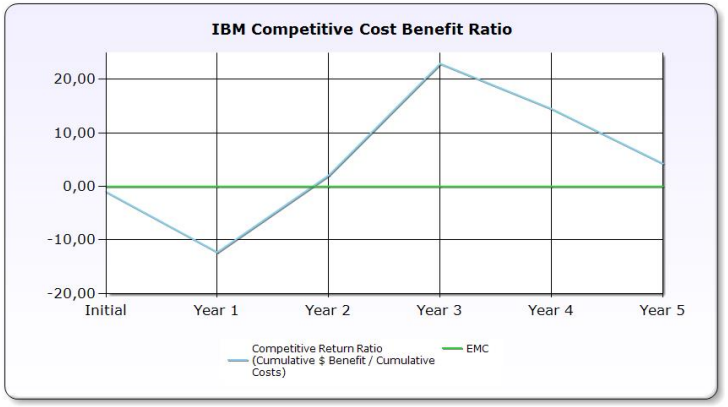
- Performance modeling for IBM Flash solutions (incl. hybrid solutions).
- Flape – Flash and Tape hybrid solution design
- Design Tape for growth solutions
- Design Spectrum Scale solutions
- => simply select the matching TCOnow! module and get started

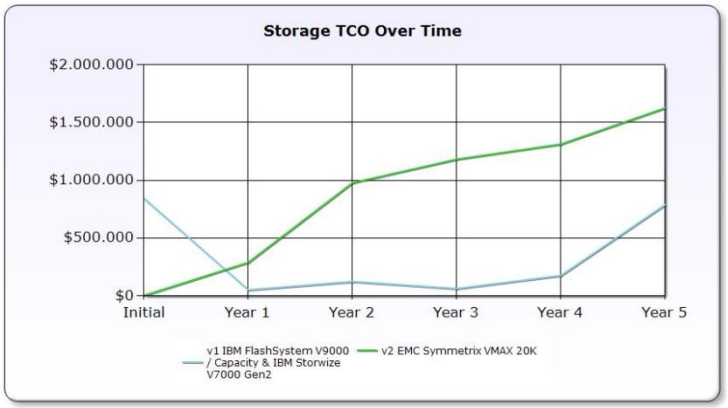


New Charts to highlight IBM's competitive advantage

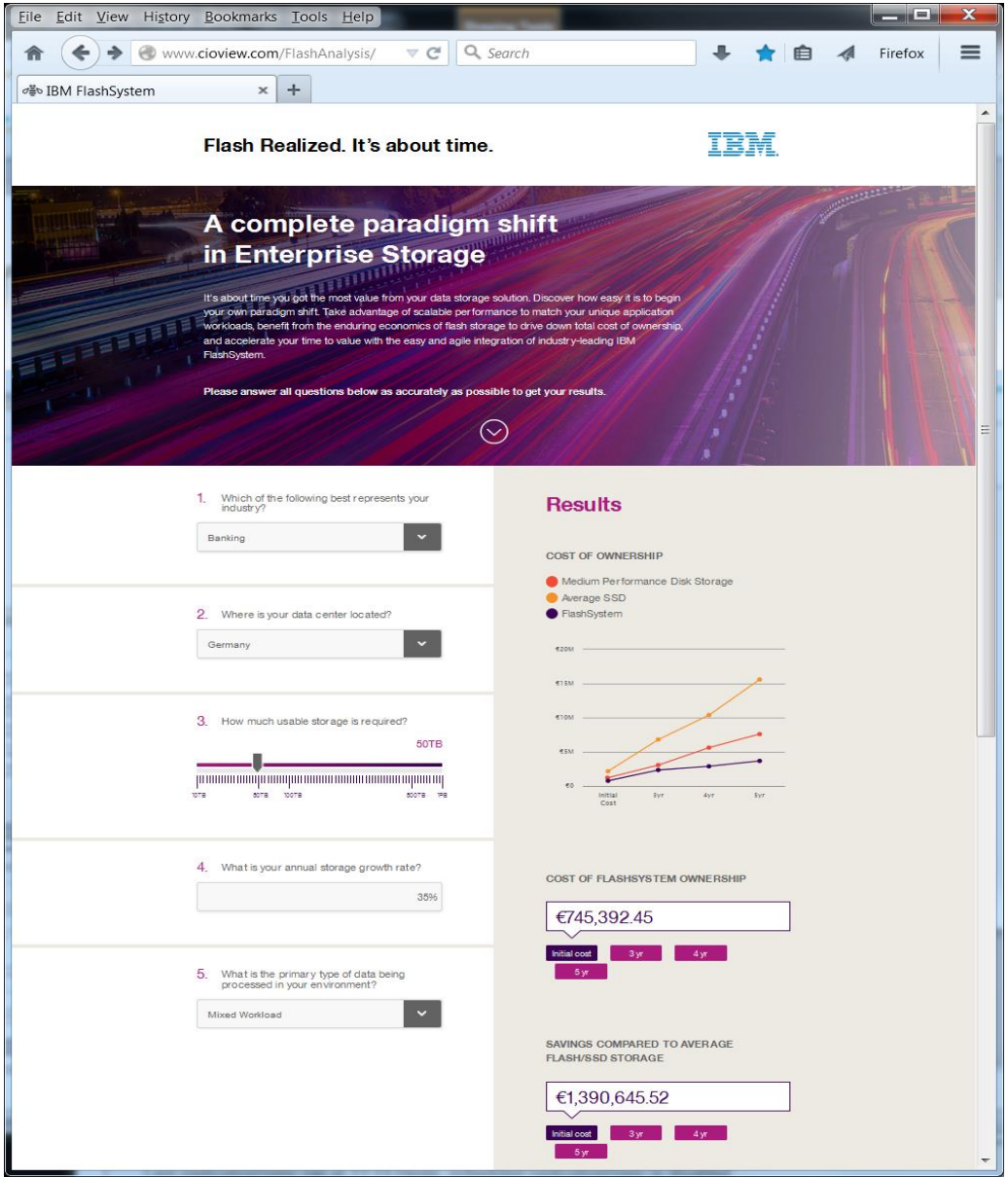
- New charts available on "New to Existing" cases:
- Sample Case: 100TB, 5year, 25%growth: Hybrid V9000/V7000gen2 (w7 compression 2:1) vs. EMC Vmax 20k (purchased in 2014)
  - IBM Competitive Benefit: Savings Per Year
  - IBM Competitive Cost Benefit Ratio
  - Storage TCO Over Time





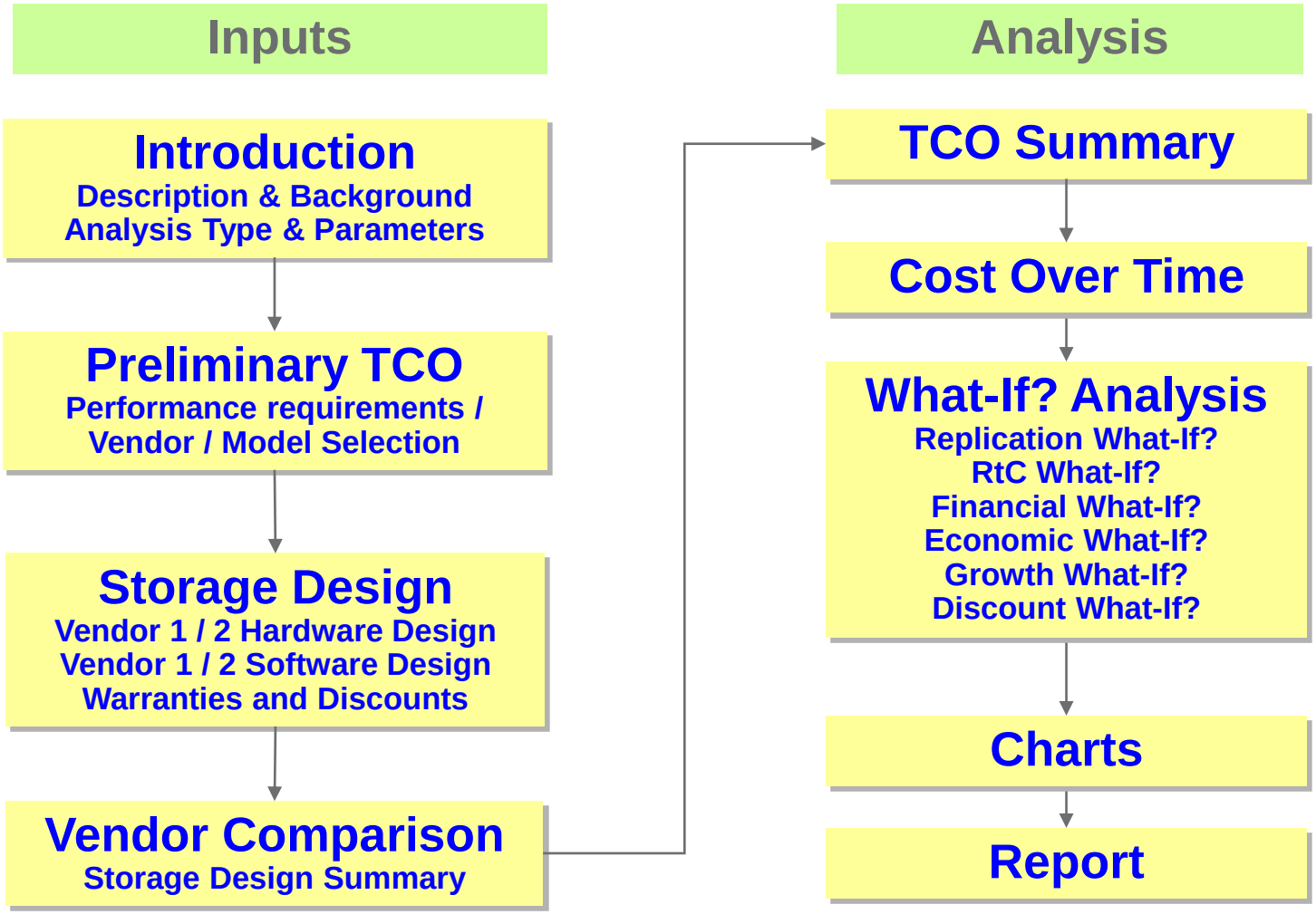


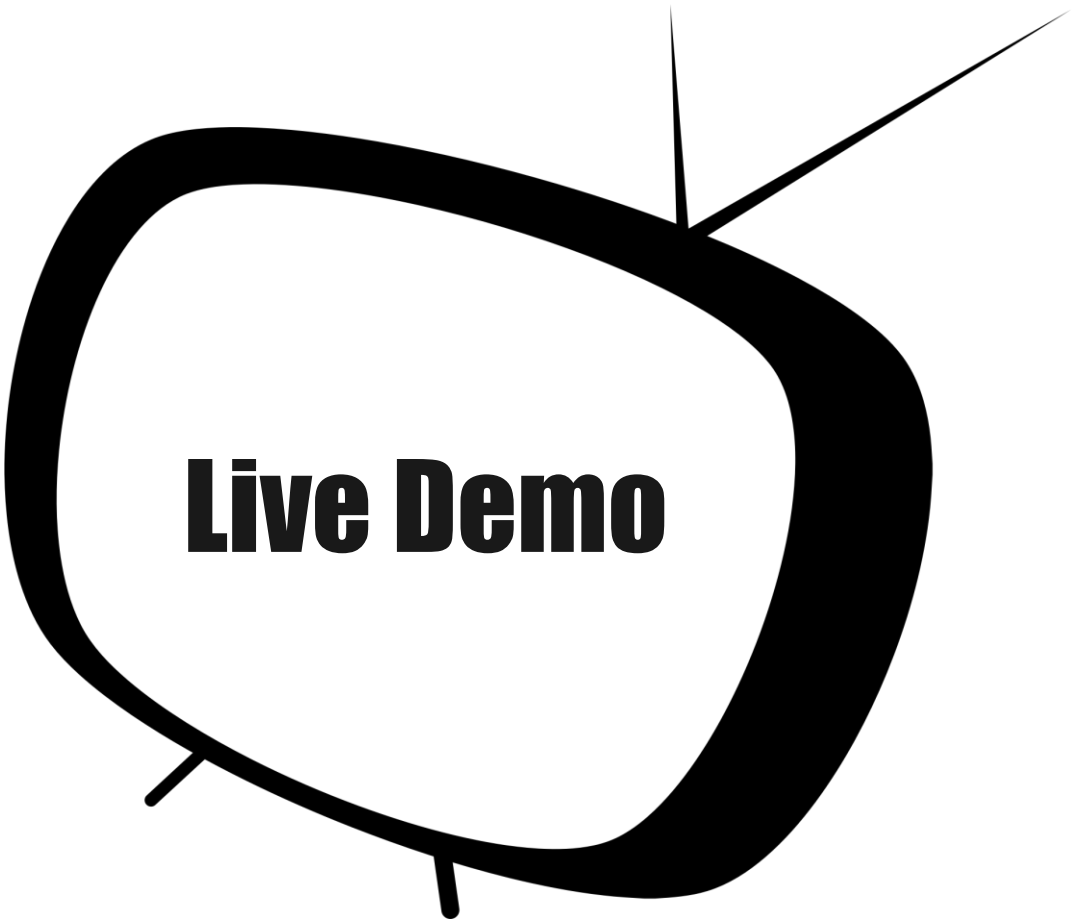
TCOnow! Flash Web Tool



- Free simplified online tool accessible for everyone.
- Mobile device support.
- TCOnow! Flash Web tool located at:
- http://www.cioview.com/FlashAnalysis/

TCOnow! Process Flow Overview




Live Demo

Have I considered the impact of storage growth on TCO?

Did I choose the optimal module/drive size?

Does my data reduction assumption apply to future data?

Did I think about reducing ongoing cost more than initial cost?

Have I considered the cost structure:
Initial Purchase price vs. Total Cost of Owernship?

What are you waiting for?

Let's go!

- Get started with TCOnow! and download the software TODAY!

  Detailed download instructions are included as additional information in this presentation)
- It's FREE for Business Partner and IBMers!
- Don't worry, we will help you with your sales cases!
- General support issues (login, etc.) will be managed by CIOview.

Get TCOnow! – yes, it‘s free for Business Partners and IBMers

- **BP prepare (pre Step 1): Pre-registration (for IBM Business Partners Only)**
- Visit the link to register your company for entitlement to these tools under IBM’s licensing agreement with CIOview Corp. (Link: http://www.cioview.com/Proxy/BusinessPartnerRegistrationProxy/BusinessPartnerRegistration.aspx?authcode=10093)
- **Step 1: Install the CIOview Player Software**
- 1. Double click the “CIOview Player setup.exe” file that you downloaded to your computer. (If you do not have the file, you can download it here). (Link: http://www.cioview.com/download/content/playersetup.exe)
- 2. Proceed through the installation screens, and click “Finish”.

- **NOTE:** The CIOview Player requires Microsoft’s .NET Framework. If you do not already have it installed on your computer, it will automatically be added during the CIOview Player installation process. A Microsoft file called “dotnetfx.exe” will be downloaded from InstallShield Software Corp., CIOview’s trusted partner. The Microsoft .NET Framework installation may take a few minutes, and may require you to reboot your computer during installation.
- **Step 2: Register the CIOview Player**
- 1. Launch the CIOview Player from the “Start/Programs/CIOview Player/CIOviewPlayer V4” menu.
- You will be informed that the player is not registered and you can go directly to the registration
  OR
- Go to “Help – Register” and complete the registration forms. Click “Register.”
- 3. Close the CIOview Player.
- **Step 3: Activate your CIOview Player License**
- 1. Check your email for a message from CIOview. It will include your unique license for the CIOview Player. To license your software, you can either:
- Click on the link in your email message to open a browser window to your CIOview Player directory. Drag and drop the license file into this area.
  OR
- Copy and paste your license file (“player.license.txt”) into your “CIOview Player V4“ directory.
- 2. Launch the CIOview Player from the “Start / Programs /CIOview Player/CIOviewPlayer V4” menu.
- **Step 4: Install the Individual Modules, and Begin a new TCOnow! Project**

- 1. Go to “Content / Browse for new Content Modules.” Your valid and available TCOnow! and ROInow! licenses are listed here.
- You may download any TCOnow! or ROInow! content modules for which you have a valid license (highlighted in green) by clicking the “Install” button.
- You may purchase licenses for other products by clicking the “Buy Now” button to proceed to the CIOview online store.
- Go to “File / New” to start your project.
- **Your are done!**

Support and Communities for TCOnow!

- For additional education sessions, sales support, all questions, feedback, change requests, etc. please contact:

  Roland Tretau roland.tretau@de.ibm.com

- Slack hashtag #tconow

  https://ibm-systems-storage.slack.com/messages/tconow/

- YouTube: TCOnow! - Solve the mystery of Storage TCO

  https://www.youtube.com/watch?v=n9ttQAtbGs0

- IBM (w3) Community for IBMer

  https://w3-connections.ibm.com/communities/service/html/communityoverview?communityUuid=bbe98293-1548-4c85-9d2e-df93b3ed2803

- SmartCloud Community for BP
  https://apps.na.collabserv.com/communities/service/html/communityoverview?communityUuid=fb09a44c-fc45-4aaf-9fe6-5097dd4dc87b

Thank You