



TOP 10

Things You Need to Know About FLASH

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Top 10 Things You Need to Know About FLASH

TOP 10

- #10 FLASH must be considered first
- #9 There is more than one design center
- #8 FLASH is not the only game in town
- #7 FLASH can be wasteful in the data center
- #6 Watch out for latency pollution
- #5 FLASH is the new disk
- #4 The AFA is NOT a product category
- #3 FLASH blurs the lines between Servers and Storage
- #2 FLASH re-defines storage networking
- #1 FLASH made DAS cool again

Virtualization Drives Efficiency

Storage System Must Automatically Differentiate Between Cost and Latency

VIRTUALIZED DATA CENTER

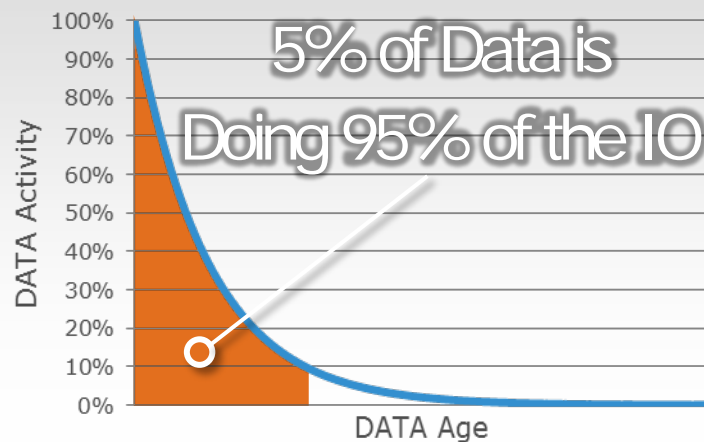


Midrange Storage must operate at the highest level of efficiency



The System must simultaneously deliver data at **lowest latency** while storing it at the **lowest cost**

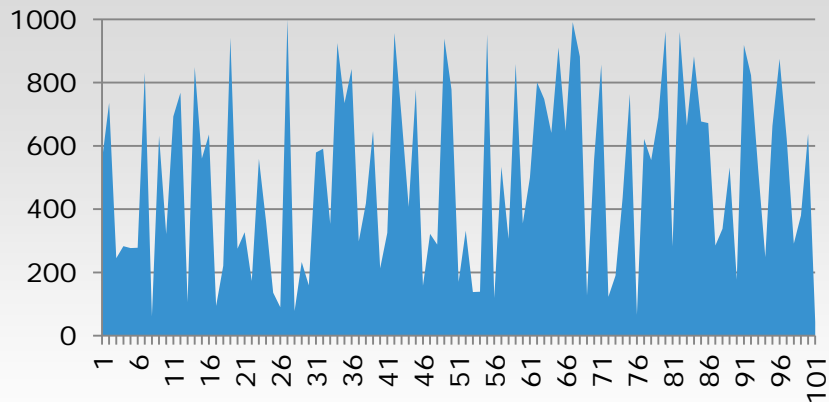
DATA is HIGHLY SKEWED



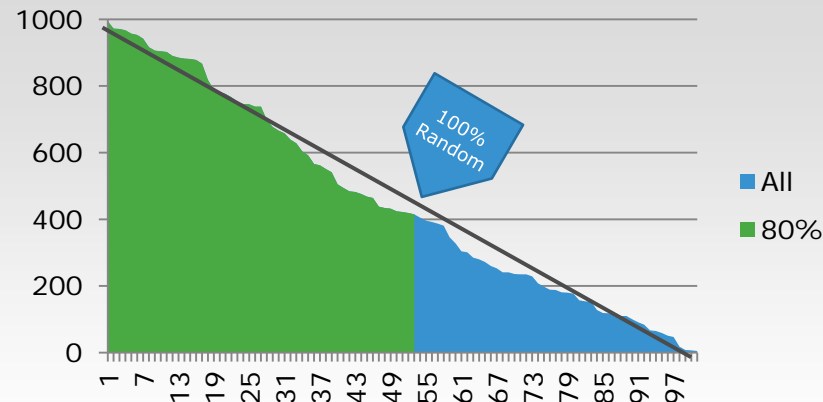
At any given time, only a *small percentage* of data is active

IO Skew

Random slice activity



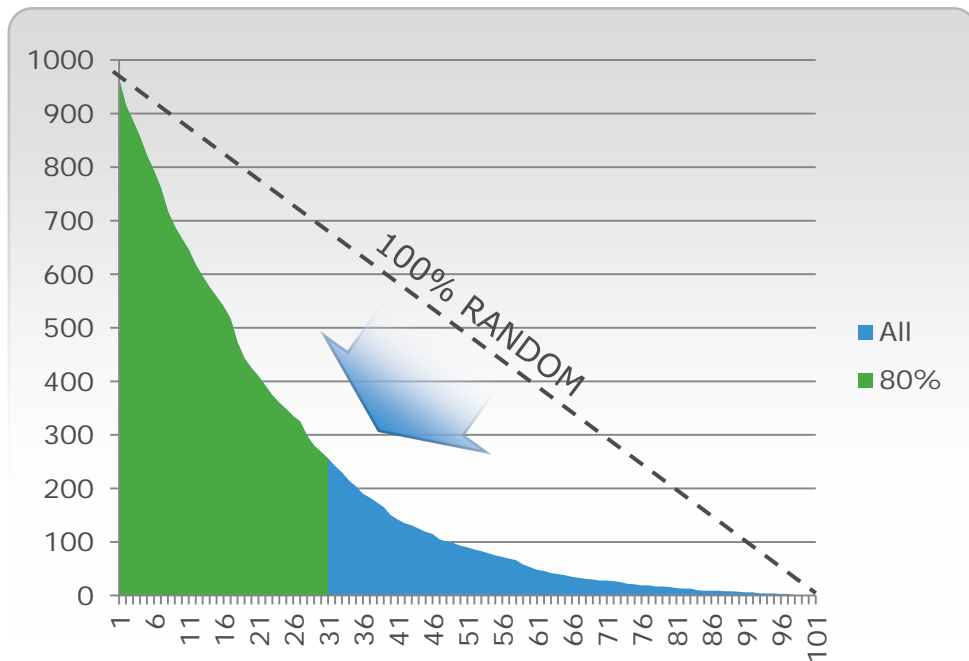
- Slice activity 100% randomized



- Slice activity stack ranked according to access frequency of a given slice
- 51 of 101 slices has 80% of IO

IO Skew

Random slice activity weighted by 3% cooling rate

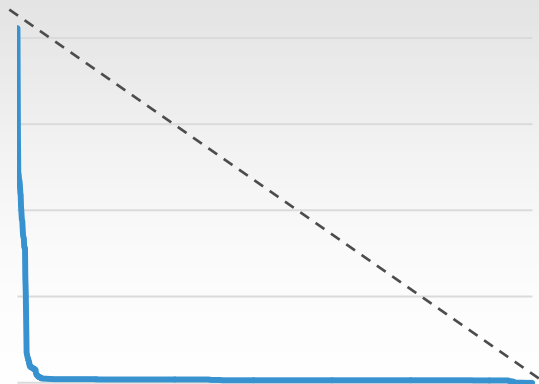


- Stack ranked slice map weighted by 3% slice-to-slice data decay
- Now only 31 of 101 slices has 80% of IO

Real Customer Skew Examples

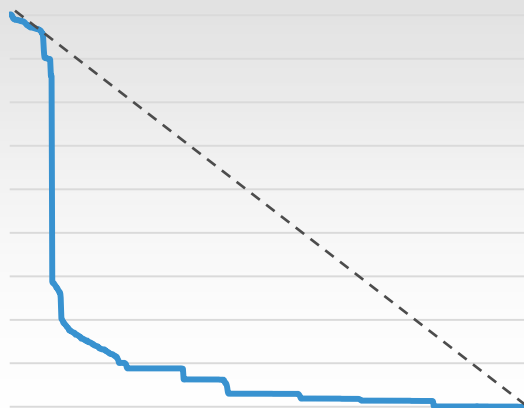
Data Activity Distribution Dictates FLASH 1st Strategy

Long Tail Skew



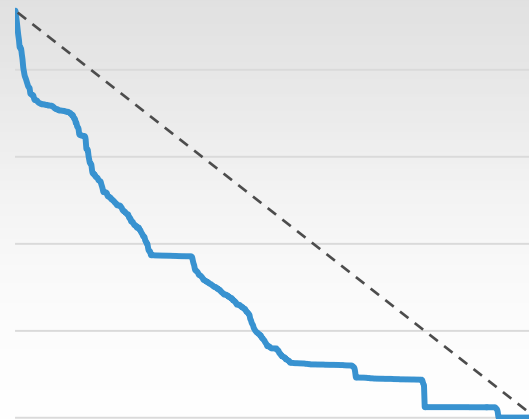
Most of the Data is long tail
with small head

Mixed Skew



Large portion of data is hot.
Some data is warm with
smaller tail

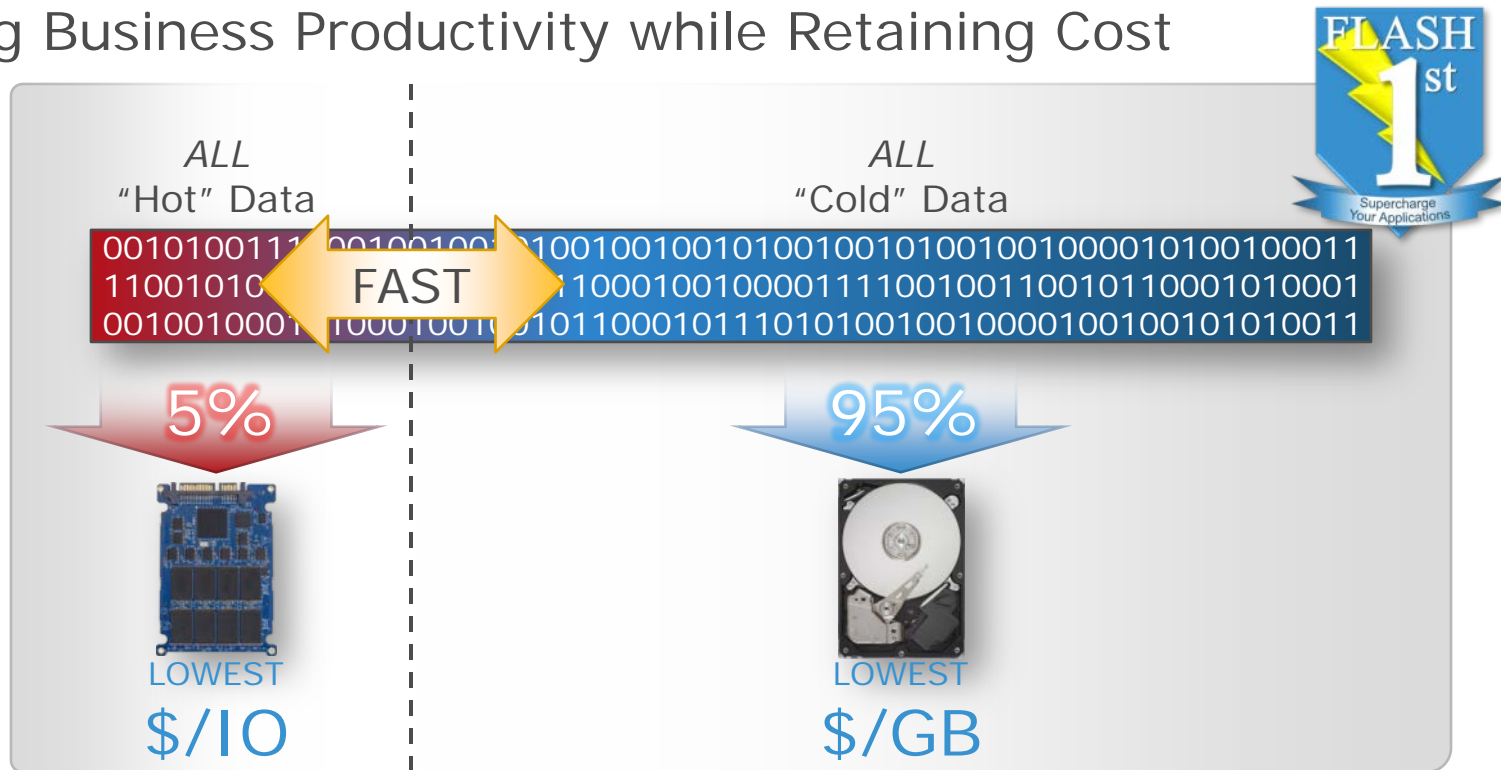
Shallow Skew



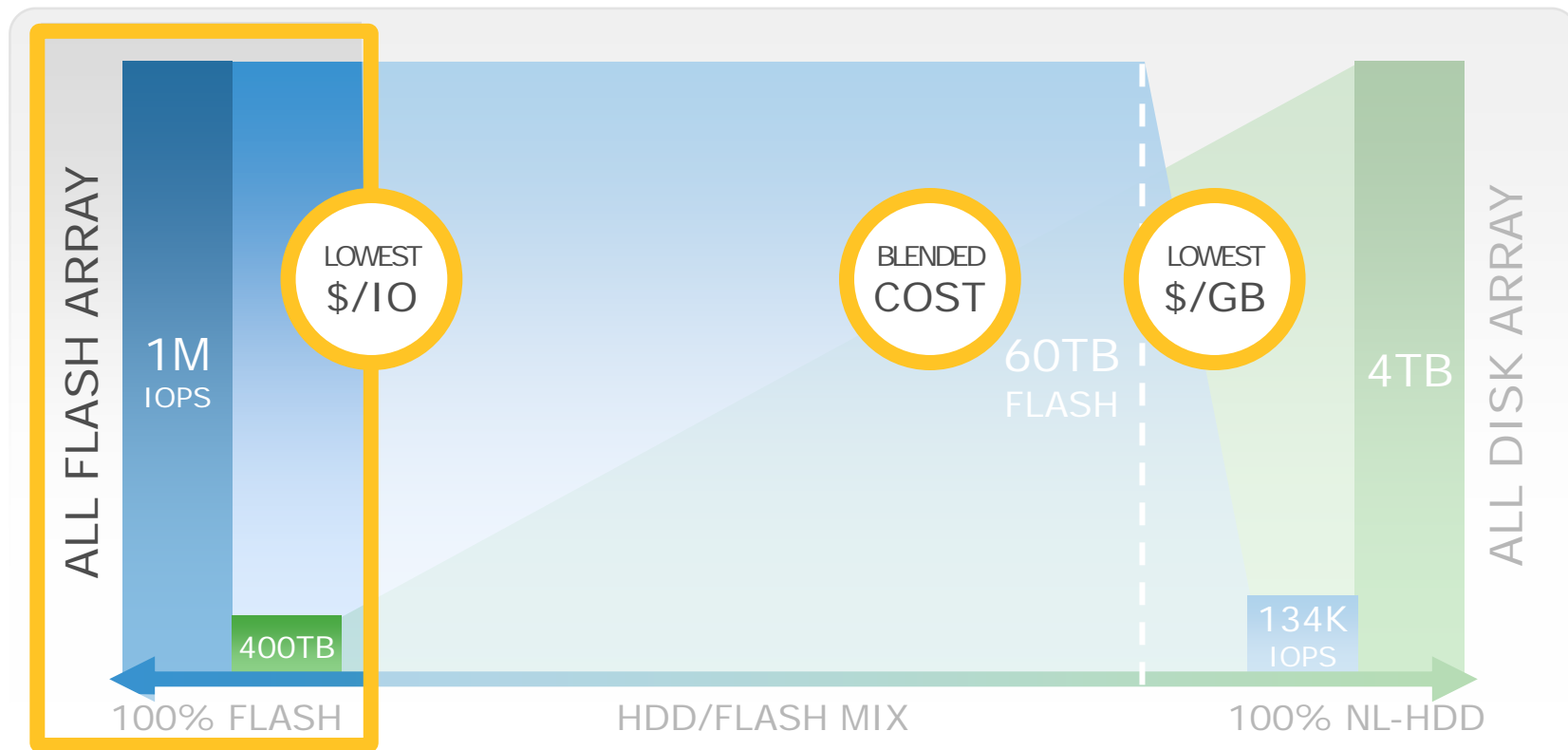
All data is hot.
No pronounced long tail.

The FLASH 1st Strategy

Driving Business Productivity while Retaining Cost



1000 Slots - All FLASH, All HDD or Mixed

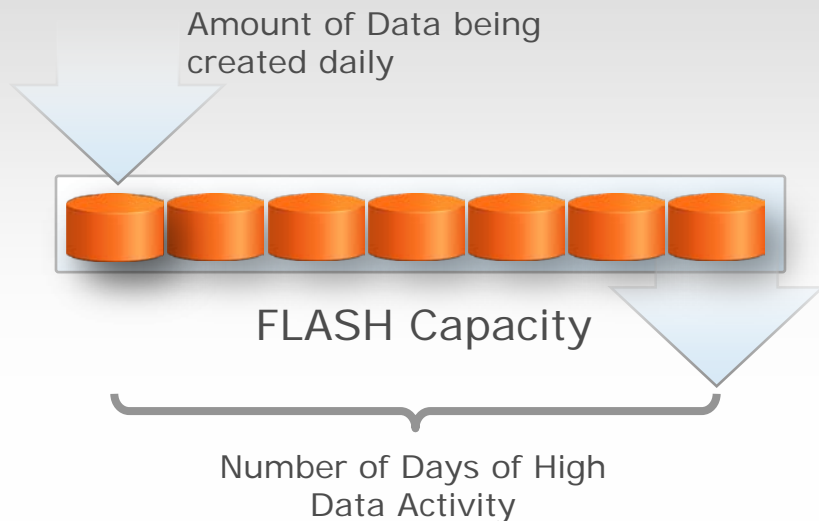


How Much FLASH?

Used dynamically with FAST



Size of FLASH FIFO



- Data follows *predictable activity decay*
- Older data is constantly being *replaced* by new highly active data
- The amount of FLASH required is determined by:
 - The amount of data created each day, and
 - The period of time it takes to cool

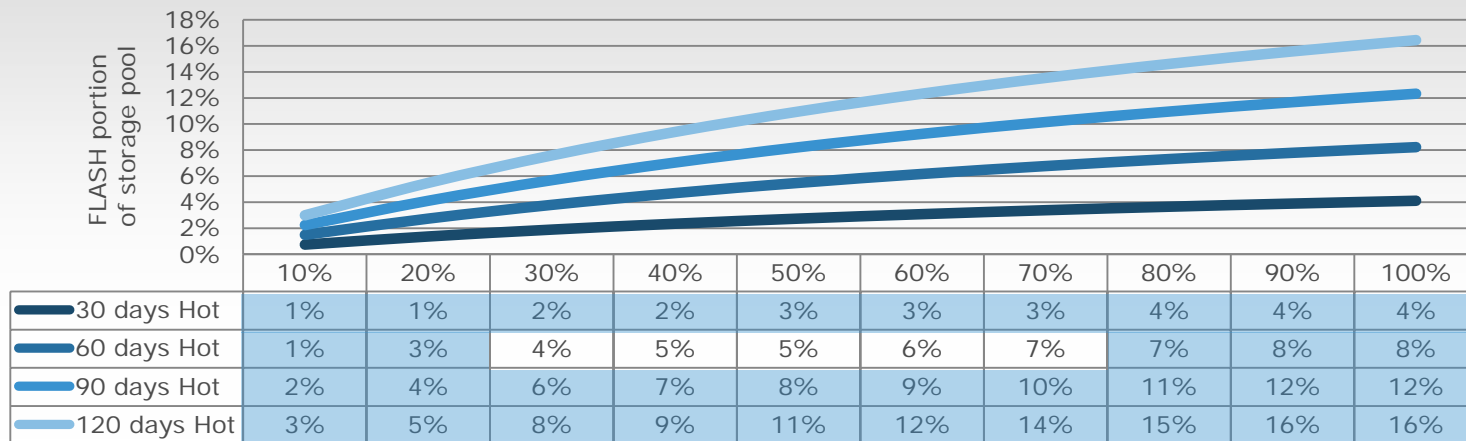
Calculating How Much FLASH



FLASH PORTION

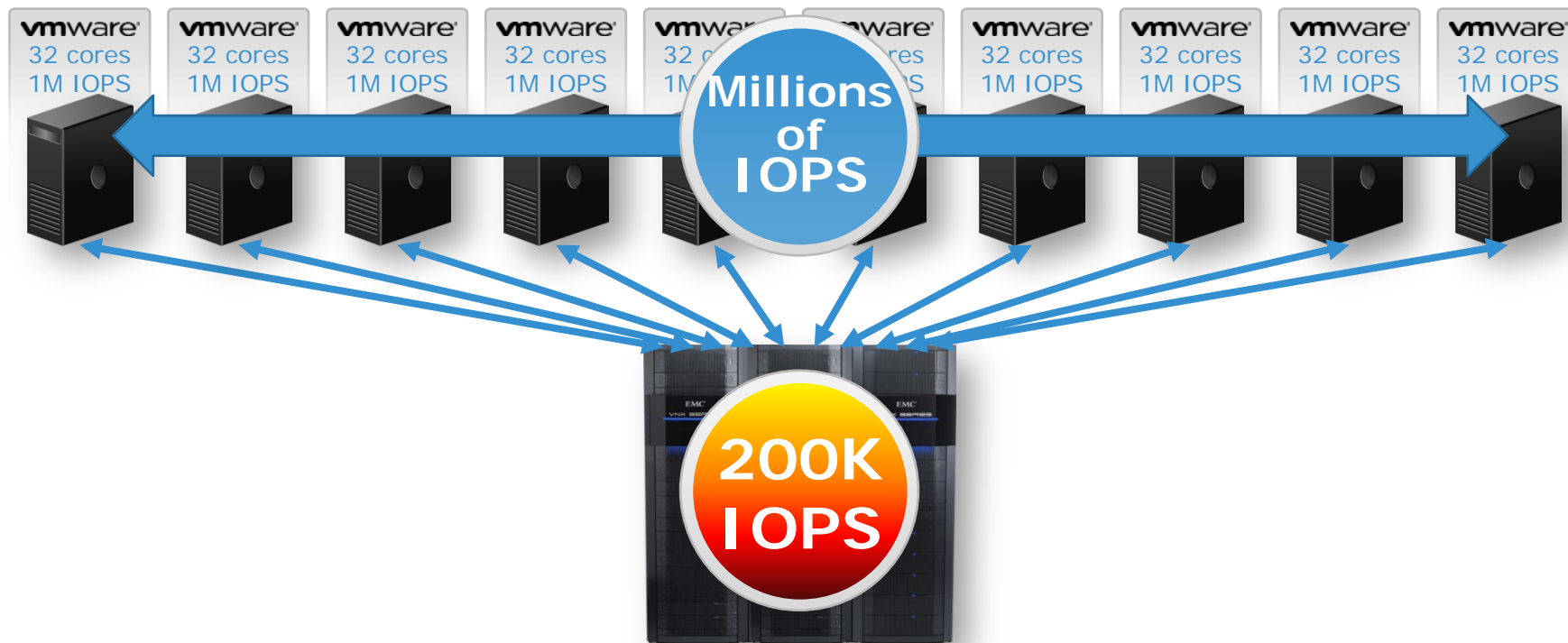
$$\text{FLASH \%} = \frac{\text{Yearly Growth Rate\%} \times \text{Number of Hot Days} \times 100}{365 \times (\text{Yearly Growth Rate\%} + 100\%)}$$

FLASH Portion
As a Function of Yearly Data Growth



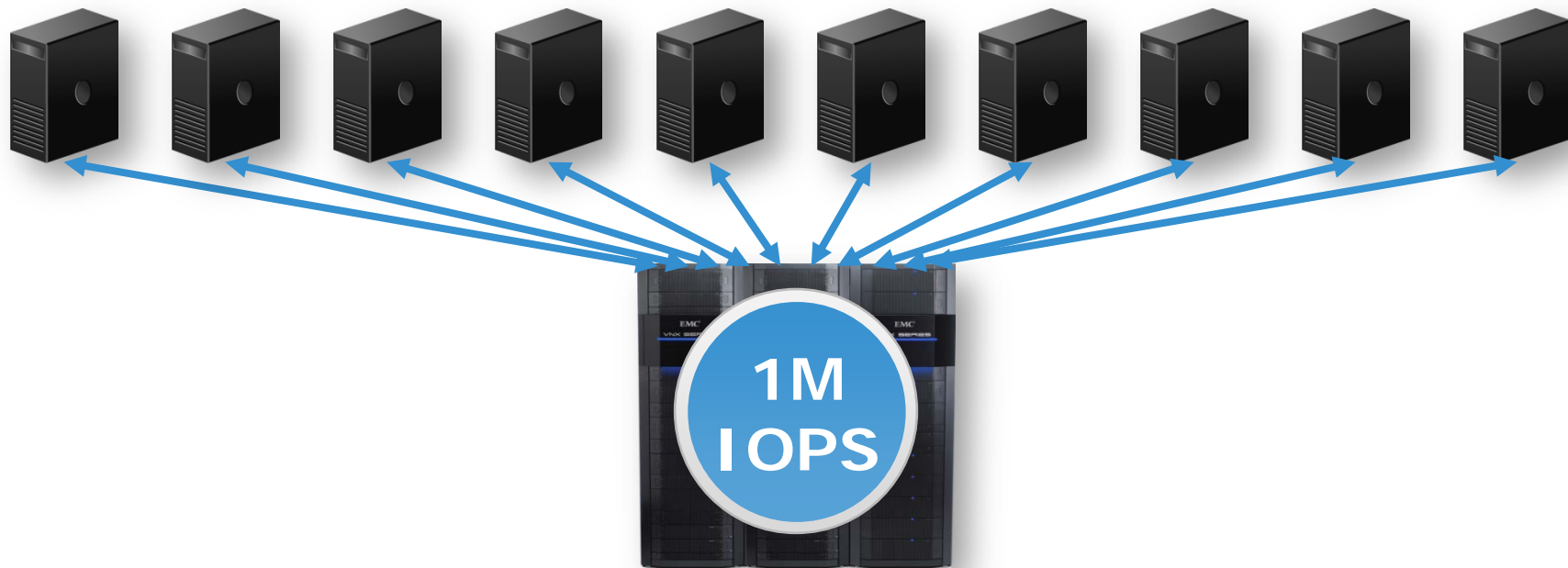
Customer's Need for Speed

Server Virtualization Puts New Pressures on Shared Storage



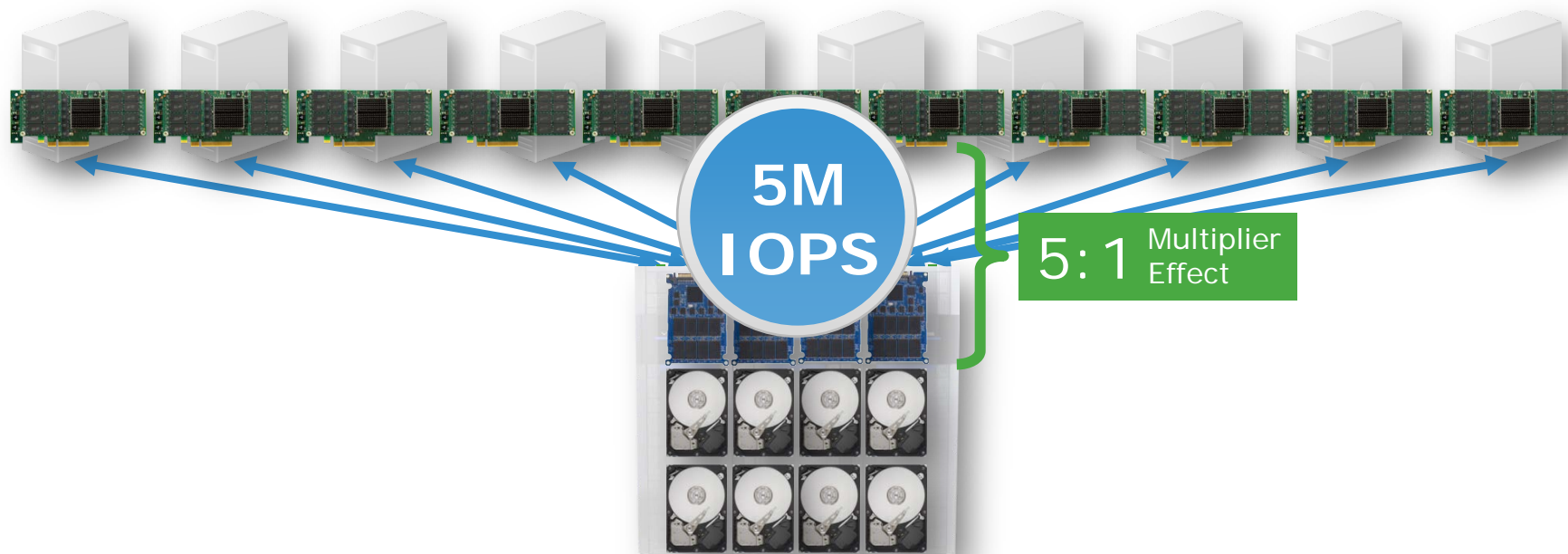
Customer's Need for Speed

Step 1 – Increase the IOPS of the Array w/ FLASH



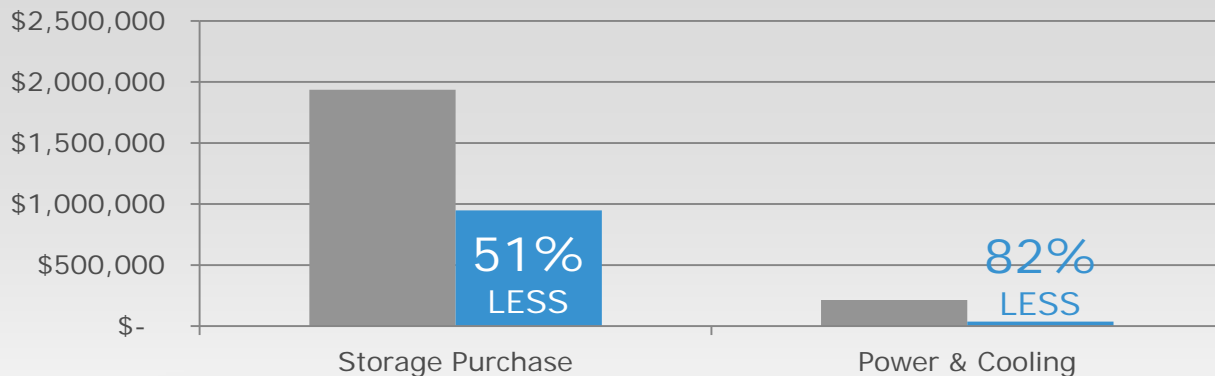
Customer's Need for Speed

STEP 2: Extend the FLASH-based Caching Host Side



FLASH 1st is YOUR Leading Strategy

5 Years of Service Life – 5:10:85 Strategy



Strategy		Storage Purchase	Power & Cooling	Total
FLASH 1st	✓	\$ 947,901	\$ 37,617	\$ 985,518
Mono	✗	\$ 1,935,918	\$ 214,221	\$ 2,150,139
SAVED		\$ 988,017	\$ 176,604	\$ 1,164,621



THANK YOU!

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