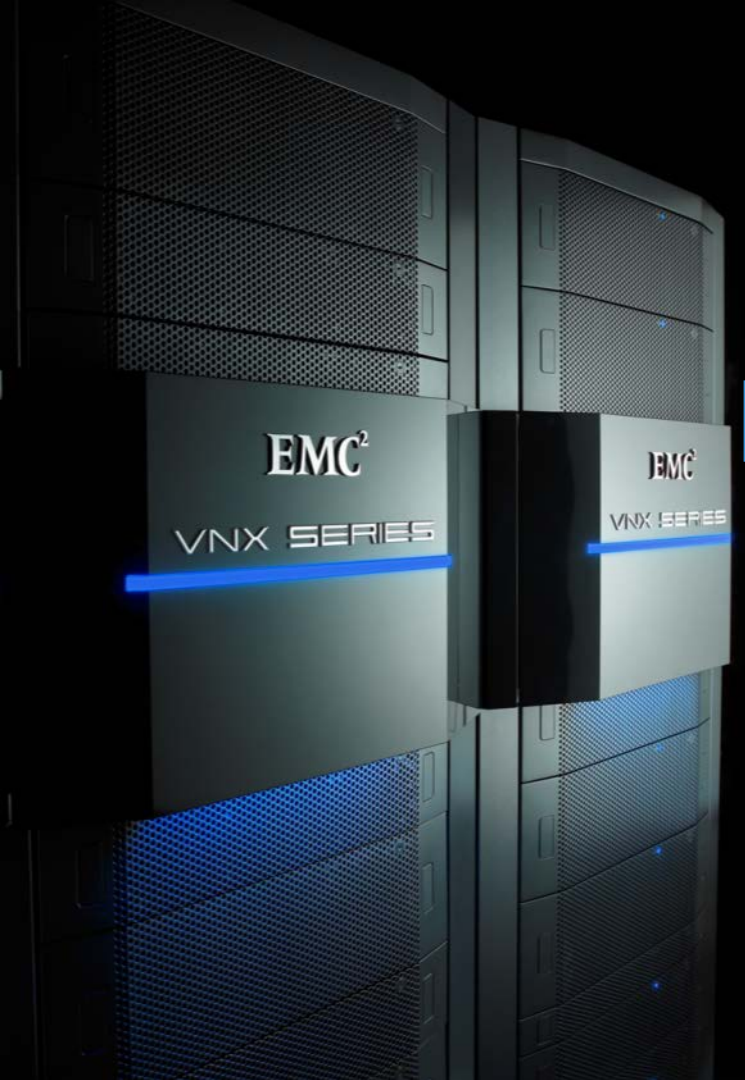
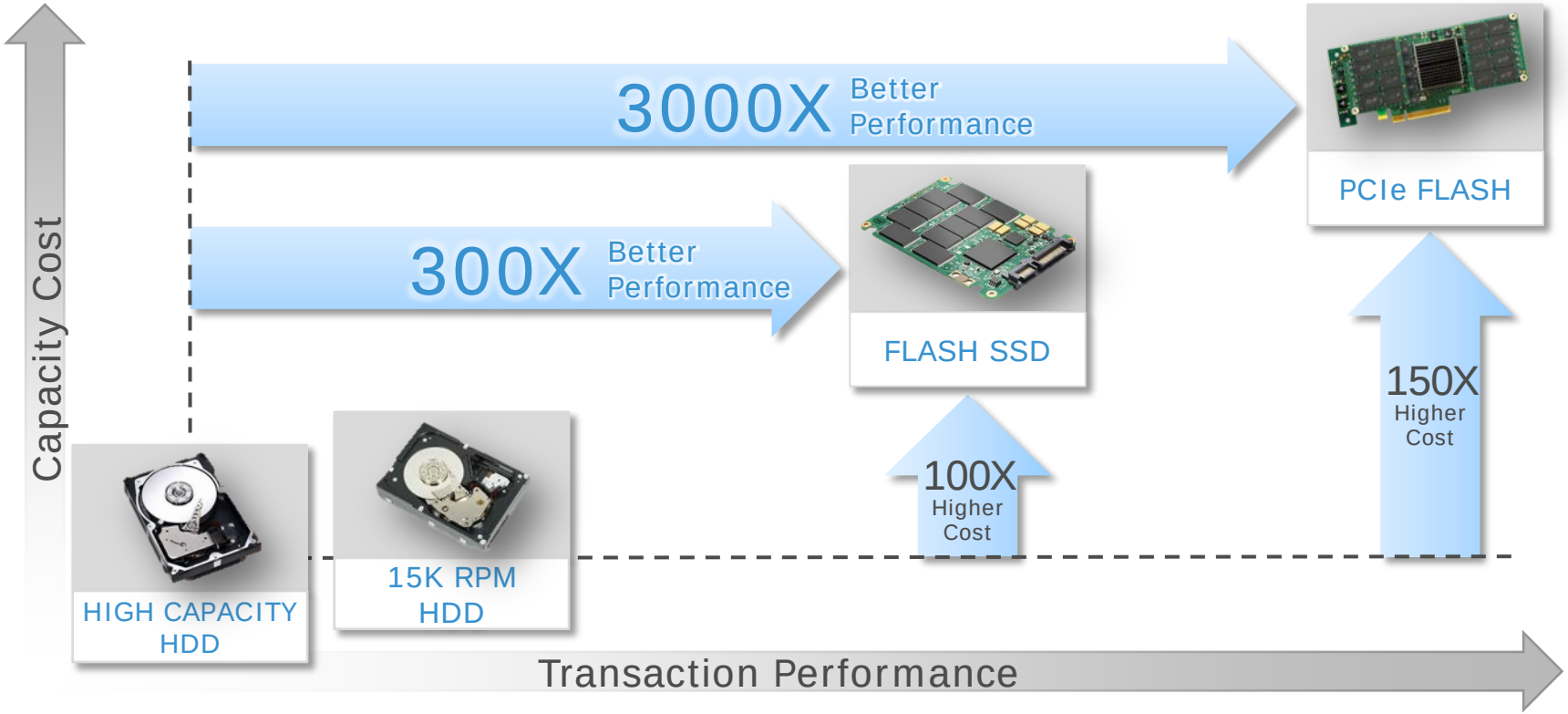


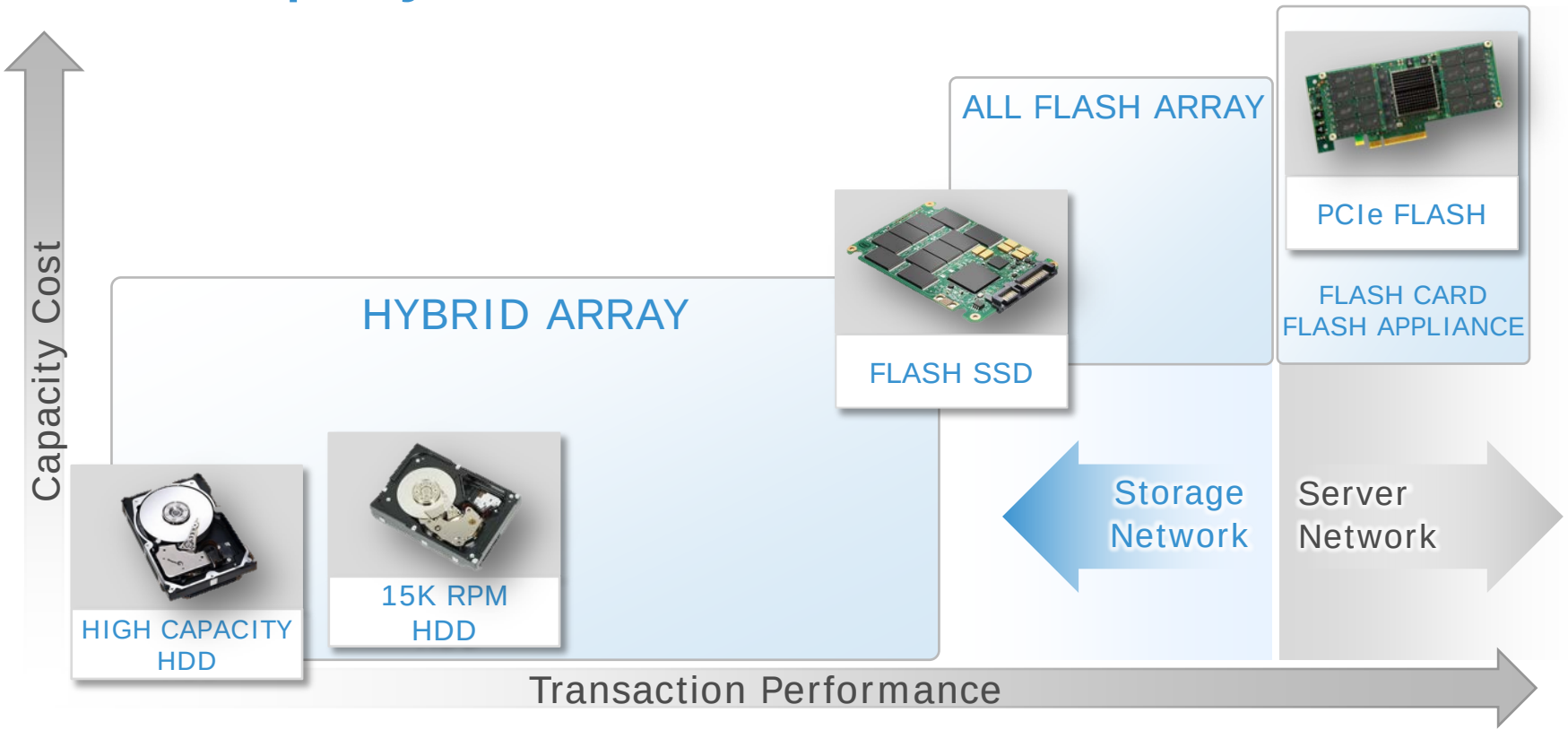
FLASH Implications in Enterprise Storage Designs

Denis Vilfort
Sr. Dir. , Unified Storage Division

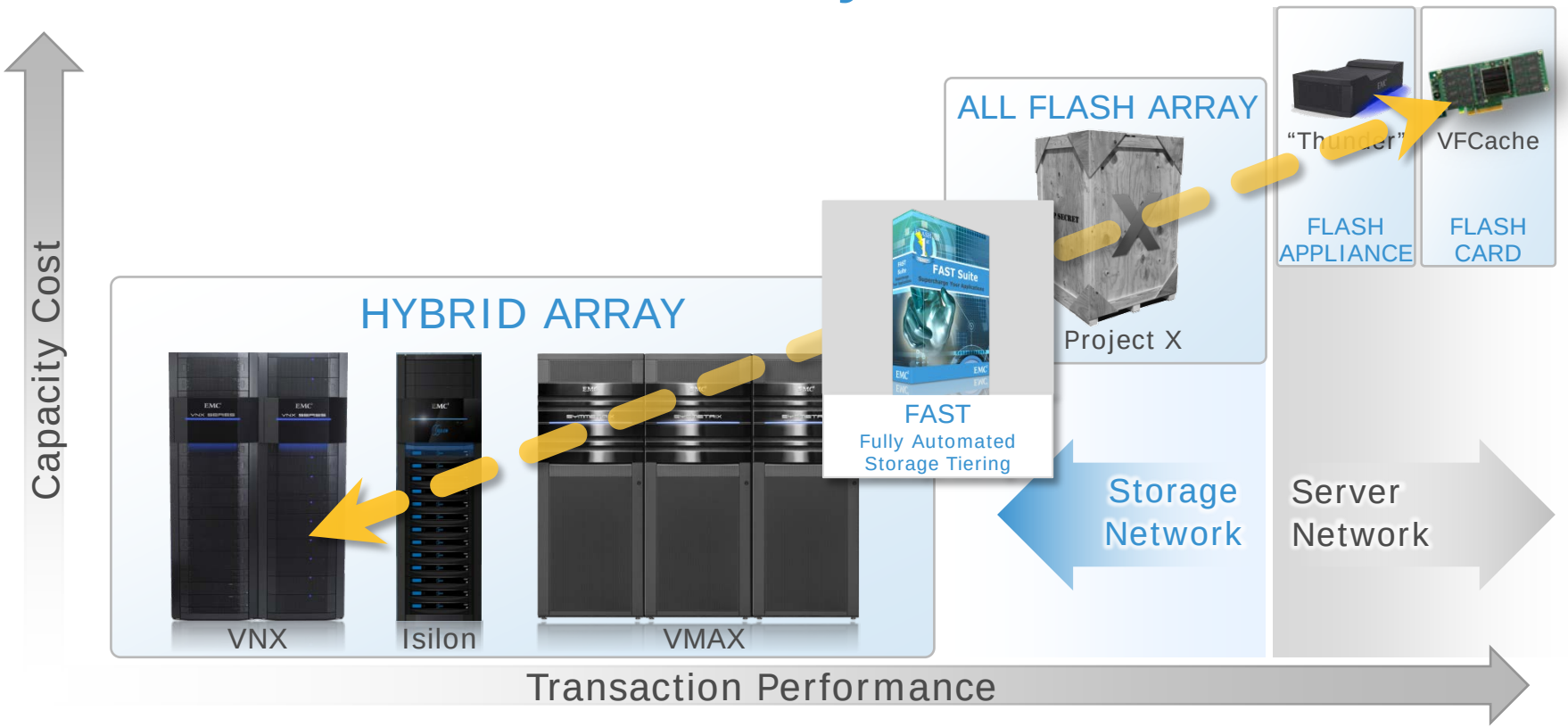
New Storage Reality



New Deployment Models

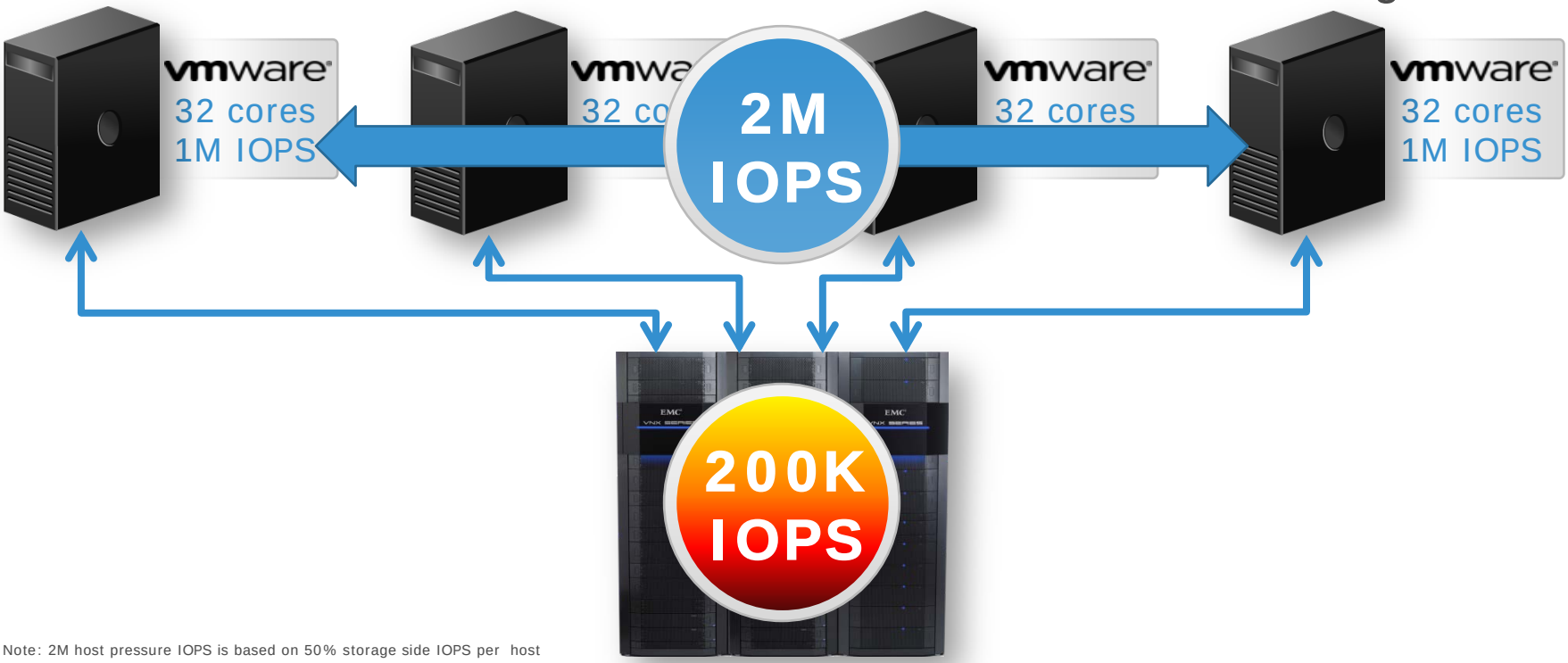


New Product Taxonomy



Customer's Need for Speed

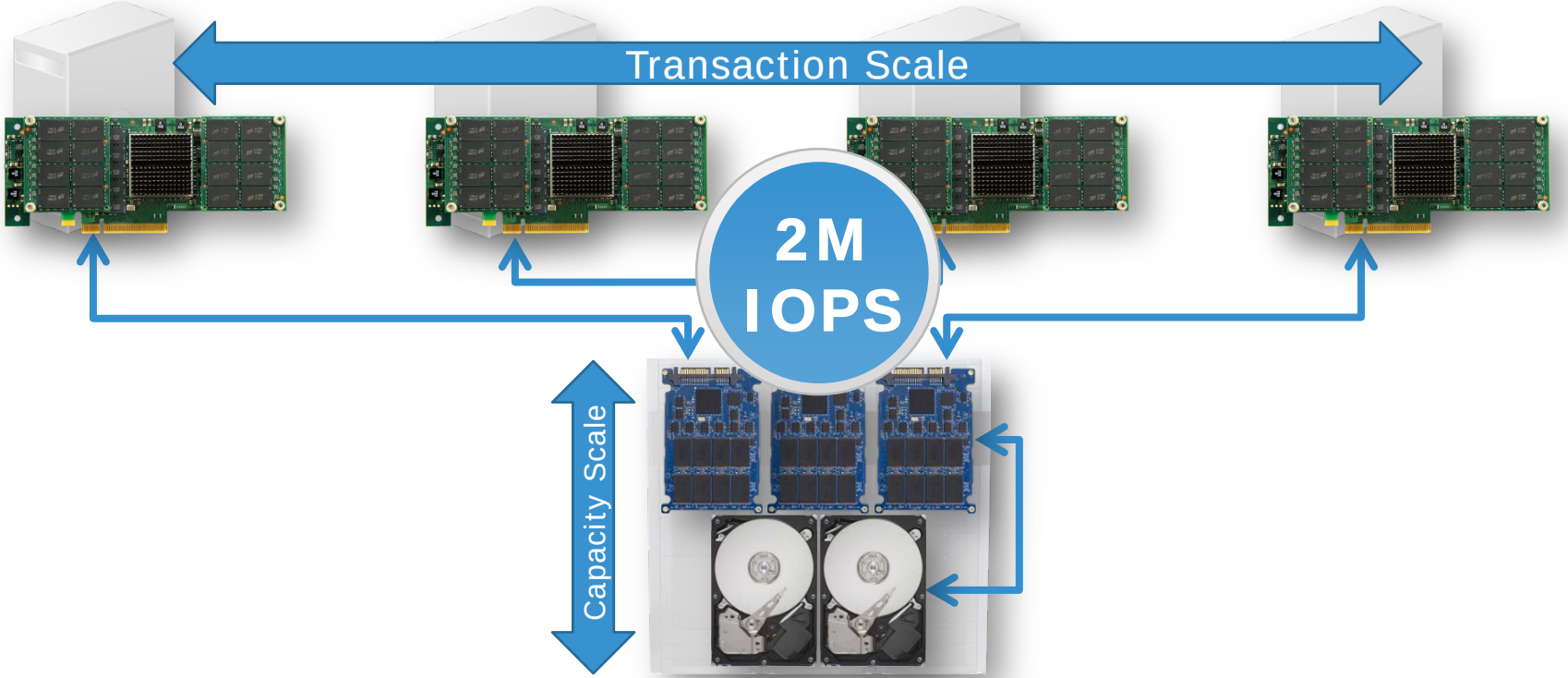
Server Virtualization Puts New Pressures on Shared Storage



Note: 2M host pressure IOPS is based on 50% storage side IOPS per host

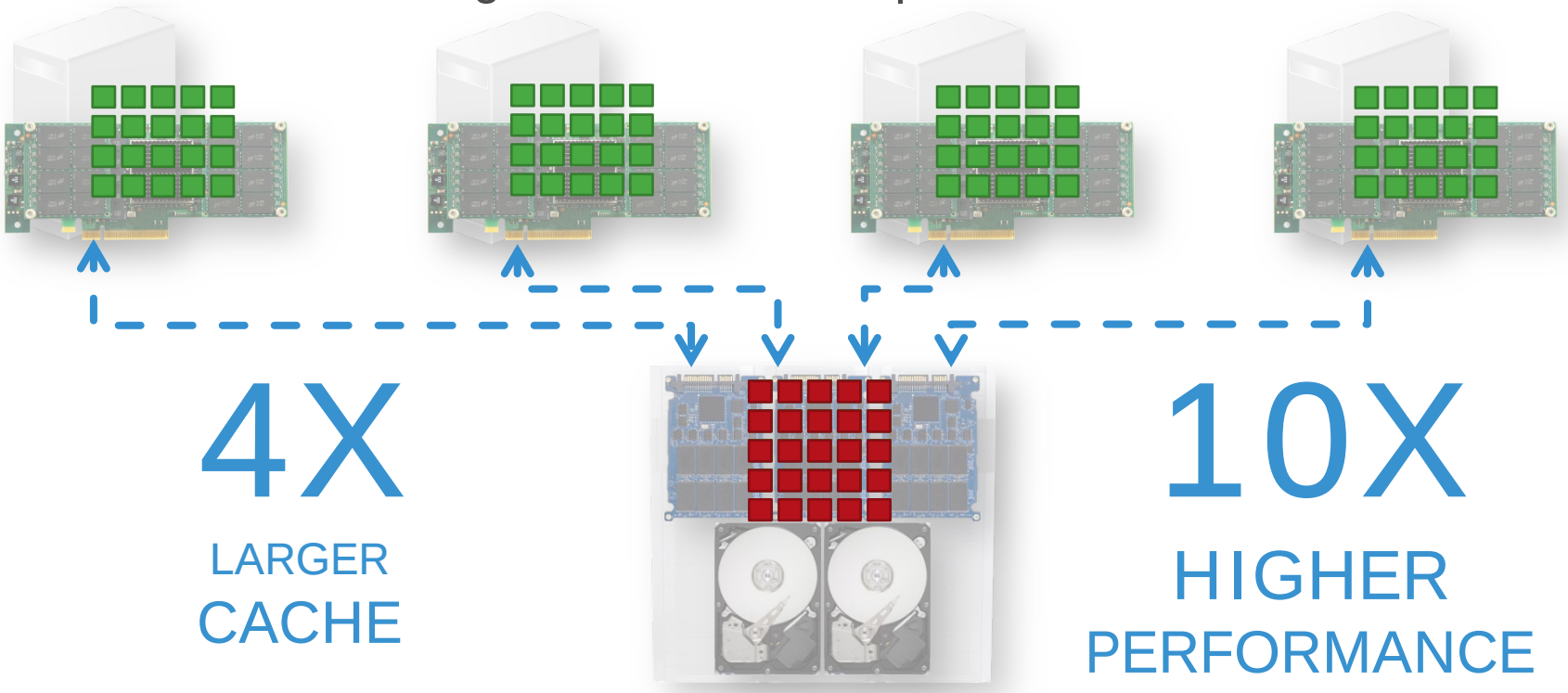
Customer's Need for Speed

READ/WRITE Differentiation is Ideal for Server-Side Caching



Customer's Need for Speed

Server-side Caching is a Force Multiplier



4X

LARGER CACHE

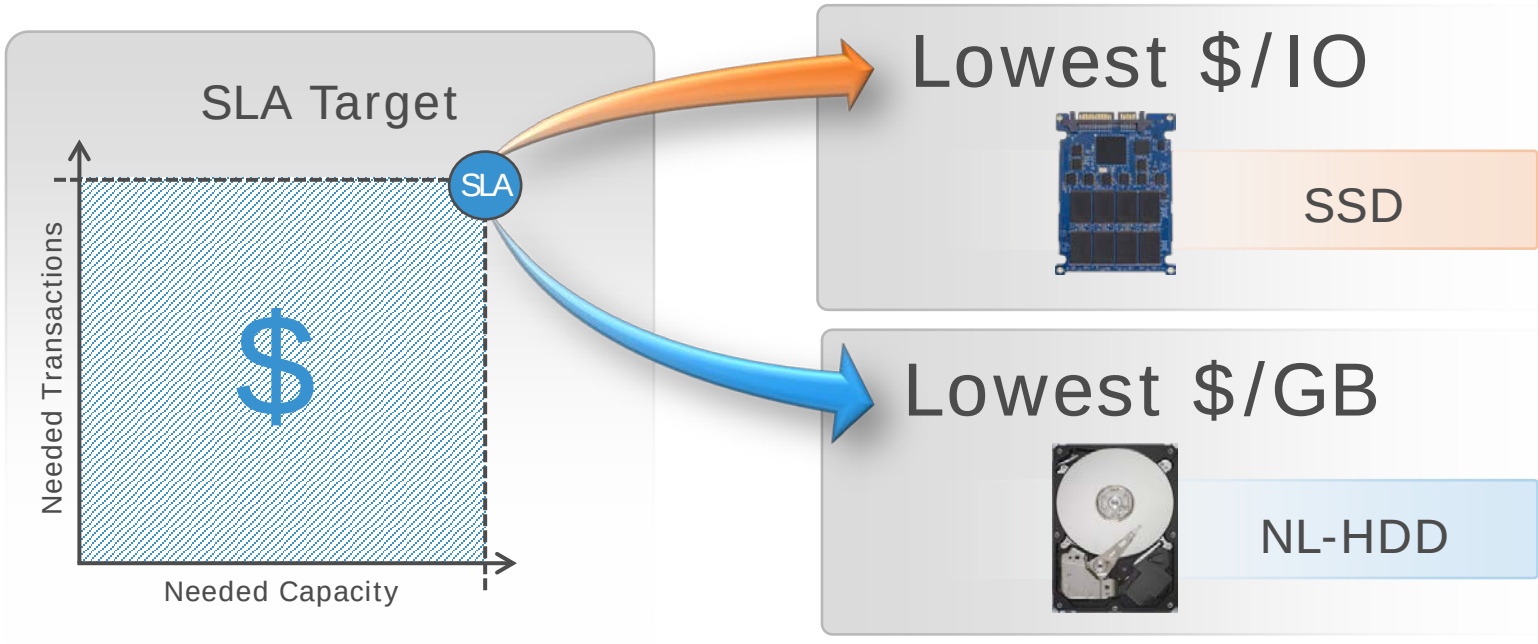
10X

HIGHER PERFORMANCE

EMC²

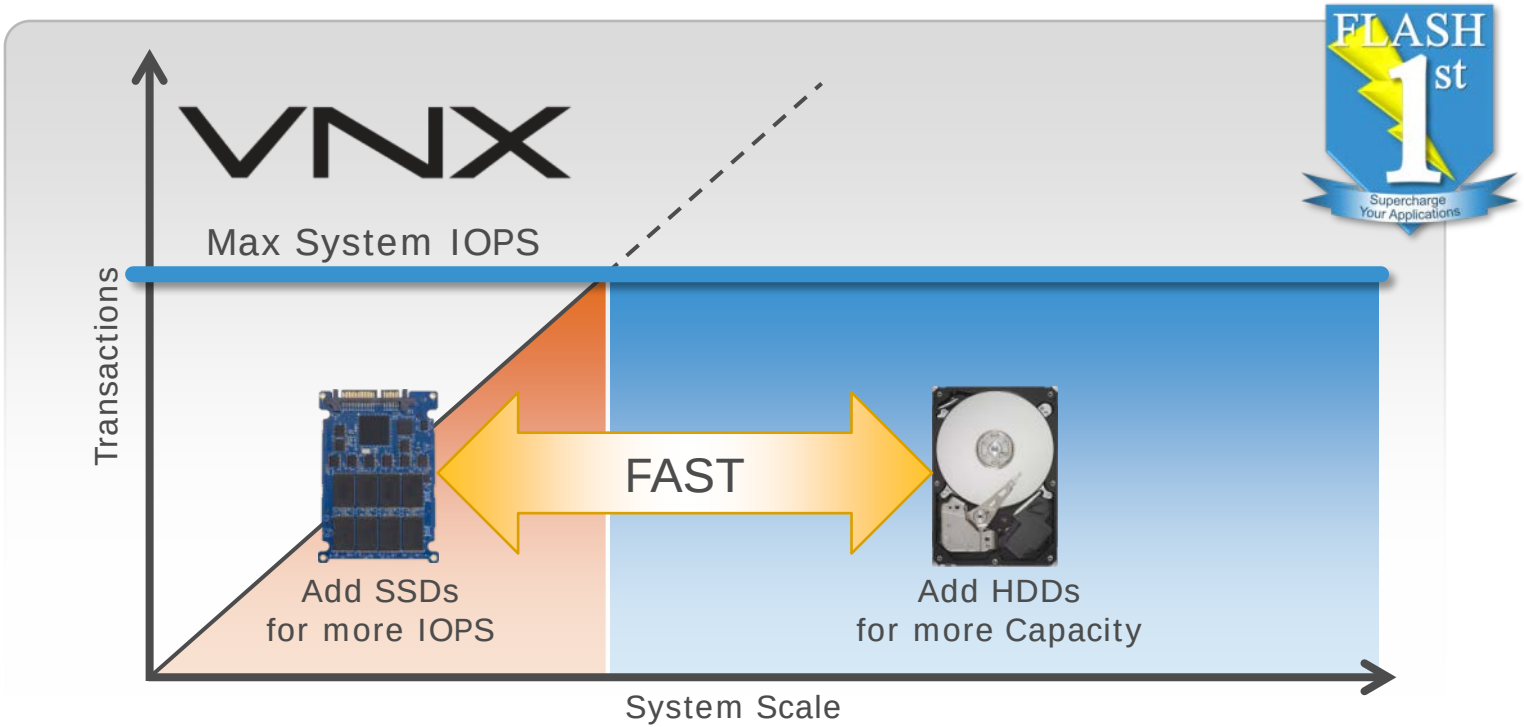
Two Key Components of Customer's SLA

Transaction and Capacity Support Needed by The Business?



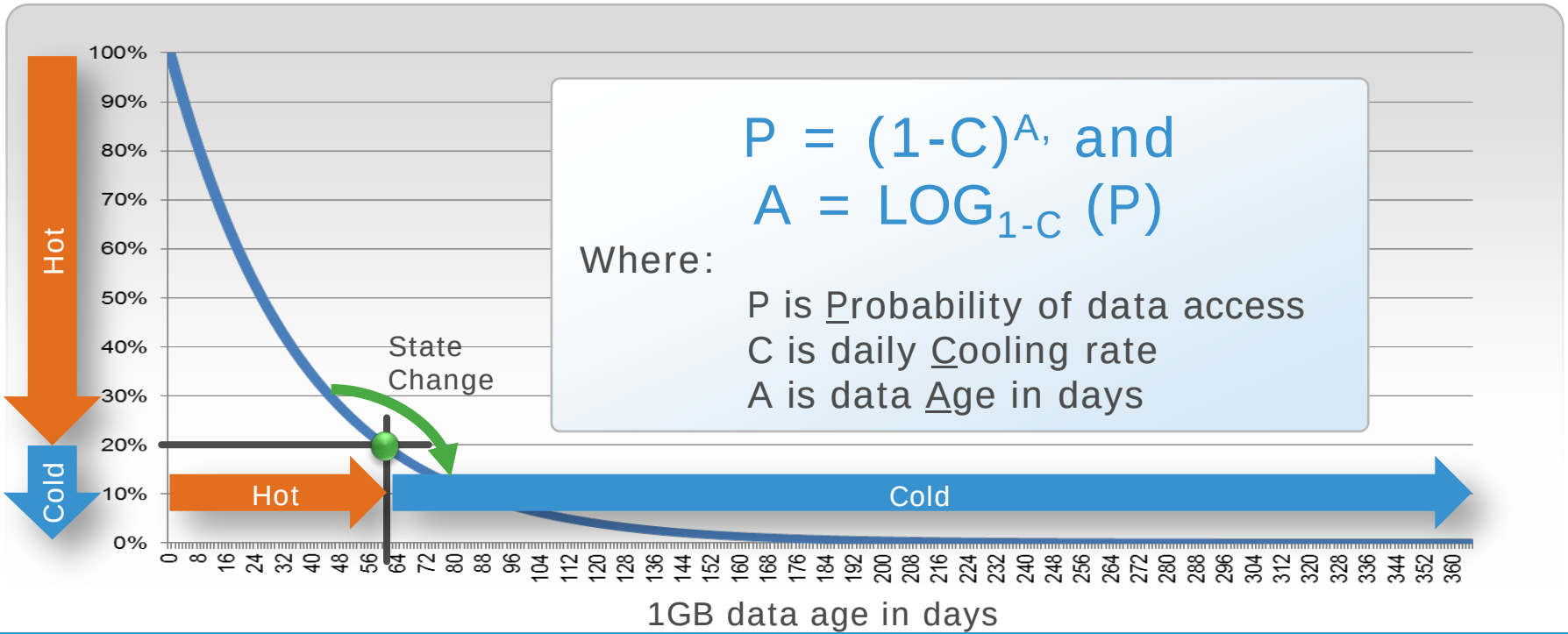
Optimizing ROI with Hybrid Arrays

Delivering Lowest $/IOPS and Lowest $/GB – simultaneously!



Modeling “Data Decay”

A simple GB-Day state model describes typical data behavior



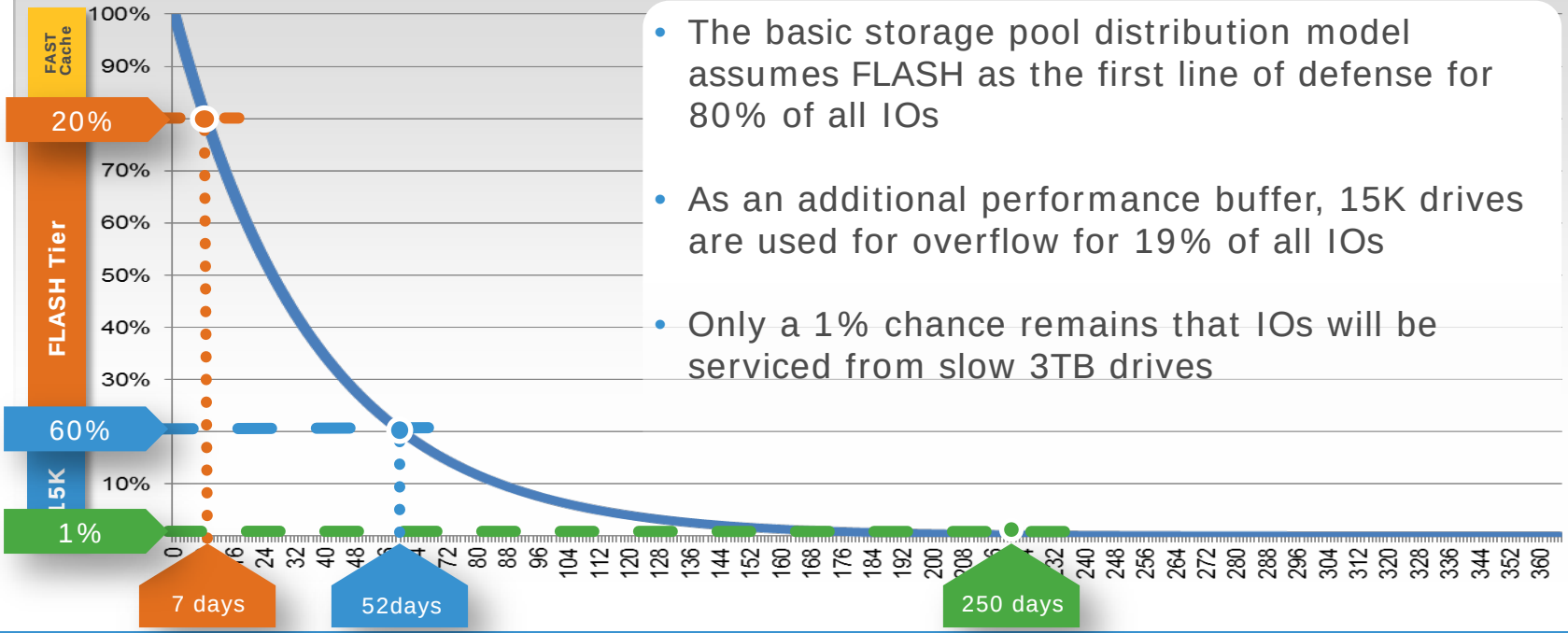
$P = (1-C)^{A,}$ and

$A = LOG_{1-C}(P)$

Where:

P is Probability of data access
C is daily Cooling rate
A is data Age in days

Data Decay Model

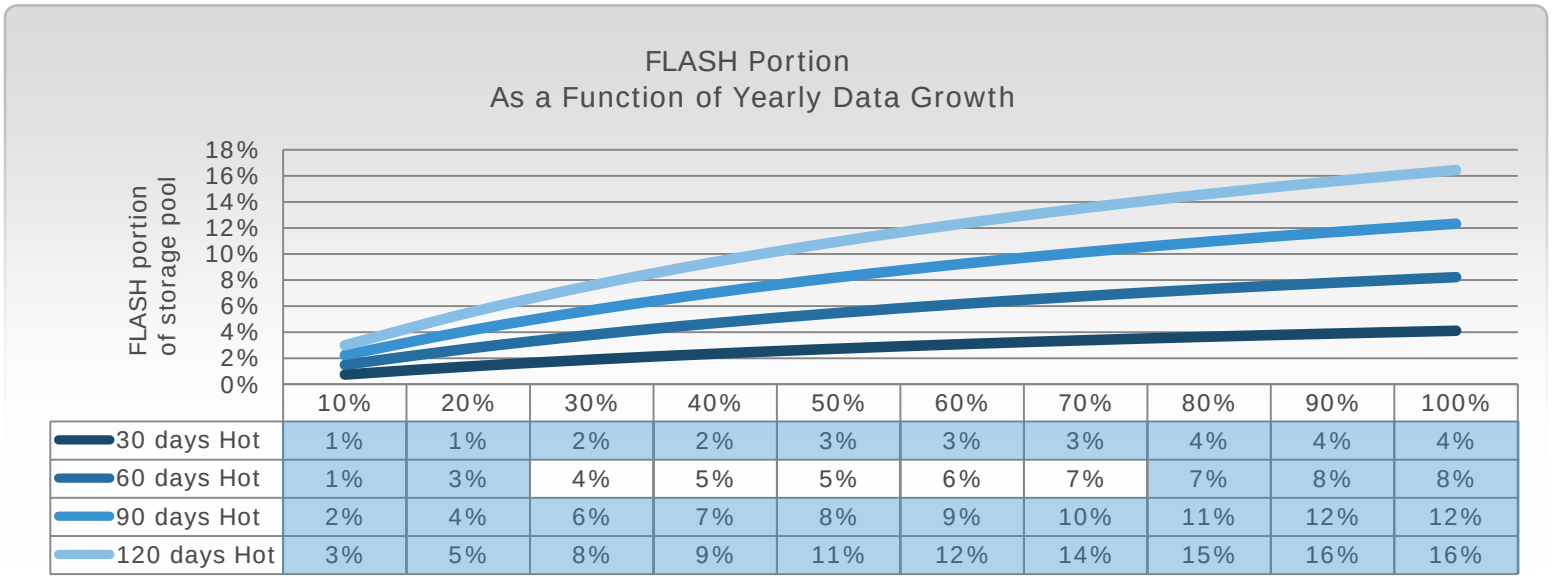


- The basic storage pool distribution model assumes FLASH as the first line of defense for 80% of all IOs
- As an additional performance buffer, 15K drives are used for overflow for 19% of all IOs
- Only a 1% chance remains that IOs will be serviced from slow 3TB drives

Calculating How Much FLASH

FLASH PORTION

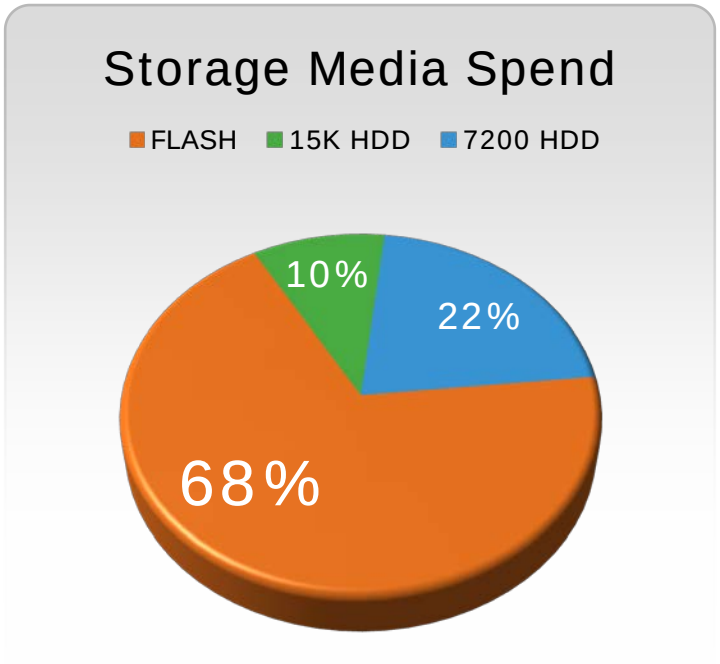
$$\text{FLASH \%} = \frac{\text{Yearly Growth Rate\% X Number of Hot Days X 100}}{\text{365 X (Yearly Growth Rate\% + 100\%)}}$$



	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
30 days Hot	1%	1%	2%	2%	3%	3%	3%	4%	4%	4%
60 days Hot	1%	3%	4%	5%	5%	6%	7%	7%	8%	8%
90 days Hot	2%	4%	6%	7%	8%	9%	10%	11%	12%	12%
120 days Hot	3%	5%	8%	9%	11%	12%	14%	15%	16%	16%

The FLASH 1st Storage Media Dollar

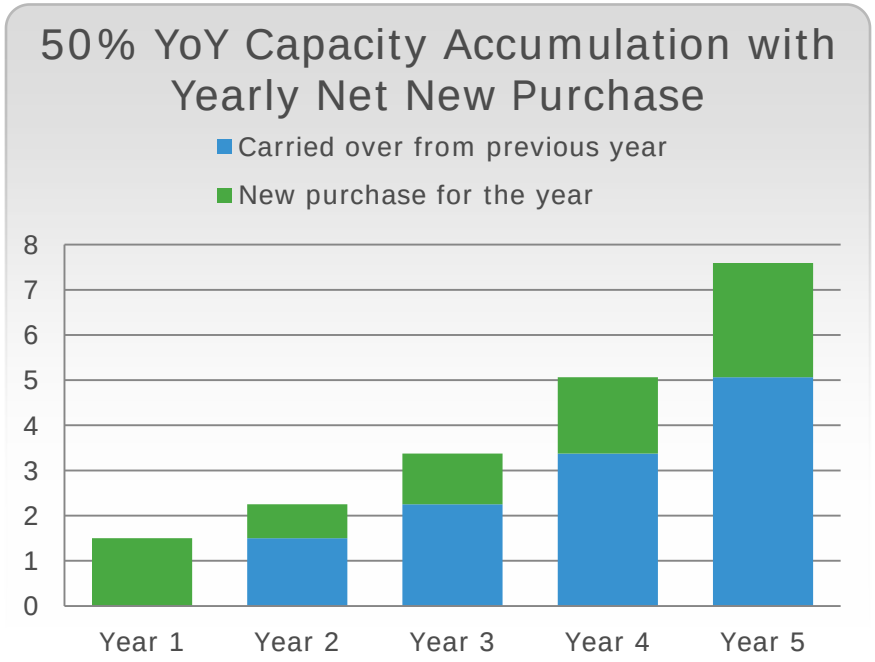
While a little FLASH Goes a Long Way, Media Cost is Mostly FLASH

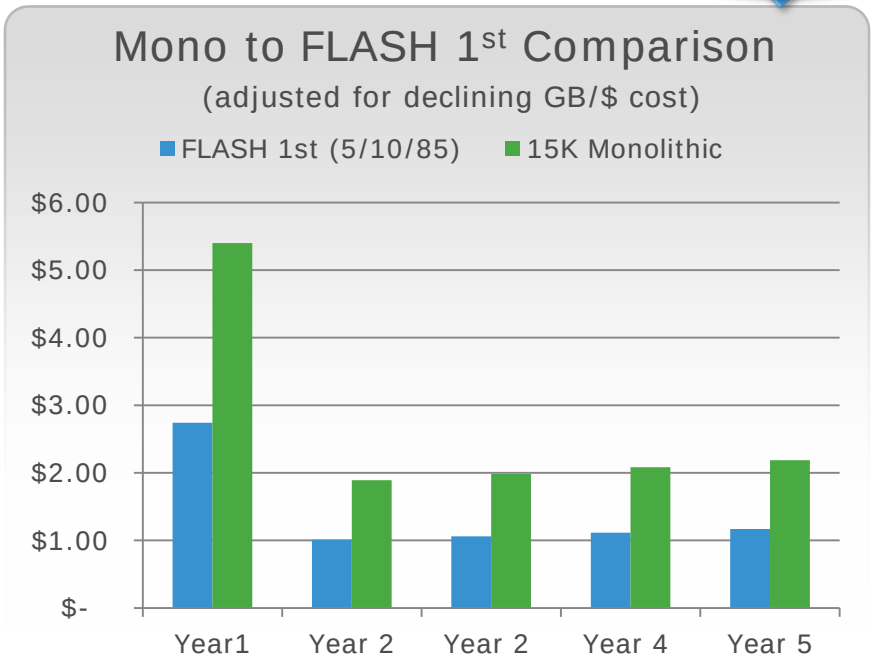


- Typical FLASH 1st Capacity Distribution:
  - 5% FLASH
  - 10% 15K HDD, and
  - 85% NL-HDD
- Typical FLASH 1st Media Cost Distribution:
  - 68% FLASH
  - 10% 15K HDD, and
  - 22% NL-HDD

The Cost Effectiveness of FLASH 1st

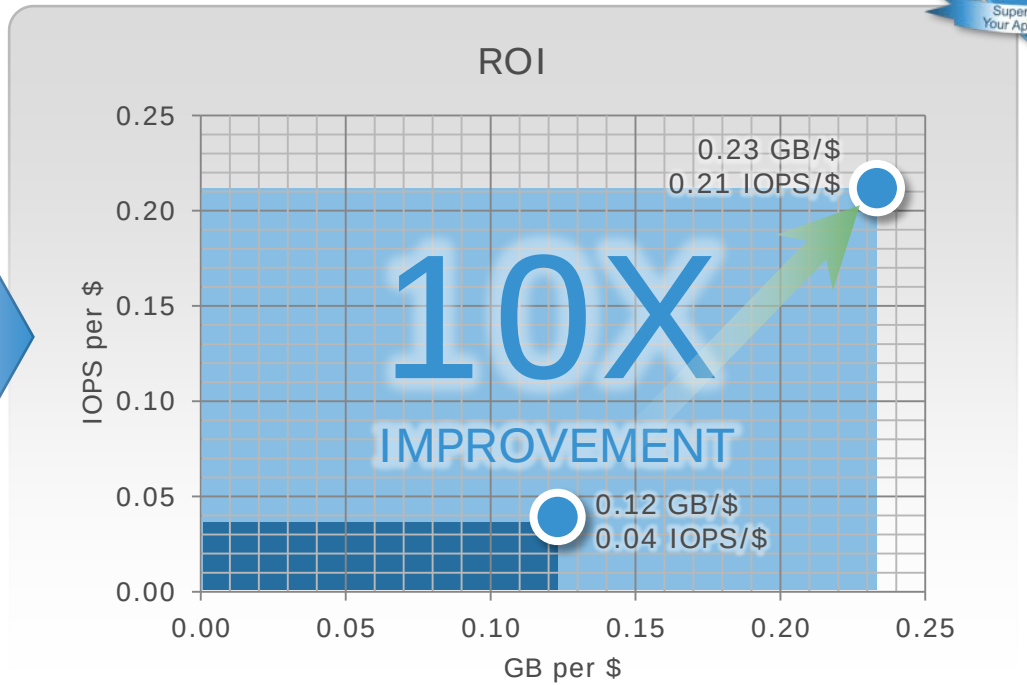
1GB growing at 50% YoY with 5% FLASH, 10% 15K and 85% NL



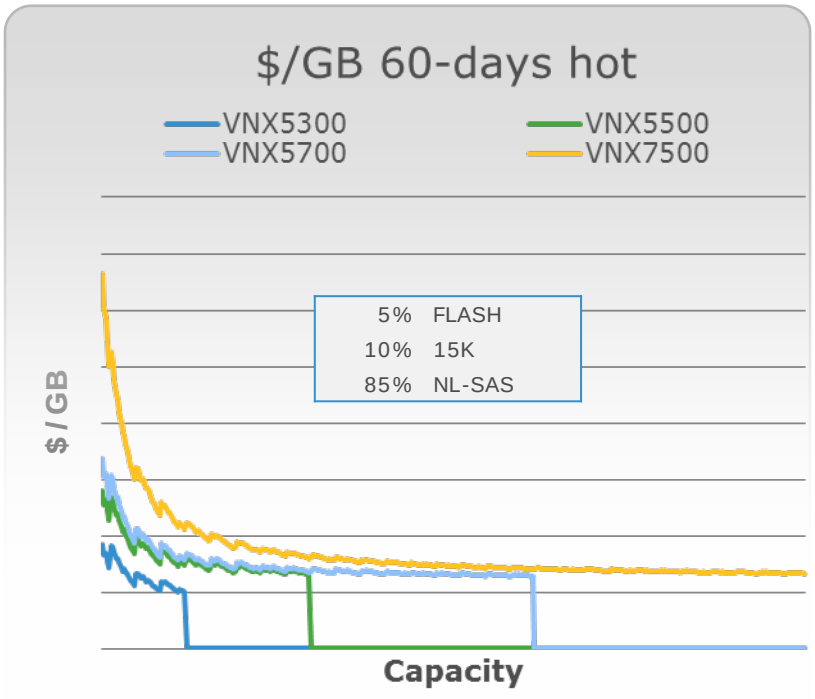


Inflection Point: ROI Transformation

5X More Transactions. 2X More Capacity. Same Budget.

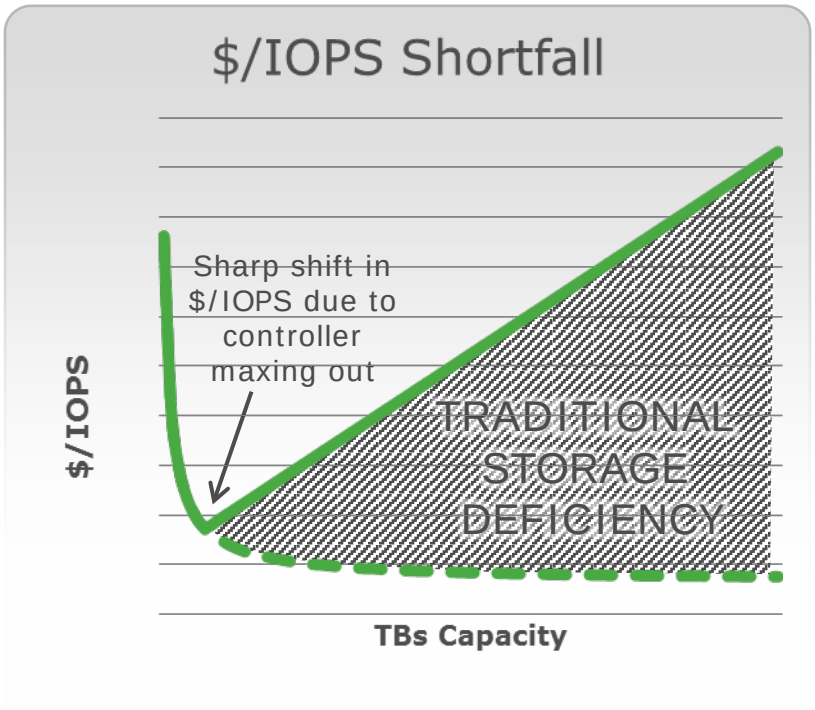


ROI Insights for Storage Design



- Scale-up architectures offer lower $/GB as increased disk-slot population amortizes larger capacities across a fixed set of controllers
- As systems scale, capacity cost asymptotically approximates blended pool cost

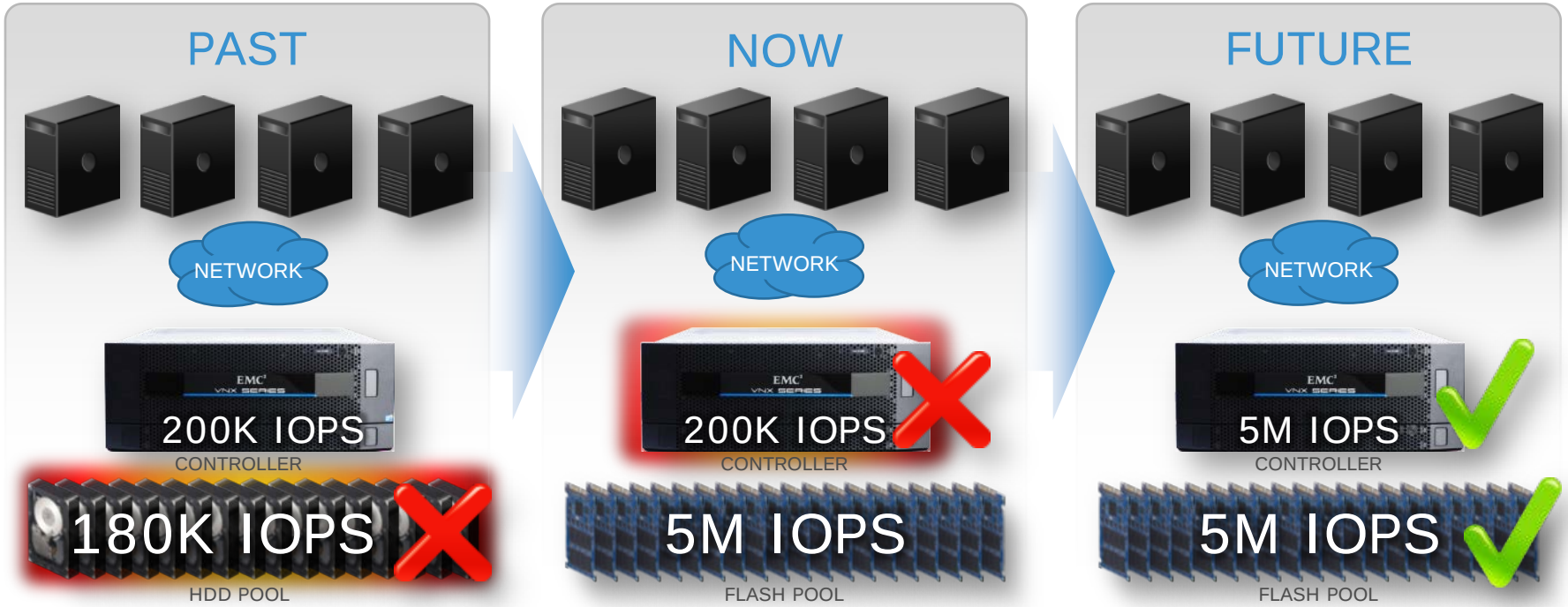
ROI Insights for Storage Design



- Hybrid FLASH-driven storage pools exerts increased pressure on the dual-controller scale-up architecture:
  - Blended pools at scale constitute more IOPS than older controller implementations can consume
- Dramatic increase in controller IOPS are therefore needed for scale-up architectures to remain cost effective

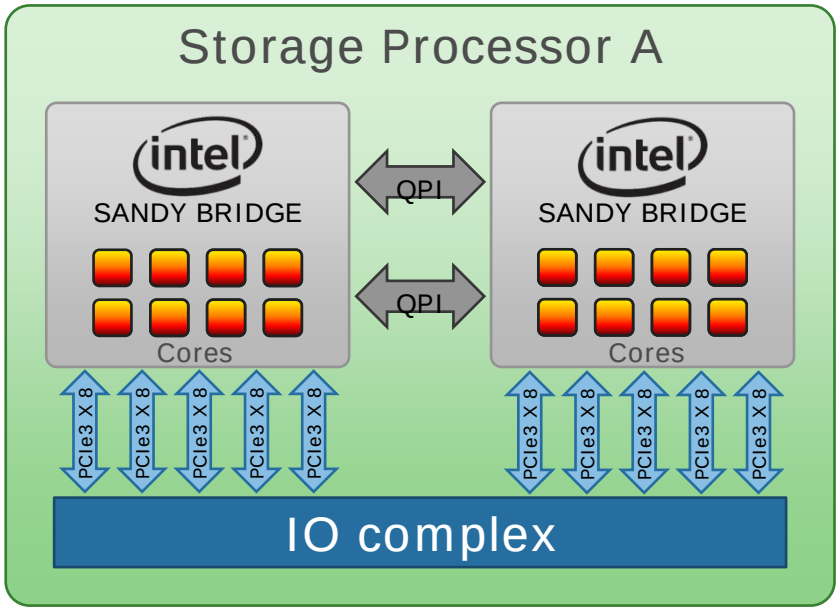
FLASH Implications on System Design

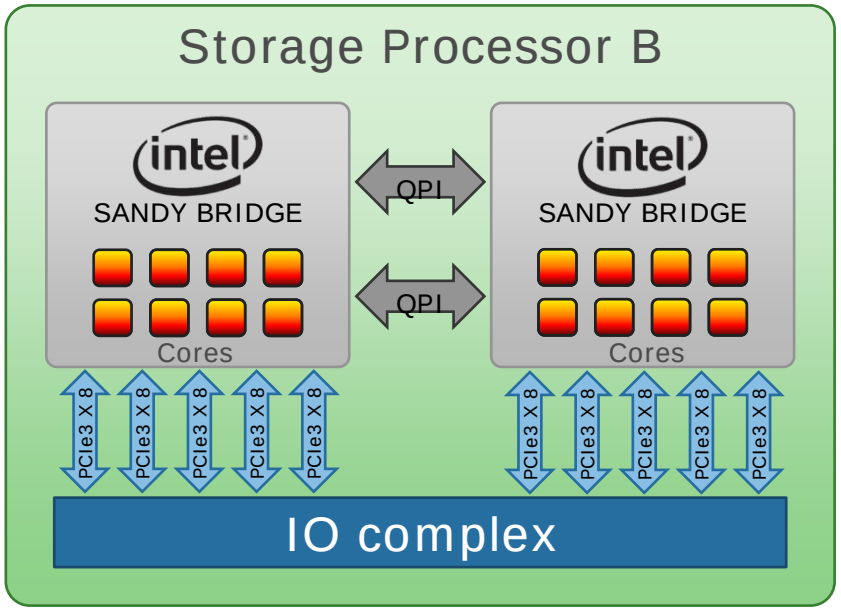
FLASH 1st is the Only Option



Moore's Law Transforms Storage

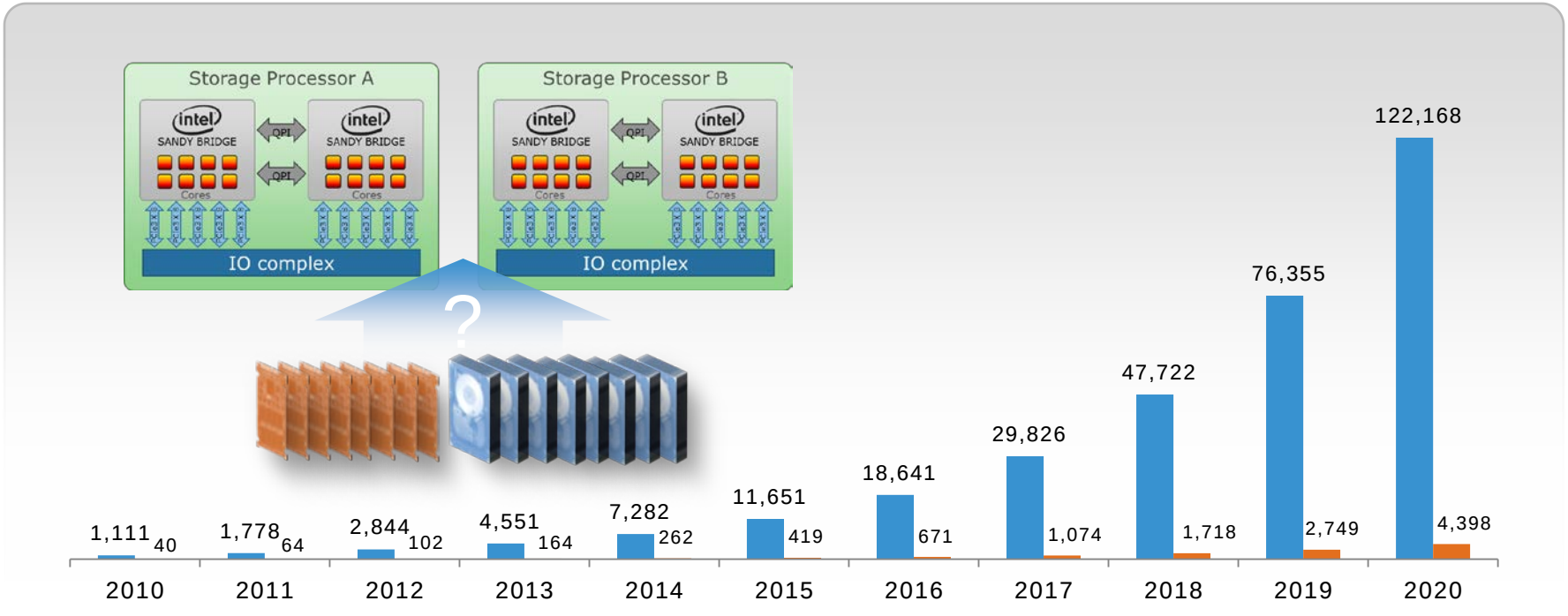
Feeding a Modern Storage System Requires FLASH 1st Design



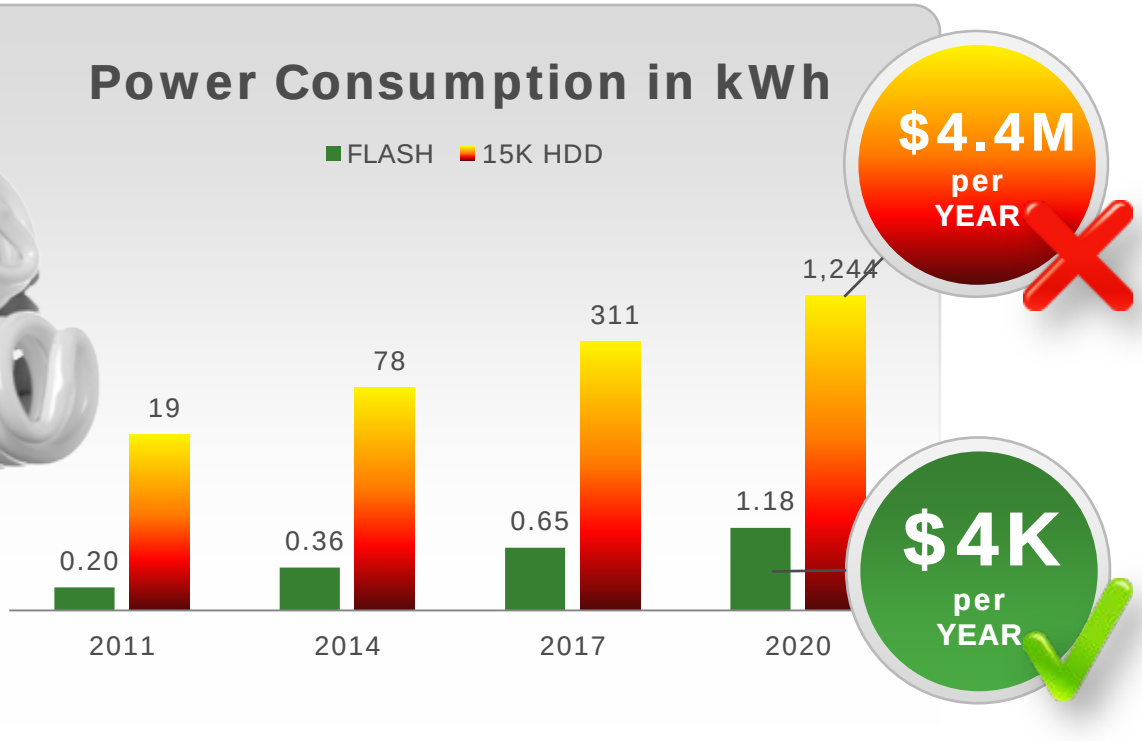


Moore's Law Transforms Storage

Feeding a Modern Storage System Requires FLASH 1st Design

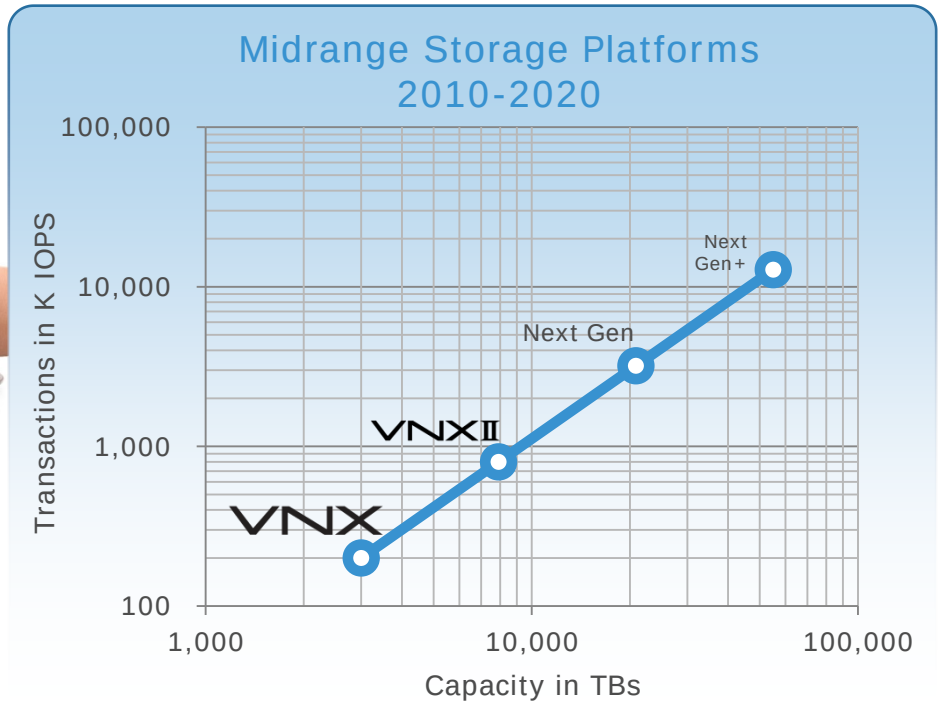


POWER!



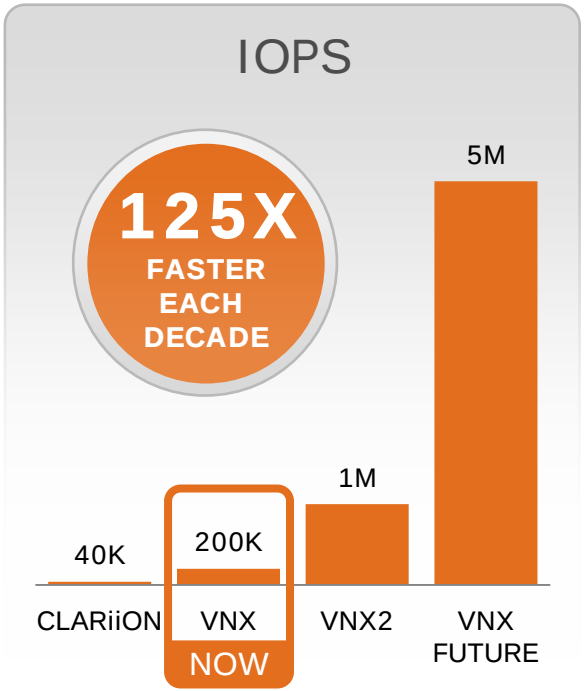
Transforming Experiences

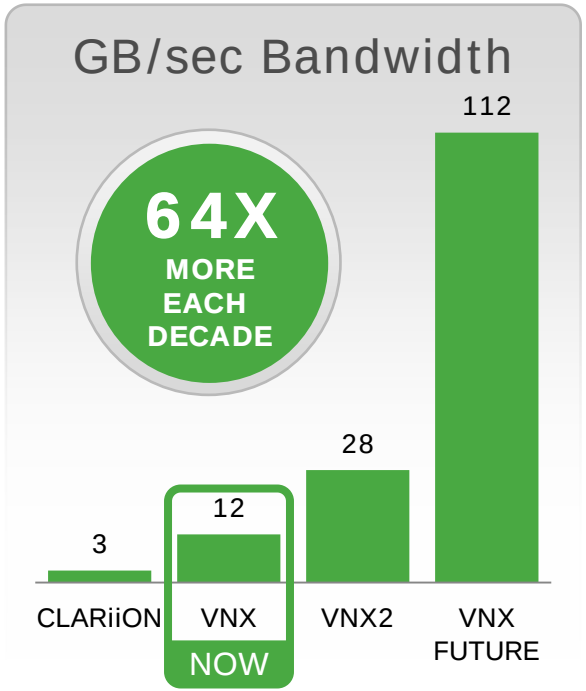
Richer Content and Deeper Analytics Drives Need for Speed

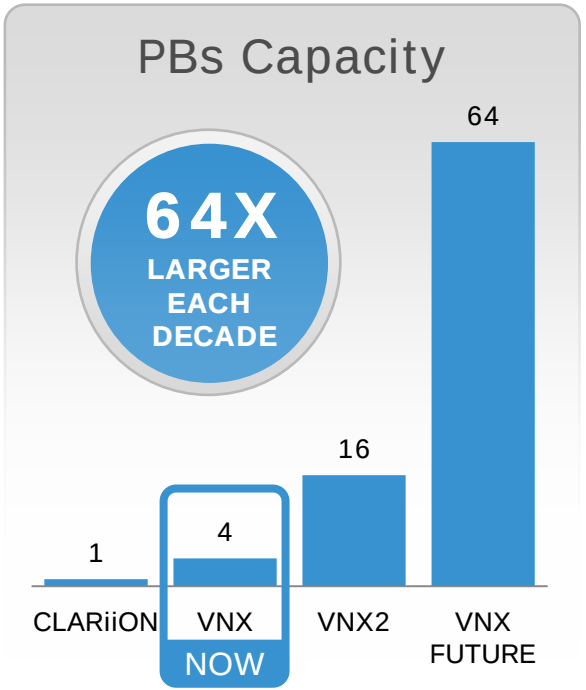


Transforming the Future

Exponentially Growing Design Centers for Midrange Storage








EMC²