Enterprise Flash Storage
Annual Update

Or how the data center is replacing spinning rust with solid state

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Your not so Humble Speaker

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- Use Chris Evans' flash shipped blog
- Trends:
    - Consolidation
- Density
    - Last year 1-1.6TB SSDs were leaders
    - Today –
        - SanDisk has 2TB SATA, 4TB SAS
        - Virident

3

Agenda

- Flash moves mainstream
    - All legacy vendors have viable AFA and Hybrids
    - Flash shipped last year
    - Changes in AFA positions 2012-2014
- Evolution in all flash arrays
    - Why deduplication makes sense
- Evolution on the server side
    - Read caching to pernix/Dell fluid cache
    - ServerSANs and their downsides
- Storage integration into infrastructure
    - REST interfaces
    - Coho, DataGravity
    - Application Integration
- Choosing the right solution
- Advances on the horizion

Flash has gone mainstream Hybrids and AFAs

- EMC XtremeIO
- NetApp EF550
  - Flashray someday
- HP 3Par 7450
- Dell Compellent AFA
- HDS
- IBM TMS + SVC

- Pure Storage
- Solidfire
- Cisco/Whiptail
- Nimbus
- Tegile
- Nimble Storage
- Fusion-IO IOControl

Flash has gone mainstream
(Volume)

Q1 - 2014
AFA Flash Shipped

30	
25	
20	
15	
10	
5	
0	

EMC   HDS   IBM   NetApp
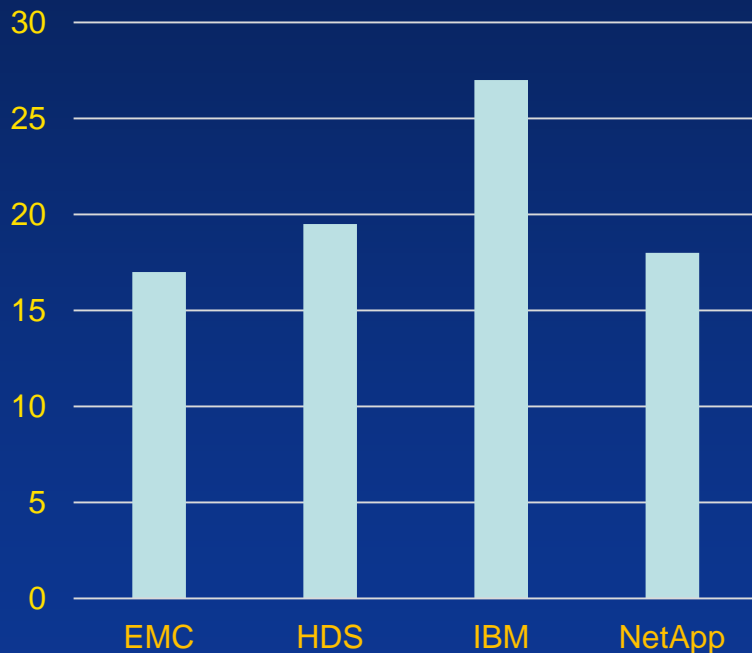
- ~400PB AFA ship 2014

- Enterprise SDD:
  - 2012 $3billion
  - 2013 $4.4billion

- ~80% of VNX/FAS ship w/flash

And the market matures

- Consolidation in components
  - HGST (Virident, Stec, Velobit)
  - Sandisk (Smart, FlashSoft, Fusion-IO)
  - Seagate (LSI)
- Flash systems vendors reach upstart status
  - Nimbus IPO
  - Pure raises $375 million

Evolution of Enterprise Flash

2010

- 100K+ IOPS
- Consistent sub-millsec latency
- Go fast for special cases

2012

- Still a point solution
- Becoming cost effective
- Limited data services
- Data reduction

2014

- Flash is mainstream
- Full data services & data reduction
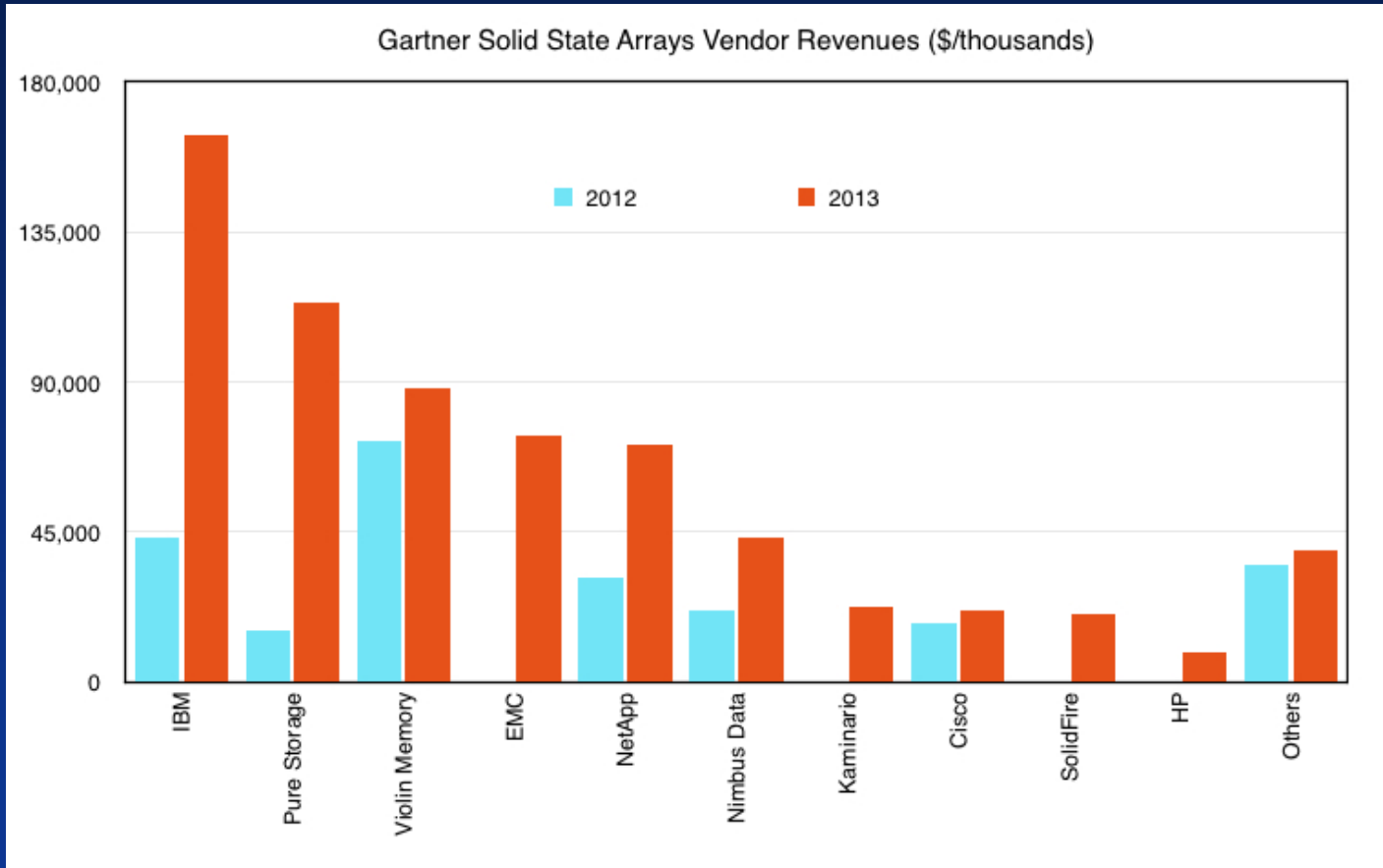- Cost effective for many applications

- All flash is inevitable
- Facebook…
- Murphy's law
- Growing our TAM

- Flash cheaper than disk, really?
- Kryder's law

Gartner Solid State Arrays Vendor Revenues ($/thousands)

AFA Evolution

- 2012
  - Market leader Violin
    - No real data services
    - Just fast, fast, fast
- 2014
  - Even mainline vendors adding data reduction
  - Data services now table stakes
- Dedupe increases CPU requirements
  - But has minimal impact on performance

Storage Network Caching

- Pitched as acceleration
  - 4 vendors for NAS
  - 3 for Fibre Channel
- Market said Feh!
- Evolved into WAN/Cloud
- Collaboration as well as acceleration

Workloads

Caching Appliance(s)

Storage

Server Side Flash - 2014
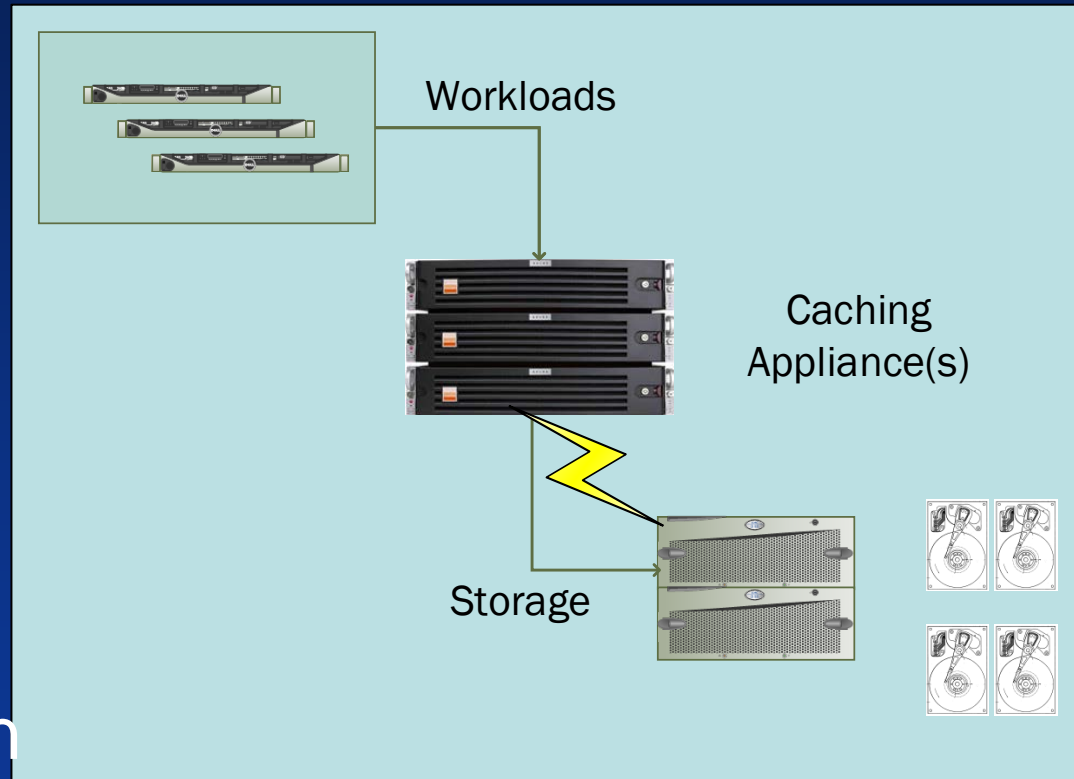
- Platforms add limited caching
  - VMware VFRC
  - Storage Spaces SSD tier & write back cache
- ISPs add:
  - Replication for DAS applications
 - Pooling for DAS and Cache
  - Write back caching

Distributed Cache

- Duplicate cached writes across n servers
- Eliminates imprisoned data
- Allows cache for servers w/o SSD
- RDMA based solutions
  - PernixData
  - Dell Fluid Cache

Cache Pool
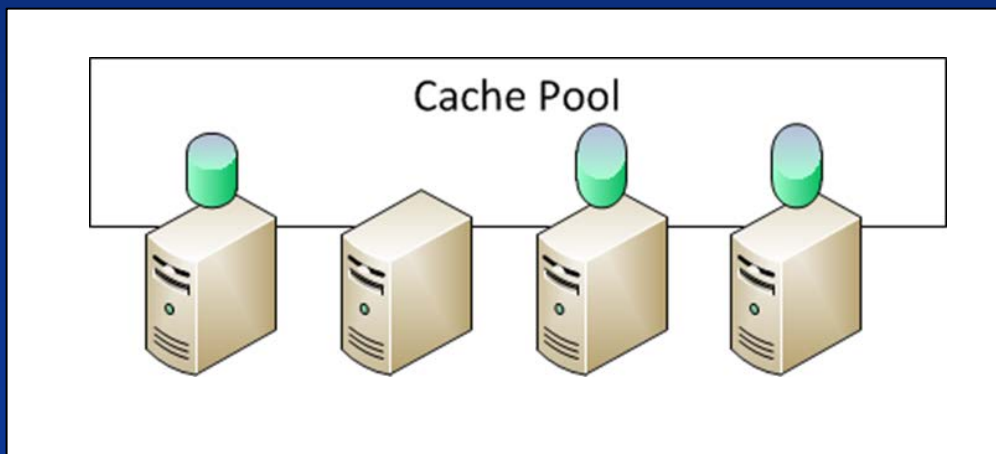
Virtual Storage Appliances

- Storage array software in a VM
- iSCSI or NFS back to host(s)
- Caching in software or RAID controller
- Players:
  - ~~VMware~~
  - StoreMagic
  - HP/Lefthand
  - Nexenta
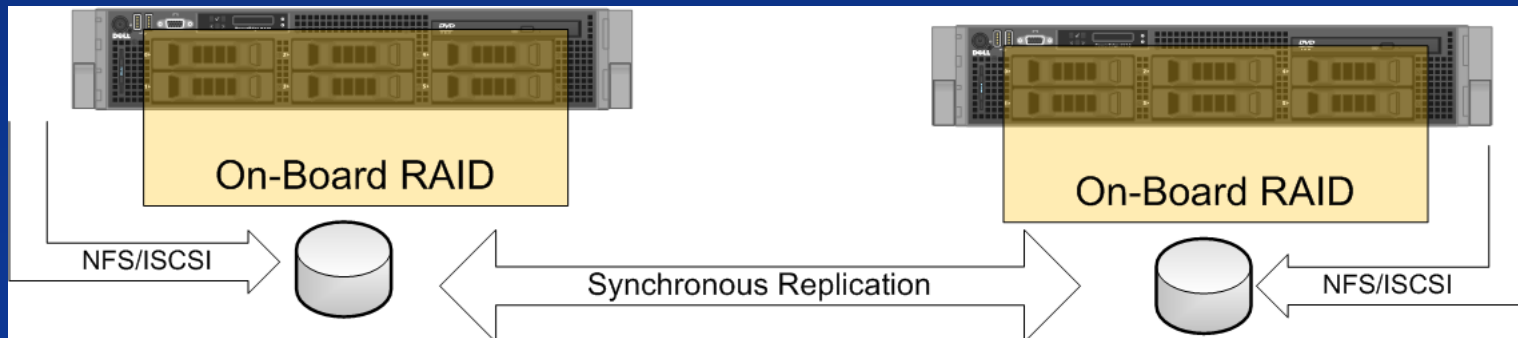
Hyperconvirged Infrastructure (ServerSAN)

- Use server CPU and drive slots for storage
- Software pools SSD & HDD across multiple servers
- Data protection via n-way replication
- Can be sold as hardware or software
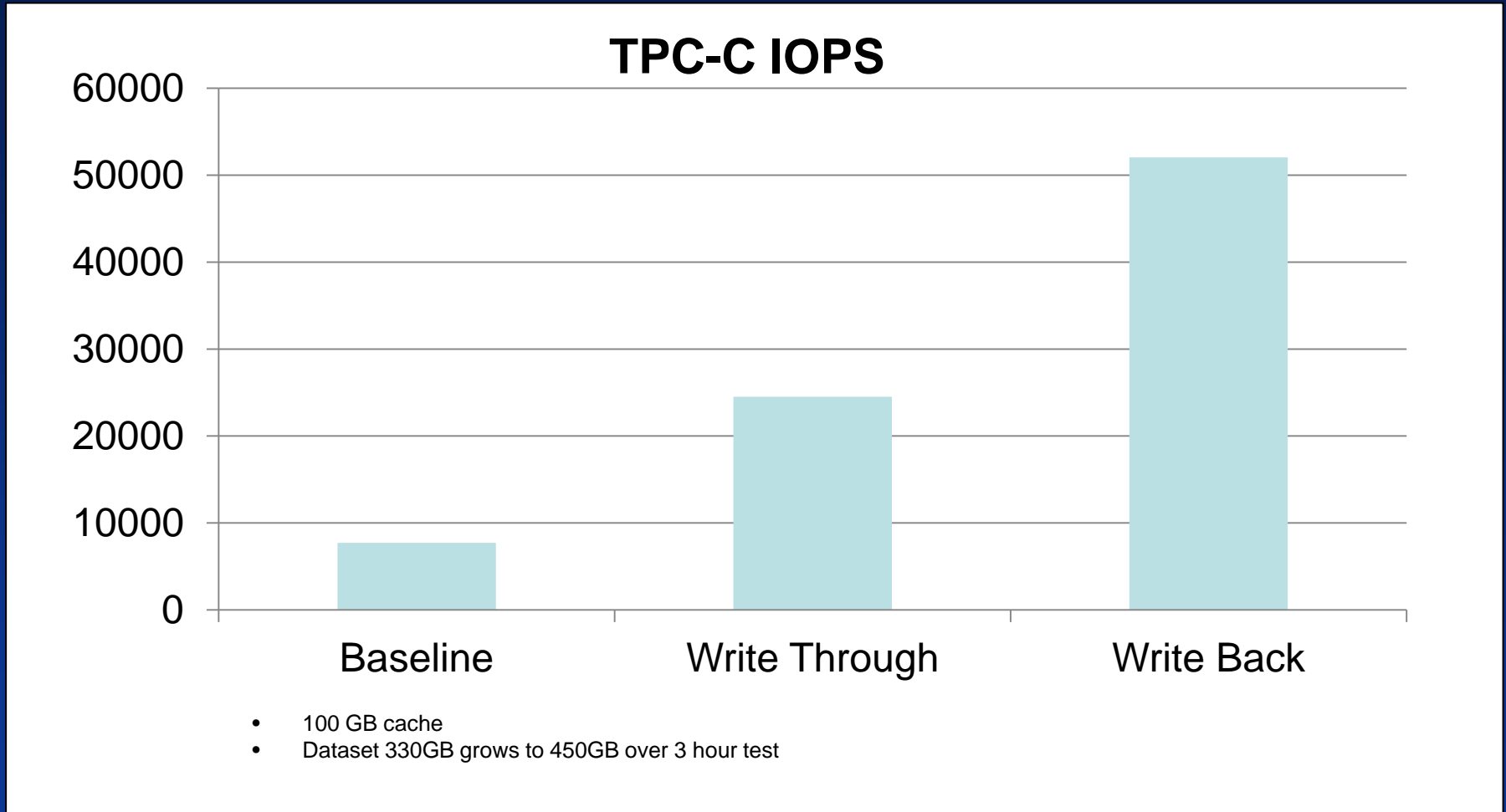 - Software defined/driven
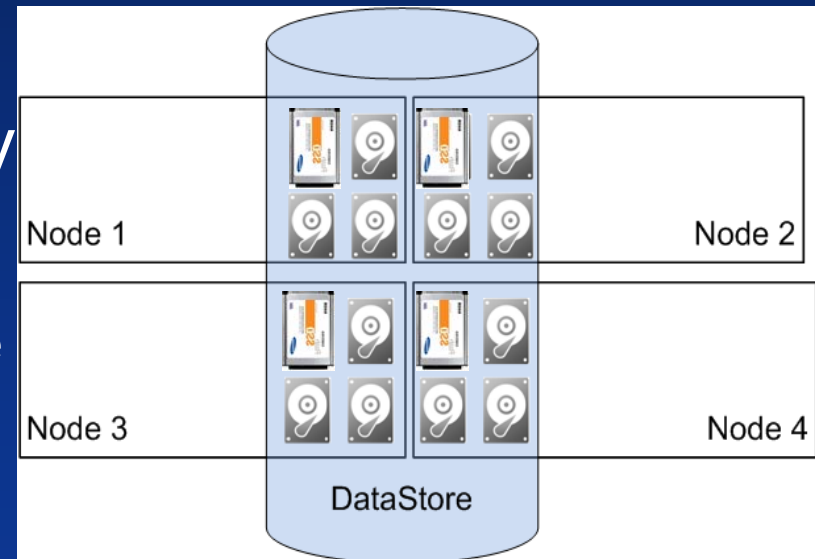
ServerSAN Products

- VMware's VSAN
  - Scales from 4-32 nodes
  - 1 SSD, 1 HDD required per node
- Maxta Storage Platform
  - Data optimization (compress, dedupe)
  - Metadata based snapshots
- EMC ScaleIO
  - Scales to 100s of nodes
  - Hypervisor agnostic
- Atlantis Computing ILIO USX
  - Uses RAM and/or Flash for acceleration
  - Works with shared or local storage

TPC-C IOPS

Bar chart showing TPC-C IOPS with three bars:
- Baseline: ~7,500
- Write Through: ~24,500
- Write Back: ~52,000

Y-axis: 0 to 60000 in increments of 10000

- 100 GB cache
- Dataset 330GB grows to 450GB over 3 hour test

Enterprise SSD Evolution

- Density - Today's largest devices
  - SAS - 4TB
  - SATA – 2TB
  - PCIe – 4.6TB
  - PCIe vendors discontinuing 200-600GB models
- Interfaces
  - Dell previewed PCIe in 2.5"
  - NVMe reaching market
  - SCSI Express in next gen servers

- AFA
  - Scale to 100TB
  - Snapshots, replication, dedupe and compression
  - Hypervisor/OS integration
- Server side
  - NVMe/SCSI Express in next generation of servers
  - ServerSAN state of the art will advance fast
- Hybrid systems flash % to grow