



SSDs and Scaleout Storage

Andy Mills, CEO/Co-Founder Enmotus, Inc.

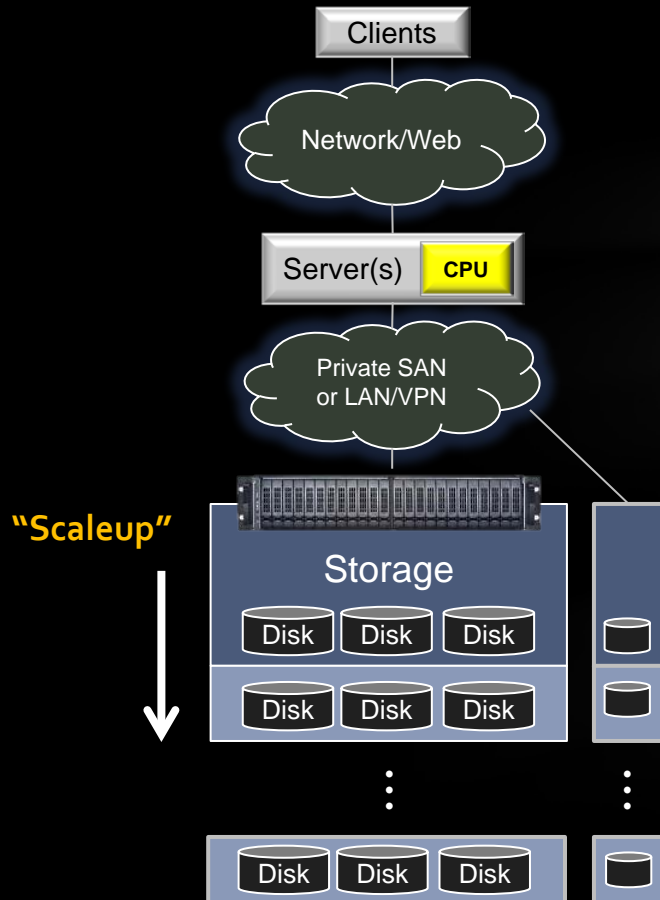
Tiering at the speed of your data™

Topics

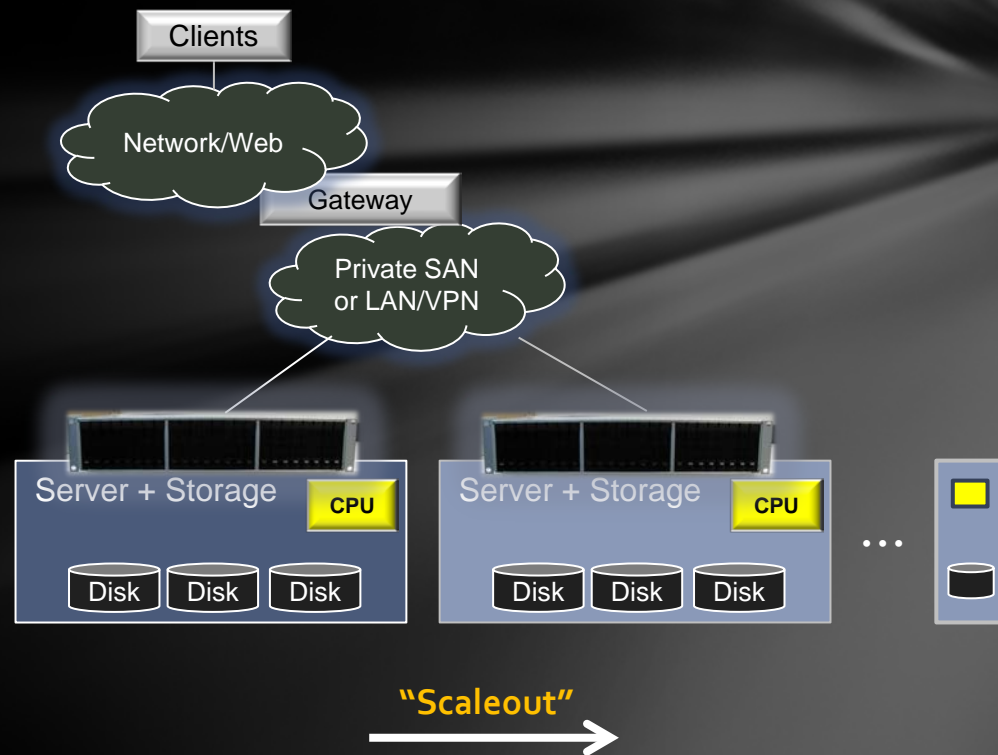
- Scaleout vs. Scaleup Storage
- Demands of Utility/Cloud Services
- SSDs and Scaleout
- Micro-virtualization approach to scaleout

Scaleout vs Scaleup

Typical Enterprise Environment



Distributed, Clustered or Hybrid Environment

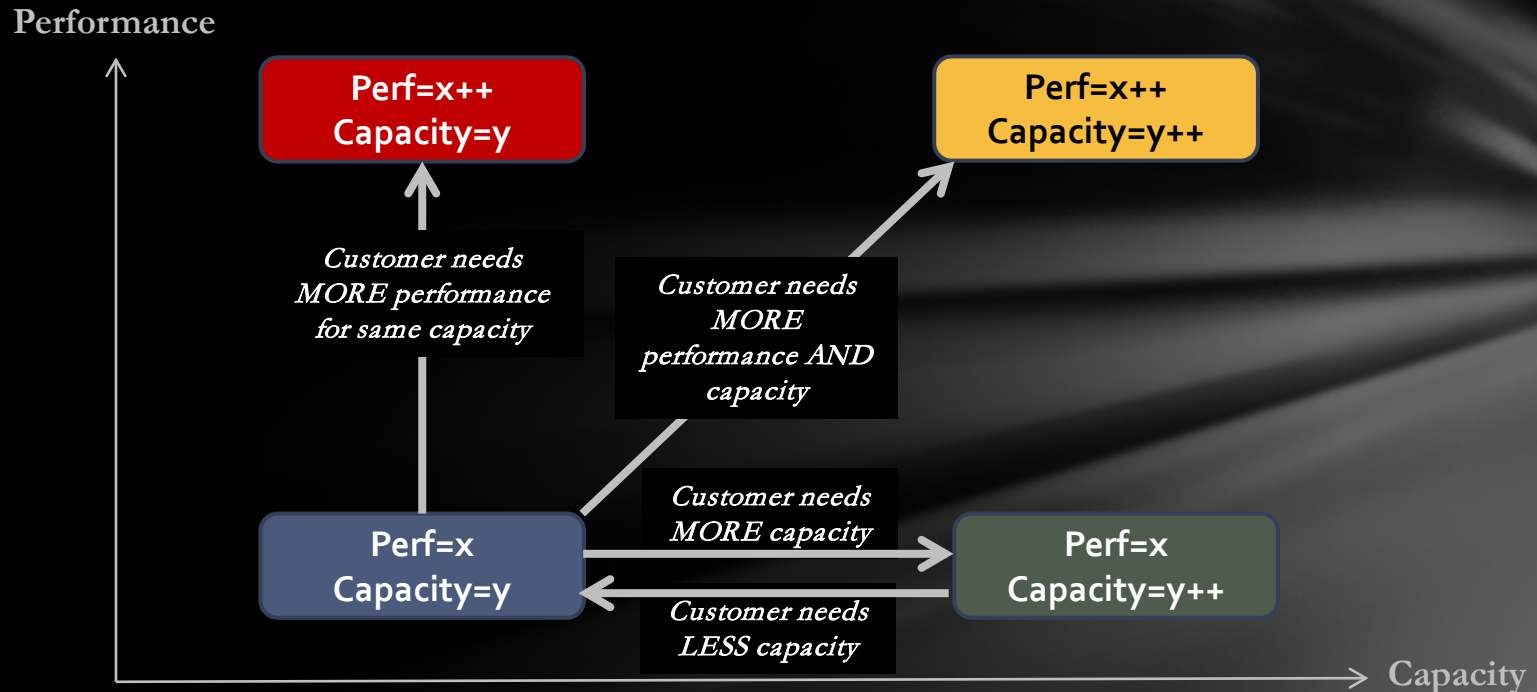


Scaleout Economic Factors

- Commodity X86 Storage-server Hardware
 - Whitebox vendors experiencing rapid growth in web scale
 - Standard Intel class storage-servers performance easily handles most storage tasks
 - Provide easy to replicate common, standard building blocks
- Social Media Storage Systems Influencing Next Gen Enterprise
 - Use common, cheap server-storage components and use data replication across compute-storage nodes instead of expensive HA/RAID systems
 - Significant contributor to the long term displacement of SAN in emerging enterprise “big data” apps such as business analytics

Essentially ... add more compute, capacity and performance easily, non-disruptively and using common building blocks

Utility Data Center On Demand Needs



	Bronze	Silver	Gold	Platinum
Application	Basic	Enterprise Equivalent	Critical Market or Business Sector	Military or Safety Critical
Capacity Scaleout	Business Day	4 hours	Near time	Real time
Performance Scaleout	Business Day	4 hours	Near time	Real time

Source: Open Data Center Alliance Master Usage Model: Scale-Out Storage Rev. 1.0

SSDs and Scaleout

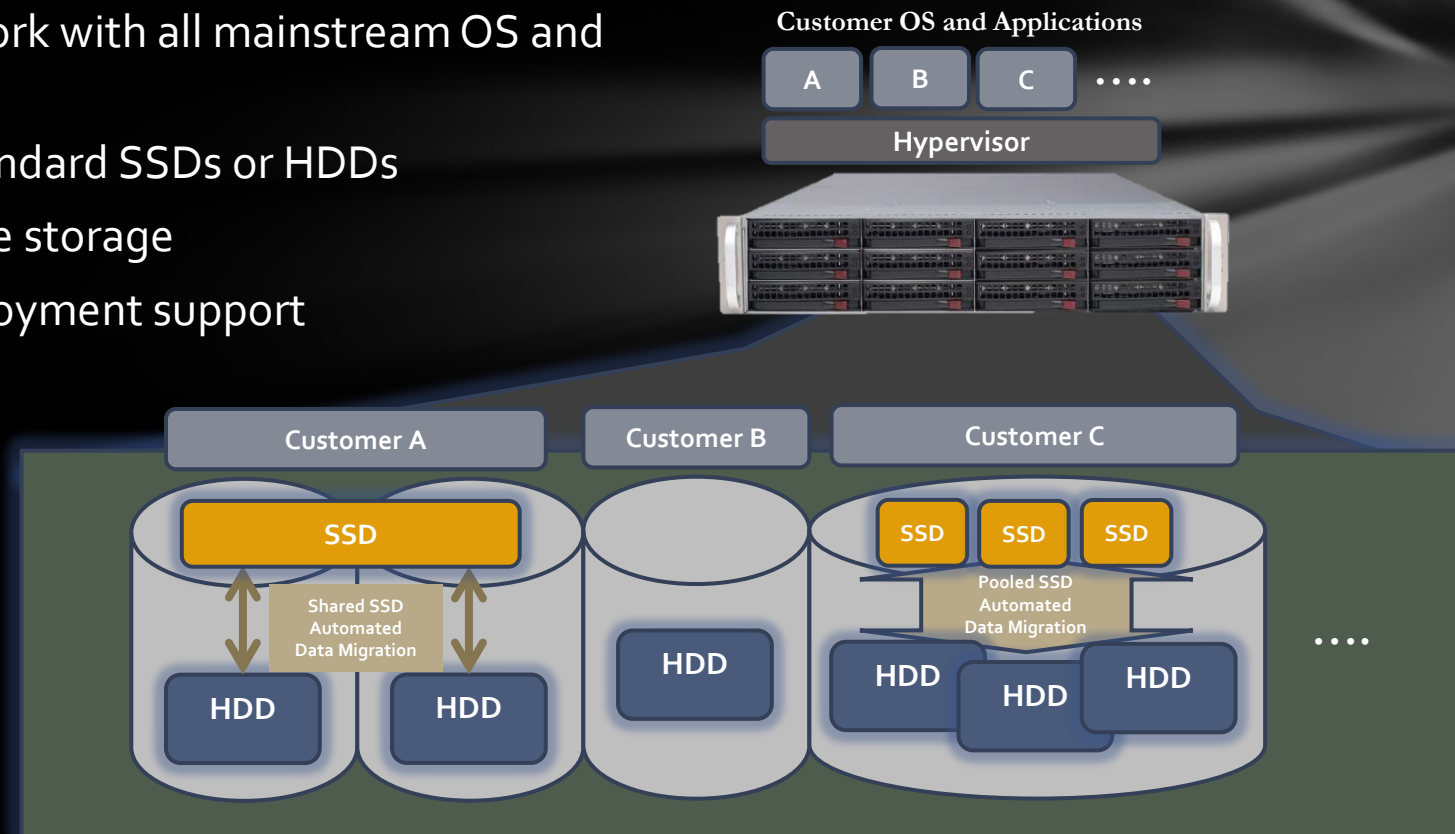
- Where SSDs Are Doing Well
 - High numbers of transactions per second e.g. database, time critical transactions
 - Web or big data with HUGE numbers of customers/users hitting the same area
- Expense Justification
 - Operational efficiency improvements (i.e. can handle more transactions or customers)
 - “Racks of storage” elimination (e.g. 1 PCIe SSD can replace several hundreds of HDDs)
 - Wattage/operating cost improvements
- In Cloud, Usable SSD Performance Is Capped By The Network
 - 1G Ethernet IOPs performance varies depending on HW and cache implementations from few K IOPs to few 10s of K at best - still much better than a HDD
 - 10G is capable of achieving 1 millions IOPS with the right hardware
 - Lower cost SATA/SAS SSDs work well here with good HDD hybridization to create meaningful capacities with SSD like performance

Challenges in Cloud/Utility

- General Issues
 - SSDs to-date have required specialized hardware
 - SSDs remain too expensive to deploy across the board
 - No uniform way to share expensive SSD resources
- The Opportunity
 - Enterprise SSDs are becoming more budget friendly
 - Hybrid SSD-HDD approaches help bridge a serious cost per GB gap
- Most Appropriate Strategy For General SSD Deployment
 - Use a mix of SATA/SAS SSDs per server (e.g. 15-20% SSD, rest HDD)
 - Use a hybrid technology with automated provisioning and data migration features that is common across all OSes for the base configuration nodes
 - Use a PCIe SSD/12G SAS SSD hybrid approach for a smaller number of higher service, higher revenue level nodes

Node Storage Requirements

- Work seamlessly with high level provisioning tools
- Autonomously and automatically load balance SSDs
- OS agnostic - work with all mainstream OS and hypervisors
- Use industry standard SSDs or HDDs
- Easily add/delete storage
- Bare metal deployment support



Enmotus Solutions

Basic e.g. Bronze



**FuzeDrive™
Cloud**

Micro Virtualization Software
for Linux and Windows Server

- 4 Virtual tiered volumes
- 48TB capacity limit

Basic entry level service class
service

Virtual Machine e.g. Silver



**FuzeDrive™
PCIe VSP**

Hardware PCIe Accelerated
Storage IO Processor

- 7 Virtual tiered volumes
- 256TB capacity limit
- 127 physical disk support

Easy to manage, OS agnostic

Sub-hypervisor virtualization
and MicroTiering™

Bare metal deployment option

Performance e.g. Gold+



**FuzeDrive™
Express**

High Performance Micro
Virtualization Software for Linux
and Windows Server

- 32 Virtual MicroTiered volumes
- 256TB capacity limit
- 127 physical disk support
- PCIe SSD support

High Performance PCIe SSD Hybrid
Storage Implementations

All Flash SSD-SSD Virtualization
and Tiering for Gold+ service