Flash Use Cases
Traditional Infrastructure vs Hyperscale

Steve Knipple, CTO / VP Engineering

Atmosera : Global Hybrid Managed Services Provider

Agenda

- Speaker Perspective
- The Infrastructure Market
- Traditional Infrastructure Architecture
- Hyper scale architecture
- Hyper converged architecture
- Not everyone's ready for hyperscale
- Flash Options for Service Providers
- Azure and AWS options
- Customer Examples
  - SaaS
  - Enterprise
- Final Thoughts
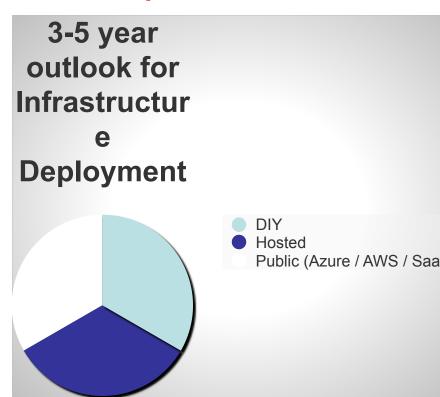
About the Speaker

- 20 years of global experience in IT (data centers, networking, client services)
- CTO / VP Engineering for Atmosera, Hybrid Managed Services Company
  - Based in Beaverton, OR since 1995
  - ISP -> Colocation -> Managed Services -> Private Cloud -> Azure & AWS (often called the "hyperscalers"
  - Now focused on hybrid infrastructure deployments and hybrid cloud
  - Client mix 50% SaaS / 50% Enterprise
- Nearly all clients onboard with an infrastructure "transformation" and then continue to upgrade as their needs change
- Over 60% of business today is private cloud
  - Deployed on "commoditized" components in a traditional HA design
- Nearly 25% of our production storage is flash
  - All flash arrays, PCI-E, local SSD's
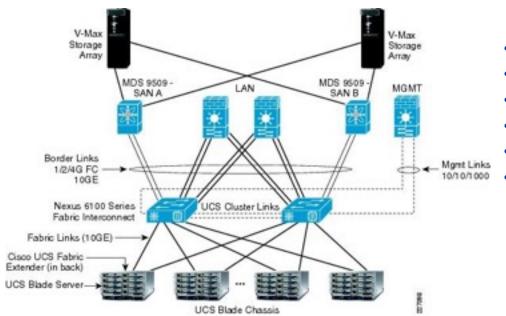 - Most recently SOFS (Scale Out File Server)

Hybrid Workload Concept

- 1/3 DIY, 1/3 Public (AWS, Azure, SaaS), 1/3 Hosted
  - Plan / Build / Run an infrastructure yourself
  - Operate an Infrastructure
  - Outsource an Infrastructure
- Fundamental business forces will balance deployment methods
  - Sunk cost (of client owned equipment and software)
  - Premium cost of utility model at scale
  - Security / compliance concerns
- "Operational Orchestration" integrates offerings

3-5 year outlook for Infrastructure Deployment

- DIY
- Hosted
- Public (Azure / AWS / Saa...
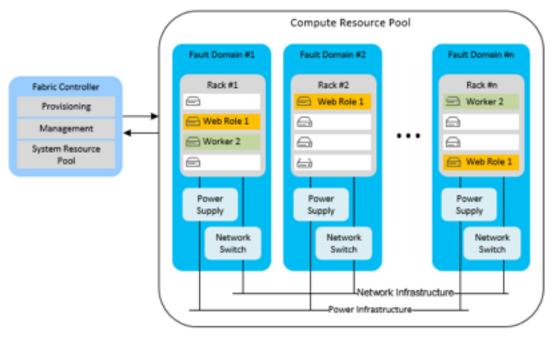
Traditional Enterprise Architecture

- Redundant Storage Controllers
- Disks in RAID groups
- Redundant switches, firewalls
- N+1 servers
- High cost, but highly available
- No single point of failure

Hyperscale Architecture

- Low cost non redundant commodity components
- Low Cost
- Compute + storage is a single point of failure
- Platform and Application Level redundancy
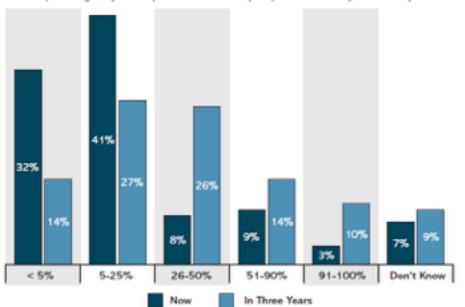
Hyper Converged

- Integrated compute, storage, networking, and virtualization in a single commodity hardware box supported by a single vendor
- Flash options are integrated… typically offer SSD or HDD as options, but limited to what the provider offers
- Good options for some workloads

Still very few applications are ready for the public cloud (i.e. ready for hyperscale)

FIGURE 7: WORKLOADS READY FOR PUBLIC CLOUD

What percentage of your compute workload is ready for public cloud today vs. in three years?

Range	Now	In Three Years
< 5%	32%	14%
5-25%	41%	27%
26-50%	8%	26%
51-90%	9%	14%
91-100%	3%	10%
Don't Know	7%	9%

Legend: ■ Now ■ In Three Years

Source: TheInfoPro, a service of 451 Research

Some are using the public cloud like traditional infrastructure… not always the best option

If you use the public cloud (the hyperscale clouds), you should use some or all the features
- On-demand self service
- Broad network access
- Resource pooling
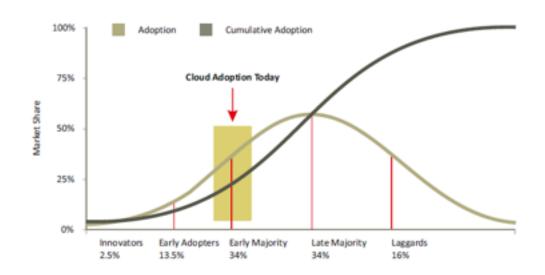- Rapid elasticity
- Measured service

Most need a mix today of hyperscale and traditional, public and private

Flash Memory
Summit 2015

8

We are just getting started

Exhibit 17   The State of Cloud Adoption Today

Source: HfS and Avendus Research

Flash Options (for Service Providers)

- Options have to be distilled into sellable units at a fixed GB/month with IOPs and latency considerations under SLA
- Difficult to price when cost is changing so fast, providers want contracts and customers want utility
- Customers want options, not lock-in

In Server Memory	All Flash Arrays	PCI-E	Enterprise SSD	Consumer SSD
$16k/TB	$9/TB	$5k/TB	$3k/TB	$300/TB
$0.88/GB/month	$0.50/GB/month	$0.28/GB/month	$0.17/GB/month	$0.02/GB/month

Azure

Azure Premium Storage Options

There are 3 types of Premium Storage disks to choose from: P10, P20, and P30. The type of disk is determined by its size. Each disk type is assigned a different number of IOPs and bandwidth:

Disk Type	Disk Size	Storage IOPS	Storage Bandwidth (MB/s)
P10	128 GB	500	100
P20	512 GB	2300	150
P30	1024 GB	5000	200

Optimized compute: 60% faster CPUs, more memory, and local SSD

D-series virtual machines feature solid state drives (SSDs) and 60% faster processors than the A-series and are also available for web or Azure Cloud Services. This series is ideal for applications that demand faster CPUs, better local disk performance, or higher memories.

We have a new variant of the D-series sizes called "DS" that are specifically targeted for Premium Storage. The pricing and billing meters for the DS sizes are the same as D-series.

Through September 30, 2015 we will charge for D-Series Virtual Machines at US South Central rates for all available regions. Prices listed below will be effective starting October 1, 2015.

INSTANCE	CORES	RAM	DISK SIZES	PRICE
D1	1	3.5 GB	50 GB	$0.171/hr (~$127/mo)
D2	2	7 GB	100 GB	$0.342/hr (~$254/mo)
D3	4	14 GB	200 GB	$0.684/hr (~$509/mo)

D and DS class machines
- $70 for 1vcpu/4GB RAM 50GB SSD
P class storage

AWS

Operating System

- ○ Linux
- ○ Red Hat Enterprise Linux
- ○ SUSE Linux Enterprise Server
- ● Windows
- ○ Windows and Web SQL Server
- ○ Windows and Std. SQL Server
- ☐ EBS-O

Select	Name	vCPU	Memory (GiB)	Instance Storage (GB)	I/O	EBS Opt.	On-Demand Hourly Cost	Reserved Effective Hourly Cost (Savings %) *
●	t1.micro	1	0.6	--	Very Low	--	$0.020	$0.010 (49%)
○	t2.micro	1	1.0	--	Low	--	$0.018	$0.009 (51%)
○	t2.small	1	2.0	--	Low	--	$0.036	$0.016 (54%)
○	t2.medium	2	4.0	--	Low	--	$0.072	$0.033 (55%)
○	t2.large	2	8.0	--	Low	--	$0.134	$0.065 (51%)
○	m4.large	2	8.0	--	Moderate	Yes	$0.252	$0.122 (52%)
○	m4.xlarge	4	16.0	--	High	Yes	$0.504	$0.245 (51%)
○	m4.2xlarge	8	32.0	--	High	Yes	$1.008	$0.490 (51%)
○	m4.4xlarge	16	64.0	--	High	Yes	$2.016	$0.979 (51%)
○	m4.10xlarge	40	160.0	--	Very High	Yes	$5.040	$2.447 (51%)
○	m3.medium	1	3.75	SSD 1 x 4	Moderate	--	$0.130	$0.064 (51%)
○	m3.large	2	7.5	SSD 1 x 32	Moderate	--	$0.259	$0.127 (51%)
○	m3.xlarge	4	15.0	SSD 2 x 40	High	Yes	$0.518	$0.255 (51%)
○	m3.2xlarge	8	30.0	SSD 2 x 80	High	Yes	$1.036	$0.511 (51%)
○	c4.large	2	3.7	--	Moderate	Yes	$0.193	$0.113 (42%)
○	c4.xlarge	4	7.5	--	Moderate	Yes	$0.386	$0.226 (41%)
○	c4.2xlarge	8	15.0	--	High	Yes	$0.773	$0.451 (42%)
○	c4.4xlarge	16	30.0	--	High	Yes	$1.546	$0.903 (42%)

Many options
- $50 for 1vcpu/4GB RAM 50GB SSD
- Lot of storage options

Storage: Amazon EBS Volumes:

	Description	Volumes	Volume Type	Storage	IOPS	Snapshot Storage	
⊖		1	Provisioned IOPS (SSD) ▼	0 GB	0	0 GB-month of Storage	▼
			The type of the volume.				

⊕ Add New Row

The Path to Flash (and hyperscale) National SaaS Provider

- 2010 – Traditional Architecture
  - Physical Servers, SAN (with SAS spindles), redundant load balanced web servers
  - Active Passive DBs
  - Very complex maintenance, single points of failure, applications not resilient
- 2012 – Virtualization of Infrastructure in a Fully dedicated private cloud
  - Consolidation and upgrades, Flash Hybrid Storage Array
  - Highly available infrastructure (improved uptime and reliability)
  - Advanced monitoring tools (especially around storage performance)
- 2014 – Flash costs go down and software improves (incredible performance increase)
  - DBs move to Active / Active
  - PCI-E flash introduced for the DB layer
  - In Server memory increased to 512GB/server
- 2016 and beyond
  - Removal of SAN, all data to PCI-E
  - More memory at the server level
  - Software based High Availability for remaining components
  - Disaster Recovery to public cloud

The Path to Flash (with traditional infrastructure) International Retailer

- 2010 – Traditional Architecture
  - Physical Servers, SAN (with SAS spindles),
  - Active Passive DBs
  - Older versions of Enterprise Applications
- 2012 – Upgrades / Standardization
  - Consolidation and application upgrades
  - Virtualization
  - Highly available infrastructure (improved uptime and reliability)
  - Advance storage performance monitoring tools
- 2014 – High business growth
  - Introduction of All Flash Array for to ERP system… improved batch jobs performance by over 50% and reduced backup windows by 90%
- 2015 and beyond
  - Simplifying applications, removing customizations
  - Removal of remaining SAS based arrays in favor of All Flash arrays
  - Introduction of PCI-E flash for applications that have redundancy

Final thoughts

- Flash will excel in all architectures and will flourish in all formats, but the mix will change as prices continue to drop and capacities go up.
- Hyperscale will win the day, but it will take a long time for applications to adapt and everything to move
  - Legacy applications will need to live somewhere (i.e. traditional infrastructure).
  - Think of the x86 migration… x86 is the clear winner, but there is a long tail of legacy
- Watch the hyperscalers (AWS and Azure)… they will drive economies of scale and economies of innovation that will drive the industry
- Watch the managed services space (Private Cloud Providers). They will fill the gaps that the large hyper scalers have during the transition and will provide the balance to the public cloud