



Flash Memory Summit

Leveraging the Latest Flash in the Data Center

Trends and recent enterprise end user examples

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Flash Memory Summit

Agenda

- Speaker Perspective
- State of Flash in the Data Center
- Data Center Trends
 - Cloud Shift
- End user requirements (and concerns)
- Recent end user examples
 - A hospital
 - A medical insurance company
 - Government
 - A dental practice management company
 - Trends
- What's next



Speaker Perspective

- Management and technology consultant
- Focus on Enterprise companies performing IT infrastructure risk assessments, data center and cloud strategic planning, and implementation advocacy
 - Engagement typically starts with root cause analysis of a service outage, low service uptime history, or lack of disaster recovery
 - Typically non software companies that rely on heavily on their digital strategy
- Experience across numerous verticals (healthcare, manufacturing, insurance, government)
- Previously CTO of a cloud computing company, early adopter (2012) of flash in the data center.
 - It took just 5 years for flash to move from a niche solution to mainstream implementations



State of Flash in the Data Center

- Widely available and deployed
- Hybrid and all flash SAN's generally replacing all traditional spinning disk arrays for production loads
- Implementation generally go smoothly, especially for all flash arrays
- High level of performance (high IOPs and low latency) is now expected
- NVMe adoption is starting (local disk and in SANs)
- As costs continue to decline, flash beginning to enter lower tier and even backup workloads
- Focus moving toward traditional storage management (workload management and distribution). Large performance range to work with.

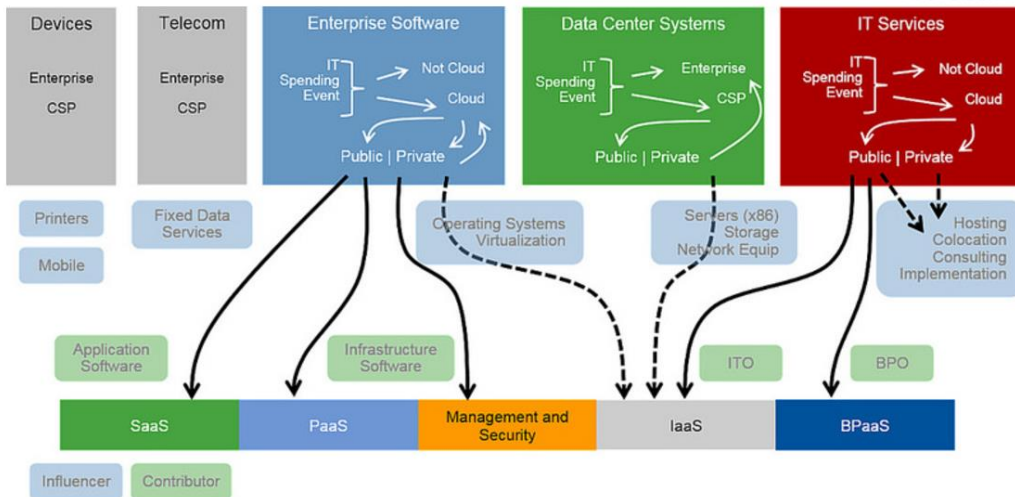
However...

- Largest impact to end users (by far) is the wide availability of the public cloud (IaaS / PaaS) and SaaS



“Cloud Shift”

- According to Gartner research, by 2020 “Cloud Shift” will affect more than \$1 Trillion in IT Spending making cloud computing one of the most disruptive forces in IT since the early days of the digital age.



IDC: IT Spending To Hit \$2.7 Trillion By 2020

Companies that invest in third platform services such as cloud, mobility, and big data as part of their digital transformation efforts will drive IT spending growth, according to IDC.

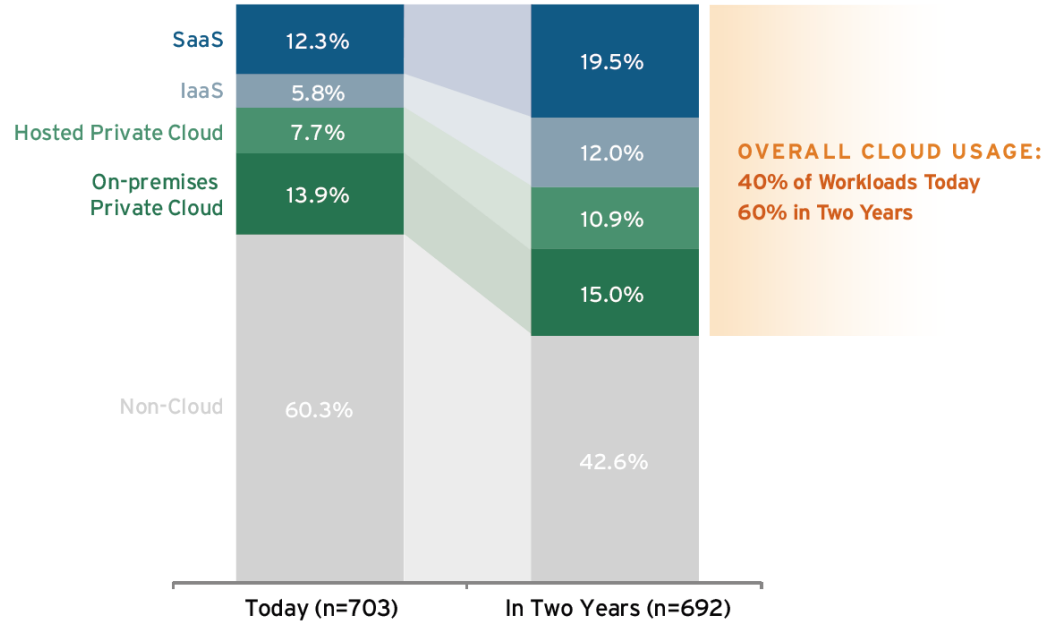
Source: Gartner (July 2016)



“Cloud Shift”

- Workloads are moving fast
- Shift is accelerating as technologies mature

Figure 1: Percentage of Workloads Running in the Cloud



Source: 451 Research 2017



“Cloud Shift”

- The leaders are way out in front
- The industry will continue to consolidate



Gartner's Magic Quadrant for Cloud Infrastructure as a Service, Worldwide June 2017.



Strategic reasons for cloud shift

Economies of Innovation

- Always available latest cutting edge capabilities
- Increasing capabilities available only in the cloud

Utility based consumption

- Financial flexibility becoming a requirement
- Where IT is seen as a differentiator, long term forecasting is difficult

Low barriers of entry

- Entry points very low cost (sometimes free)
- Available everywhere anytime



Effects of “Cloud Shift” in the Data Center

Application offloading

- When mature, software as a service (SaaS) leads the day
- Mail, CRM, content management, etc

New development against platform services

- Platform as a Service standardizes middle tier
- Database, business intelligence, machine learning, IoT (internet of things)

Legacy and latency sensitive workloads isolated on premise or in colocation

- Older enterprise application not “born in the cloud” can’t easily be forklifted or migrated
- Older operating systems not available in the cloud
- Applications that need low latency network in addition to storage

The reality for the next 5 years (at least) is hybrid infrastructure, and flash will be in all the deployment modes. However...

- SaaS and PaaS will be evaluated on capability and performance with flash supplier hidden
- Customer owned and operated infrastructures will become more selective and sophisticated in flash purchases
- New applications that require local storage will generate new growth (cars will become mobile data centers)



Some end user examples

- All come from different verticals but the challenges and opportunities are similar
- They all currently have a hybrid infrastructure in place
- All are seeking to offload commodity applications to the cloud
- Some are buying new functionality only available in the cloud
- They all use flash (3 of 4 exclusively) for their critical workload



End user flash requirements (and concerns)

- Predictable, consistent performance
- Reliability
- Deployment flexibility (distributed vs concentrated workload)
- Hybrid cloud interoperability (integration of private and public cloud deployments)
- Wide range of performance characteristics (requiring QoS or smaller independent implementations) to guarantee performance during peak needs and avoid underutilization during off times



End user example #1 - Large hospital

Where is flash used?

- For critical workloads (transactional and reporting).
- Boot disk (for hypervisors mainly)
- Implementation is SAN based within a converged infrastructure (First in 2016, expansion in 2017)

How was solution selected?

- Compatibility with primary EMR (electronic medical records) system
- Compatibility with existing converged infrastructure solution
- All the solutions investigated has performance that well exceeded requirements

Results?

- Extremely smooth experience, performance and stability exceeded expectations

Next steps?

- Moving less critical loads to flash
- Using flash within the public cloud (IaaS for disaster recovery and SaaS for commodity applications)



End user example #2 - Government

Where is flash used?

- Within purchased SaaS application for election reporting system (hosted at a public cloud provider)
- System disk for web front end
- Backend DB storage (for analytics)

How was solution selected?

- Selected based on capability of the application

Results?

- Performance initially ignored
- Before implementation, performance metrics created leading to flash utilization

Next steps?

- Monitor performance with system growth, pay closer attention to service levels



End user example #3 - Insurance Company

Where is flash used?

- Enterprise wide for all workloads
- Primarily in hybrid arrays (flash fronted spinning disks), multiple arrays

How was solution selected?

- Initial selection based on price and customer service

Results?

- Performance initially exceeded expectations, leading to poor storage management
- Mixing workloads (high I/O and low I/O) without QoS features created inconsistent performance
- Perceived excess overhead or capacity and performance lead to unnecessary and over aggressive data protection strategy
- Overtime, storage based features (snap shots and replication) affected performance and capacity

Next steps?

- Implementation of basic storage management
- Reallocation of workloads based on individual workload requirements
- Integration with cloud IaaS/SaaS deployments



End user example #4 - Medical Practice Management

Where is flash used?

- Initially flash fronted hybrid array with critical workload pinned to flash only
- Today, all flash array, iSCSI connected over 10G ethernet

How was solution selected?

- Recent purchase, structured selection process based on price and customer services

Results?

- Seamless implementation into existing x86 compute environment
- Initial implementation exceeds expectations, high performance with cost reduction

Next steps?

- Offload commodity apps to SaaS offering (mail, collaboration)
- Utilize extra storage capacity on critical analytics SaaS offering



What's next?

- Storage QoS
 - Traditional storage management returns
- Real time and historical storage performance data is a differentiator
- Latest generation NVMe focused on
 - Extremely performance sensitive workloads
 - Advanced analytics and business intelligence, AI and machine learning
- Hybrid cloud is the min 5 year reality for many Enterprises
 - Flash technology is “hidden” to end user (just unit based performance)
- Cloud computing will drive innovation in the data center and set standards and performance / cost expectations.



Flash Memory Summit

Other presentations...

- 203-C Wednesday 3:20-4:25pm
 - Building your Flash castle in the cloud
- 302-C Thursday 10:30am
 - Enterprise application storage panel