A SOLIDFIRE BENCHMARK REPORT

2017 Service Provider Flash-Based Storage Services

Research on how service providers are using flash storage to create innovative, next generation storage services

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The shift is real and ever changing — the IT industry is continuing to expand its capabilities with the seemingly perpetual growth of the cloud. The cloud is impacting the distribution of IT spending, the diversity of storage architectures, and how storage environments are deployed. With all this change, the development of new IT strategies is now more necessary than ever (IDC - Dec 2015). Never before have the areas of availability, performance, security, time-to-value, and simplicity been so crucial for the development and success of one of the IT industry's major growth engines: the cloud service provider.

Forward-thinking service providers are now placing a greater emphasis on innovation — investing in automated, software-defined next generation data centers that are cost-effective, efficient, and able to provide improved service delivery to their customers. They are using these new infrastructures to combat the perpetual increase in running costs of their data centers — minimizing the power, real estate, and labor needs that their businesses require.

In 2015, SolidFire released the first service provider benchmark report that identified several industry trends that operators could use for future planning. This report builds and develops on the trends unveiled in 2015 and gives cloud/managed hosting providers insights into the current state of the market, including which capabilities the next generation data center needs to provide in such a competitive market.

This 2017 Benchmark report covers updates on:

- The impact of solid-state arrays (SSAs) in the service provider market
- Orchestration platform usage
- Workload mix and preferences
- Cloud and hosting service differentiation
- Greatest perceived storage platform risks

As the market continues to shift toward third-platform/mode 2 technology, the aim of this document is threefold: 1. To help service providers stay abreast of new developments in the market, 2. To enable them to lead the implementation of next generation services, and 3. To create successful business growth.

Key takeaways:

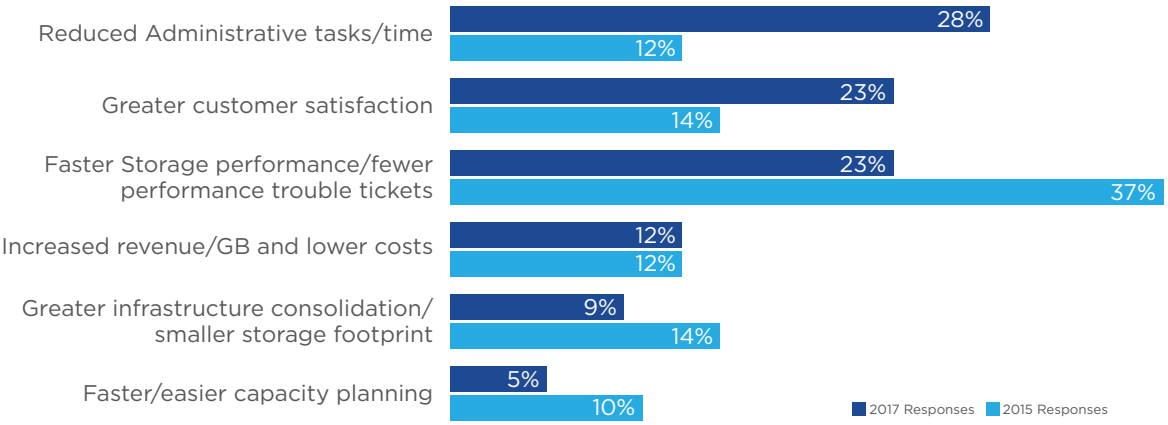
- Flash is delivering greater end customer satisfaction
- Integrated flash-based storage systems are reducing complexity in service provider environments
- OpenStack deployments in service provider environments have increased significantly
- More performance-centric workloads are being pushed into the cloud due to flash storage
- Due to rapid market changes, service providers are still concerned with aligning inbound revenue with outbound expenses in a timely manner

This report summarizes the responses of existing SolidFire customers to six key questions that identify how the market is developing in 2017. These questions and the market insights from industry experts are summarized in the following document.

Insight #1:

Reduction in administration tasks and improved customer satisfaction are the greatest business impacts of solid-state array adoption.

What is the greatest impact that solid-state array storage has had on your business?



2017 Source TVID: 55E-A06-146, 2015 Source: TVID: 79B-710-D2F

The impact of flash arrays is continuing to shift: This year reduced administrative tasks and time have a bigger impact on the overall service provider business (28%), compared to 2015's survey, suggesting SSA's greatest business impact coming from faster storage performance and fewer trouble tickets (dropping to 23% this year from 37%). Customer satisfaction is also impacting the service provider business — climbing to 23% from 14% in 2015.

As reducing admin tasks becomes more top of mind among service providers, storage automation provides opportunity to streamline tasks. If a task is repeated more than five times a month, it should be automated.

SolidFire's ability to auto-balance both data and performance once new resources are added to or removed from a cluster frees up significant time that would originally be allocated to manually balancing workloads and storage requirements. Automating, in turn, reduces the risk of human error and enables time savings — both of which are pertinent as the market develops and moves toward standardizing on a next generation data center infrastructure.

"Our single biggest challenge used to be storage, but with SolidFire's automation, this has now reduced significantly..."

Eric Neumann, Chief Technology Officer, AOD Cloud

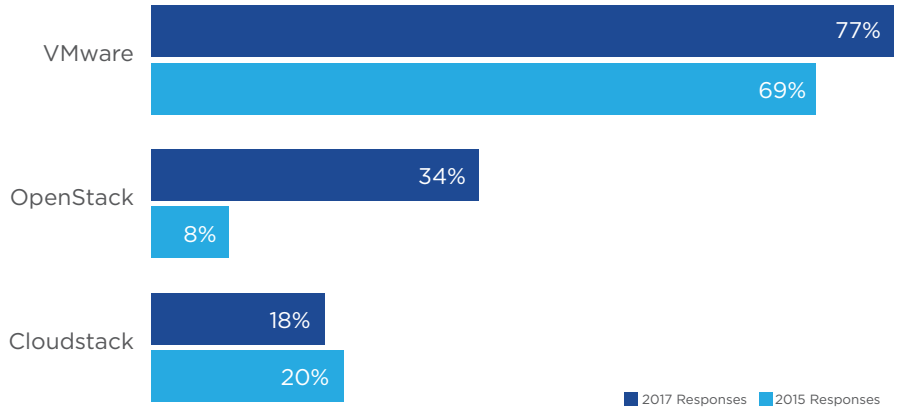
The shift from last year's greatest business impact of performance issues toward today's costs savings for the business may be attributed to education in the market, as storage technology continues to inform on software-defined performance controls. The shift among SolidFire customers is due to the built-in capabilities of SolidFire's Quality of Service (QoS) — which allows complete performance control over any and all of the applications or volumes running on a cluster. This eliminates issues associated with "noisy neighbors," with the ability to granularly change IOPS associated with the volume or individual application in a matter of seconds. Performance issues are now resolved in minutes instead of hours.

QoS will continue to build a market expectation for consistent and normalized storage performance. While many storage vendors quote implementations of QoS, care should be taken to investigate whether the techniques employed actually control performance versus merely attempt to manage it through rate-limiting methods. Given the increased emphasis on customer satisfaction to reduce customer churn in the service provider's business, the importance of selecting a robust form of QoS that guarantees performance is critical. This theme is repeated in many areas throughout the subsequent findings of this report.

Insight #2:

Service providers are still predominantly based on VMware as an orchestration platform, but there is significant growth in OpenStack usage.

What orchestration platform are you currently using?



2017 Source TVID: DA0-1F7-4C1; (2015 TVID: 5C6-7D9-C7B)

While the most used orchestration suite among service providers continues to be VMware (with an increase to 77% from 69% in 2015), there has been a significant increase in the adoption of OpenStack. Compared with only 8% usage across the respondents in 2015, this year's benchmark shows OpenStack usage up to 34%. CloudStack usage has dropped slightly over 2015, from 20% to 18%.

Interestingly, in 2015, service providers were more consistently using a single vendor. The 2017 results show multiple tools are being used in the same business. While OpenStack adoption is growing significantly, it is being implemented by service providers in addition to their VMware instance, instead of replacing it.

To unify the first two insights, deep vendor integration will reduce admin tasks while supporting usage of multiple orchestration tools. The implementation and usage of storage within these orchestration suites needs to be simple and fast to deploy. While many storage vendors are able to integrate into VMware's vCenter plug-in and OpenStack's Cinder driver, the level of API complexity required to do this can vary significantly across offerings. For example, provisioning a new volume in OpenStack (including QoS settings) on a SolidFire architecture uses only a 12-line API call. Alternate storage options require over 200 lines to perform the same task. The depth of a storage vendor's API integration can be of great importance to the service provider.

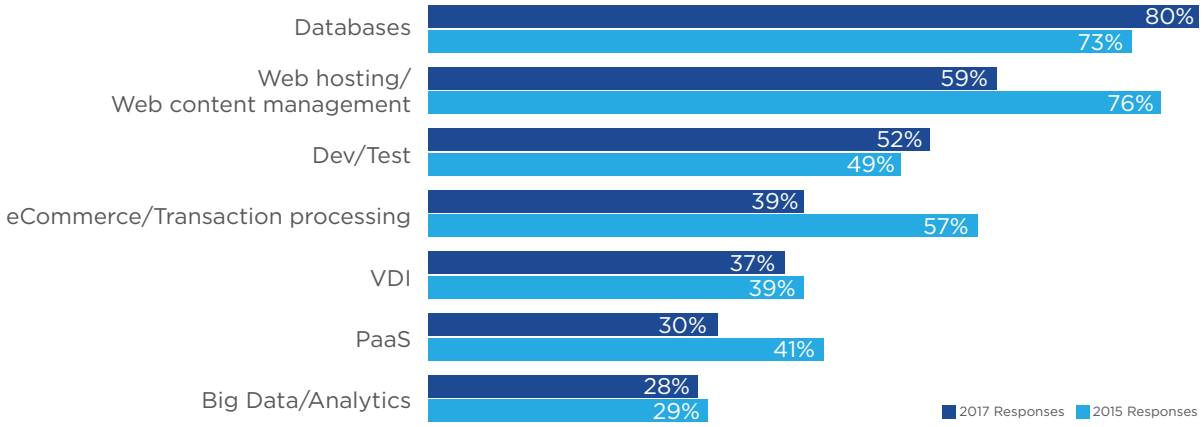
"[SolidFire] integrates well with our OpenStack implementation and does exactly what we need it to do."

Xander Niega, Senior DevOps/Systems Engineer at Demand Media
TVID: 3E4-251-618

Insight #3:

In a diverse application landscape, cloud and hosting providers continue to cater to databases and web hosting workloads.

What workloads or applications are you specifically catering to on your cloud and/or hosting platforms?



2017 Source TVID: 26B-8FC-EB7; (2015 TVID: DFE-FDD-FD5)

Of the surveyed respondents, workloads and applications have seen a significant shift toward database and dev/test environments with all others remaining flat or reducing significantly. Web hosting remains one of the top two applications but has dropped significantly since 2015 (to 59% from 76% of catered workloads). With the biggest percentage change, decreasing from 57% to 39%, e-commerce workloads shouldn't be ignored either. PaaS is also down to 30% (compared to 41% in 2015).

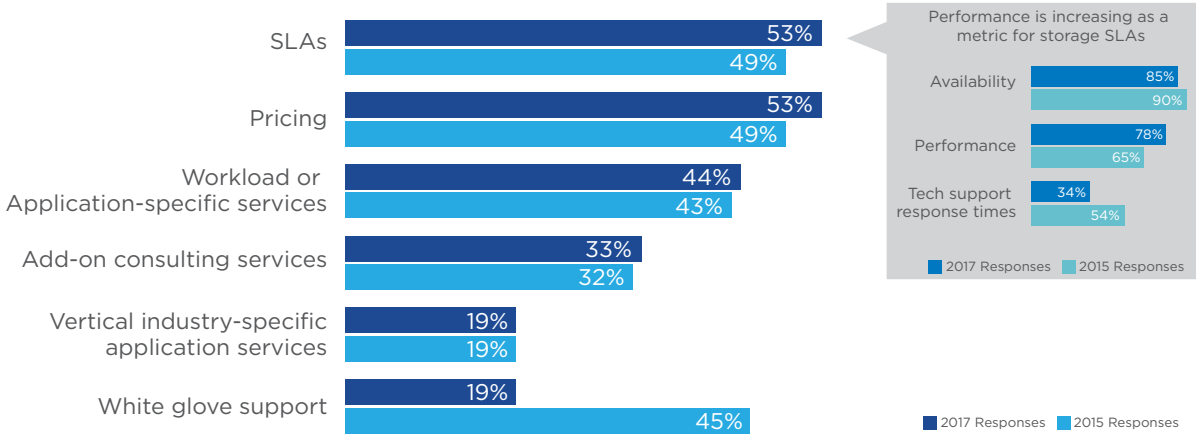
Service providers using all-flash arrays (AFAs) continue to cater to a mix of workloads and applications on their cloud and hosting platforms. It is not surprising that service providers using AFAs are expanding use cases outside of raw infrastructure/OS provisioning to include more application-based hosting services. AFAs allow service providers to deliver a dedicated-style hosting experience on their most cost-effective shared platforms, providing a strong value proposition to a broader set of customers seeking to offload more applications to the cloud. This is especially true for service providers that can guarantee predictable IOPS performance in a consolidated environment where workloads require performance consistency, such as instances where databases, web hosting, ecommerce, VDI, and big data are being deployed.

Complex workload environments with multiple applications running at scale brings with it an inherent risk of performance instability due to noisy neighbors. Storage architectures should be able to provide comprehensive QoS capabilities that can control applications on an individual, granular basis and guarantee performance at scale, irrespective of other activity on the array.

Insight #4:

Service providers continue to differentiate their cloud and hosting services with both price and service level agreements, but SLAs are shifting to performance metrics.

How do you differentiate your cloud/hosting services today? Which of the following storage SLAs do you offer?



2017 Source TVID: D45-E15-C91; 2015 TVID: 4CD-F88-572
2017 Source TVID: 5B7-05D-604; 2015 TVID: 950-2CD-767

Pricing and service level agreements (SLAs) remain in tandem as the two main factors that service providers employ to differentiate their cloud and hosting services. When comparing response rates for 2017 to those from 2015, both showed a slight increase in popularity to 53% of respondents, compared to 49% in the previous report.

Given the nature of pricing and the historical shift in focus for SLAs (from service provider protection to customer performance-centric), service providers need to remain flexible within a fluctuating market. Historically, the storage hardware type defined the performance tier, making SLAs inflexible. In the next generation data center, this bottleneck is removed by implementing software-defined performance tiering where guaranteed IOPS levels are implemented on a case by case basis through QoS settings.

With the continual focus by service providers on SLAs, the structure of these agreements has shifted over time. The majority of service providers continue to offer SLAs based on availability (85%), but an increasing number are adopting a storage performance component (78% this year, up from 65% in 2015). Although flash technology does provide greater performance, this alone does not resolve the problems of inconsistent performance or those caused by noisy neighbors. Increased performance must be accompanied by an associated increase in application control to fully take advantage of AFAs over spinning disk technologies. QoS implementations should be able to completely control application/volume performance on a granular level using three variables — maximum, minimum, and burst IOPS limits.

While white glove support decreased significantly as a differentiator from 45% of respondents to 19%, the service is still a strong customer requirement. As the market matures, white glove support is now widely offered and consequently does not provide significant differentiation among smaller scale service providers.

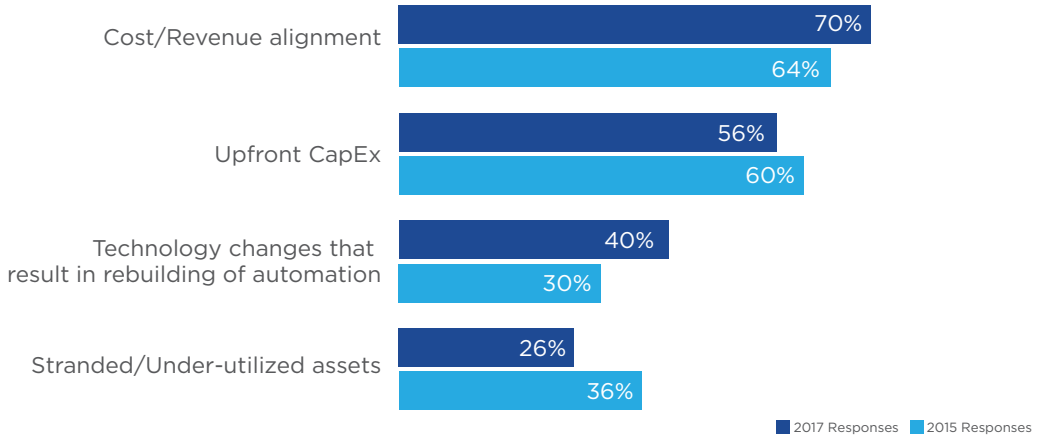
"[SolidFire] is the only proper service provider storage platform on the market. Pricing is very competitive, and the support is great."

Sarel Theron, Senior Cloud Engineer, Internet Solutions TVID: 766-78B-824

Insight #5:

The greatest storage-related risk for service providers continues to be cost/revenue alignment.

What would you consider the greatest risk in a storage platform?



2017 Source TVID: F68-9CA-1F0; 2015 TVID: 650-FB2-6E4

For service providers, the greatest reported risk continues to be cost-revenue alignment (up to 70% of respondents, up from 64% in 2015). The second greatest reported risk relates to financial uncertainty due to large upfront capital expenditures (56%). The third largest risk, related to rebuilding automation due to technology changes, saw the greatest increase — from 30% of respondents to 40%. With the top two responses totalling over 100%, service providers are showing high concern in multiple areas and not just a single problem focus.

Compared with 2015's data, respondents perceived less risk for stranded or underutilized assets (dropped from 36% to 26%). Adopting a scale-out architecture similar to SolidFire's naturally reduces the risk of siloed assets — especially when nodes in underutilized clusters can be repurposed to create new additional clusters as needed. A scale-out architecture can expand or contract on a node-by-node basis to fit your data center's needs.

With a node-based scale-out architecture, service providers can grow their storage infrastructures more flexibly on an as-needed basis. Long gone are the days of purchasing an entire architecture up front based on growth assumptions. Scale-out allows purchases to happen when needed, reducing the financial risk associated with large capex, front-end loaded, storage purchases.

Conclusion

It is evident that service providers deploying innovative flash technologies are setting themselves up to seize new opportunities — both operational and financial — to build next generation data centers. Several consistent trends have been identified in this survey that service providers can take into consideration when planning for future growth.

- Solid-state arrays are reducing administration tasks and improving customer satisfaction levels for service providers. Automation capabilities, including the auto-balancing of data and performance across storage resources, can significantly decrease the level of overhead that administrators currently have to spend on management and maintenance.
- Service providers are now frequently using more than one orchestration platform, with OpenStack showing a significant increase in adoption. Deep integration of storage APIs into the orchestration suite is critical for simpler integration and ongoing management processes.
- Cloud and hosting providers are seeing shifts in the applications that they cater for, specifically towards databases and web hosting/management. Quality of Service implementations that completely control applications and volumes (max, min, and burst limits) on a granular basis are critical to provide guaranteed IOPS for all workloads in a consolidated environment without the risk of noisy neighbors disrupting performance.
- Service providers continue to differentiate their cloud and hosting services by price and service level agreements. Software-defined performance tiering, such as is available through SolidFire's QoS, can quickly modify application performance on a case-by-case basis and drastically improve time to value. SLAs are still primarily focused on availability, with the importance of performance metrics greatly increasing. Service providers are now using a combination of these and other elements to differentiate their SLAs against their competition.
- The greatest risk for service providers continues to be cost-revenue alignment. SolidFire's scale-out all-flash array is helping to reduce some of this uncertainty through its ability to grow the storage infrastructure on a node-by-node basis so that resources can be added on an as-needed basis.

It is inevitable that AFAs will be a core requirement for the next generation data center, yet the degree to which service providers monetize these arrays and minimize operational costs will greatly depend upon a vendor's specific capabilities. Service providers that select vendors that have innovative offerings — such as guaranteed performance through QoS — enable their businesses to be better positioned in a competitive market to increase their market share.

About this survey

Conducted by TechValidate, an independent research organization, this study collected quantitative and qualitative data from over 430 responses received from 53 cloud and managed hosting service provider survey participants around the world. All survey participants are SolidFire customers.

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