



## Research Agenda, Q1 2017

### Storage

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*Covering the innovative and disruptive technologies, systems and software implemented to meet the ever-evolving business demands on storage infrastructure.*

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The Storage Channel provides ongoing research of technology and business-model innovation across the entire enterprise storage landscape – spanning primary storage systems and software, backup and recovery, archiving, cloud storage services, cloud-enabling storage technologies and storage management. Storage is emerging as a significant pain point for IT organizations, but is also ripe for disruption; the 451 Storage Channel focuses on how this space is being impacted by storage-specific technologies such as flash, and also examines how innovation in adjacent and overlapping datacenter technology segments – including server virtualization, the software-defined datacenter, infrastructure convergence, cloud, mobile and ‘big data’ – is reshaping the way enterprises and service providers think about optimizing the storage infrastructure to meet ever-evolving business needs. Designed for senior storage practitioners at end-user organizations – as well as vendors, service providers and investors – the Storage Channel encompasses every stage of the innovation lifecycle, informed by ongoing conversations with more than 200 technology suppliers and service providers in the storage space, from the stealthiest startups to industry behemoths. The team also has an active dialogue with more than 250 senior storage professionals at both midsize and large organizations worldwide.

#### ABOUT 451 RESEARCH

451 Research is a preeminent information technology research and advisory company. With a core focus on technology innovation and market disruption, we provide essential insight for leaders of the digital economy. More than 100 analysts and consultants deliver that insight via syndicated research, advisory services and live events to over 1,000 client organizations in North America, Europe and around the world. Founded in 2000 and headquartered in New York, 451 Research is a division of The 451 Group.

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## Overview

Enterprise storage – so long an afterthought of the IT department – is changing. An unpalatable combination of relentless data growth, capital expense, complexity, fragmentation and, in many cases, increasing operational overhead is prompting many enterprises to rethink their entire storage infrastructure strategy, especially in an era of unprecedented budgetary scrutiny. While these challenges are not particularly new, the changing software infrastructure higher up the stack is proving to be the catalyst for change; server and desktop virtualization, which by themselves exposed the rigid nature of many storage system designs, were merely the appetizer. Now that the enterprise wants its IT stack to look like – and behave like – a cloud, the storage infrastructure has to catch up once again. Within many enterprise IT departments, this is prompting a fundamental rethink of storage strategy, often as part of a broader rethink of the entire datacenter strategy.

The evolution of enterprise storage into something that can adequately support – even be optimized for – IT in the cloud era is fundamentally what the 451 Research Storage Channel is tasked with tracking. As with other 451 Research practices, our core research approach is to engage in conversation with a broad range of industry stakeholders – suppliers, service providers, IT decision-makers at end-user organizations, and financiers – to gain a complete picture of how emerging technologies are disrupting the enterprise storage market.

The inescapably modish term for this new approach – being used by storage suppliers new and old – is ‘software-defined storage.’ While the term itself as an offshoot of the broader ‘software-defined datacenter’ is already ubiquitous, it does speak to some fundamental changes that have been taking place in enterprise storage systems design for several years. These include the shift in storage systems design away from ASICs to using x86 industry-standard processors, the emergence of storage software functions – such as storage provisioning and data protection service – that can be divorced from the underlying hardware (essentially ‘virtualizing’ underlying hardware), and the emergence of storage stacks that to varying degrees utilize open source software. While we don’t view software-defined storage as a separate, stand-alone category, we view it as a pervasive approach that can be applied horizontally to all three key disruptive technology areas highlighted above. Accordingly, software-defined storage will be a continuing theme in our storage research this year.

Change will not happen evenly, and the rate of change will vary greatly between organizations, depending on their attitude, approach and size. And of course, many organizations will adopt a ‘two-track’ approach, perhaps treating the long tail of storage supporting core legacy applications differently from those next-generation applications that may have been built from the ground up for cloud and mobility. But we believe change will happen; the storage challenge within many organizations has reached a tipping point, and even organizations that previously proved most resistant to change are contemplating new approaches.

## Flash: Transforming Primary Storage

‘Flash changes everything’ is a familiar refrain in enterprise storage, and while the levels of hyperbole around all things flash continue to grow, it’s also true that the emergence of flash and, in the future, other forms of solid-state memory are driving a fundamental re-architecting of storage systems design, from all-flash arrays (AFAs) to server-based caching. Significantly, the emergence of an extremely fast and efficient primary storage tier is also acting as a catalyst for some fresh thinking around the overall storage environment. For example, will we see the collapse of the storage infrastructure into just two tiers – a high-performance flash optimized tier, and ‘everything else’ living on a massively scalable, capacity-centric tier running on object storage? Unsurprisingly, this is overall an extremely fertile area of innovation, particularly for venture-backed startups. How these technologies come to market, how they are implemented, and how they enable IT to meet evolving performance requirements as well as support new applications and workloads are core questions that the Storage practice seeks to address through our research.

Flash not only continues to transform the architectures of datacenter storage systems, but it is also threatening the decades-old dominance of the datacenter storage market by a very small handful of major suppliers. Currently the most dynamic area of flash usage is in AFAs. Adoption of AFAs is accelerating because of rapidly falling flash prices, and the devices are already in mainstream usage. In this sector a number of well-funded startups have made significant challenges to the hegemony of incumbent suppliers in midrange and high-end stand-alone storage systems, but the latter have regained collective dominance of the fast-growing AFA sector.

However, the relatively high price of flash means a sizeable market for hybrid disk-and-flash and even all-HDD arrays will persist for some years to come. Hybrid arrays have been available from all the incumbent storage vendors for several years, have been selling in significant numbers and are now very commonplace. The vast majority have been sold by incumbent suppliers, and are modified versions of storage systems that were originally designed to be powered only by disk. We will continue to follow product developments in this segment since it represents the bulk of the market today and it is the most competitive segment in storage.

Another category of data flash usage is in server-installed flash drives that are used to store either static, fixed data volumes, or dynamically changing caches of hot, frequently accessed data. The latter is achieved using purpose-built caching software, and is a developing technology that has attracted a large number of diverse suppliers that include storage incumbents, flash drive and chipmakers, and specialist startups. Demand for such software has been limited, but the gating factor is not the cost of flash, because the capacities of the flash drives used with caching software are relatively limited. A much more significant factor is potential buyers' lack of familiarity with what can be a complex technology.

Elsewhere in the flash and primary storage space, 451 Research will continue to monitor the developments in flash drive technology and interfaces and in flash chip manufacturing, as well as the efforts of some flash chip makers to become major suppliers of flash-based value-add technologies, such as PCIe flash cards and server-side caching software. We will also be monitoring the developing alternatives to flash as a non-volatile solid-state storage medium, such as 3D XPoint Technology, MRAM and PCM.

### First Convergence, Now Hyperconvergence

Meanwhile, sales of pre-integrated datacenter systems, such as EMC and Cisco's Vblocks or NetApp and Cisco's FlexPods, are now growing very rapidly. By configuring, racking and cabling existing server, storage and networking products into infrastructure building blocks, manufacturers can cut weeks off the time customers take to deploy such equipment, as well as simplify support. This level of systems convergence has been available for several years, and is now being followed by hyperconvergence – the blending of server and storage systems into truly single, merged platforms. These systems eliminate the need for external, SAN-attached storage by providing that storage within a cluster of application servers. A large number of startups such as Nutanix, SimpliVity and Maxta pioneered this architecture, and now incumbent suppliers are embracing it as well. It will be one of the hottest primary storage topics in 2017.

### Re-Imagining Data Protection

Once the doormat of the IT house, data protection is rising rapidly as a key focus area for companies struggling with antiquated backup and disaster-recovery practices. End users are hustling to find better ways to protect their data and, fortunately, the vendor community is responding with innovative technologies. Our data protection practice will focus on emerging technologies that could change the way end users approach data protection and data management.

Backup alone is not enough. Customers have deeper requirements and must get more value from the dollars they spend on all of their storage investments. Disaster-recovery-as-a-service (DRaaS) enablers and services in particular are growing in popularity and are forcing backup incumbents to improve their cloud integration and recoverability to both on-premises resources and public clouds. A number of interesting startups are in this sector, including OneCloud, CloudVelox, CloudEndure, Continuum, Accelerite, Druva Software, HotLink and Zerto.

In the cloud-based data protection front, we'll cover the backup incumbents that offer cloud 'connectors' for cloud-based data protection in addition to cloud storage gateway, or controller, vendors such as Aveva Systems, NetApp, EMC, Panzura, Nasuni and CTERA Networks, as well as Amazon and Microsoft. Our cloud-based data protection coverage will also monitor SaaS platform backup, or cloud-to-cloud data protection. Vendors in this space include EMC (via its acquisition of Spanning Cloud Apps), Datto (which acquired Backupify), OwnBackup and Asigra.

Another interesting trend that we'll be tracking over the next year is what is sometimes referred to as 'copy data management' or 'copy data virtualization,' which represents a fundamentally different way of approaching data protection or, more accurately, data management. Startup Actifio pioneered this technology, but we expect variations on the theme from vendors such as EMC, Hitachi Data Systems, CommVault, NetApp, Catalogic Software, Cohesity, Rubrik and Delphix.

### Enterprise Cloud Storage and Cloud Storage Enabling Technologies

Though the cloud model continues to mature overall – chiefly as a proxy for IT transformation – the storage infrastructure has yet to catch up. This is a problem, since without elegant storage- and data-level integration, much-anticipated cloud-era capabilities that utilize hybrid and 'federated' clouds will remain elusive.

There is no single approach to enabling storage for the cloud, so our research approach covers a range of technologies and capabilities that broadly fall under the 'cloud storage' umbrella, spanning public, private and hybrid models.

In addition to looking at data protection in the cloud (covered above), our focus here will also concentrate on how incumbent vendors are working to 'cloud-enable' their products for greater levels of integration and automation, as well as participation with higher-level IT management and orchestration frameworks.

We will also cover specific cloud-related emerging technology areas such as cloud storage gateways, object storage and, of course, storage as a service. We will closely monitor the evolution of the storage aspects of open source movements, such as OpenStack Swift and Ceph.

Note that while we touch on cloud storage applications such as file sync and share within the storage practice, coverage of this space falls mostly into the Business Applications Channel. We also acknowledge that a vast number of service providers offer some form of storage as a service; this space is chiefly covered by our colleagues in the Service Providers channel.

### Note

In addition to the market dynamics listed above, the Storage Channel will continue to collaborate with fellow 451 Research analysts across other channels as we assess the wider implications of the increased industry focus on Storage. Numerous vendors overlap areas of our research, and some have multiple products in different technology domains.

## Upcoming Research on Cloud Transformation

### Voice of the Enterprise (VotE)

Combining 451 Research's industry-leading analysis with an extensive network of more than 50,000 senior IT professionals, Voice of the Enterprise tracks adoption across thousands of organizations and exposes the major opportunities for enterprises, IT vendors, suppliers and investors. Each quarter's survey has a focused theme, as indicated in the table below.

	Workloads and Key Projects	Organizational Dynamics	Vendor Evaluations	Budgets & Outlook
Servers and Converged Infrastructure	Q1	Q2	Q3	Q4
Storage	Q1	Q2	Q3	Q4

### Supply-Side Research

Understanding the pace of growth and identifying the segments and industries driving value in the market is the focus of 451 Research's market tracking and forecasting methodologies. Through quarterly updates, 451 Research delivers its tracking and forecasting of the supply of key business application market indicators by region and country.

		Updates
Enterprise Market Monitor	OpenStack	Quarterly

## Technology & Business Insight Reports

### M&A Outlook 2017: Semiconductors, Systems and Storage

Analysts: John Abbott, Henry Baltazar, Tim Stammers, Steven Hill, Peter Christy, Brenon Daly

Publication Date: Q1 2017

Even after a recent record tech M&A run, dealmakers still had ambitious shopping plans in 2016. Across the globe, tech acquirers announced \$500bn worth of transactions in the just-completed year, ranking 2016 as the second-highest annual total since the internet bubble burst. More than any other year, 2016 saw an expansion of buyers beyond the 'usual suspects,' as old-line companies got caught up in transforming their businesses through M&A.

### Growing Disaster Recovery Needs Shift the Conversation for Backup Vendors

Analyst: Steven Hill

Publication Date: Q1 2017

The goal of backup systems has traditionally been about protecting data in the event of systems failure, but there is an increasing need to protect and restore the business applications and processes as well as their important data in the event of a catastrophe. Though the challenges remain similar for small and big business alike, data protection vendors are being challenged to provide new DR offerings that provide greater simplicity, better recovery times and even the flexibility to restore business applications to bare metal or cloud should the need arise.

### Flash – No Longer the Only New Memory in Town

Analyst: Tim Stammers

Publication Date: Q2 2017

Flash has already transformed datacenter storage, and is continuing to evolve. But multiple other new types of solid-state storage are emerging and are set to take different roles in a hierarchy of so-called storage-class memories. This report details those emerging memories.

### Market Map: Storage

Analyst: Henry Baltazar

Publication Date: Q3 2017

This report profiles competitors by major segment with a graphical display of the market and key segments. The analysis includes key attributes for each segment and a view of each vendor's solution relative to those attributes. The 451 Research Market Map™ is designed to provide a view of the vendor landscape.

### Preview: Storage Trends in 2018

Analyst: Henry Baltazar

Publication Date: Q4 2017

This report provides a view of key trends that will affect the market in 2018. It details the top trends, likely impact and recommendations for each.