451 Research®

Research Agenda, Q1 2017

Systems and Software Infrastructure

Covering the evolution of compute platforms within the datacenter and enterprise environments, as well as the hardware and software needed to operate enterprise-class infrastructure.

The Systems and Software Infrastructure Channel covers the entire range of compute platforms, including the hardware and software needed to operate enterprise-class infrastructure. This includes servers (x86, enterprise servers, blade servers, appliances, hyper-dense servers and high-performance computing systems), semiconductors and interconnects used within those servers (multi-core and multithread CPUs, low-energy cores, many-core processors, systems-on-a-chip, memory and I/O). This Channel's coverage also spans system software (operating systems, virtualization, hypervisors and micro services) and systems management technologies (system automation, load balancing, workload optimization and converged management). The Systems and Software Infrastructure Channel also tracks developments in the evolution of compute platforms within both the datacenter and enterprise environments.

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.

Analysts

John Abbott
Founder & Research VP

Henry Baltazar
Research Director,
Storage

Daniel Bizo
Senior Analyst,
Datacenter Technologies

Peter Christy
Research Director,
Networks

Eric Hanselman
Chief Analyst

Christian Perry
Research Manager, VotE
IT Infrastructure

Simon Robinson
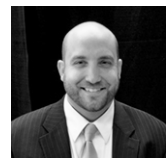Research Vice President,
Storage

Al Sadowski
Research Vice President,
Infrastructure

Tim Stammers
Senior Analyst, Storage

Greg Zwakman
VP, Market and
Competitive Intelligence

Overview

The Systems and Software Infrastructure Channel covers the physical infrastructure used by digital businesses and the software layers directly on top – including operating systems, firmware, hypervisors, virtualization and element management. Historically, the majority of these systems would have come under the category of 'enterprise servers,' installed within private, on-premises datacenters. While this is still an important distinction, lines are blurring as companies start to build out their own private cloud infrastructure, linking them with public cloud resources to form hybrid systems.

Cloud service providers and the giant Internet companies need to build out and manage their physical resources too, but they have very different requirements from the heavily engineered mission-critical transactional systems traditionally favored by large enterprises. Those low-cost scale-out systems – often built for the simpler, more predictable world of web applications – are being extended and adapted in an effort to bring their considerable cost and flexibility advantages over to enterprise computing. This trend is affecting the entire IT industry, from customers to vendors and service providers.

In this Channel we will be tracking two major (and interconnected) trends in the systems world: the convergence of the physical domains of servers, storage and networking under a unified virtual software layer, and the more widespread introduction of scale-out, commodity systems, storage and networking architectures as they move beyond Google and Facebook into the adjacent sectors of the enterprise datacenter and high-performance computing labs. Both point the way toward increased management and automation not dependent on specific hardware – sometimes referred to as the software-defined datacenter.

Chips and Interconnects

Digging deep into the physical compute layer remains crucial to understanding higher-level trends. While the vast majority of general-purpose servers use the x86 instruction set, established enterprise-class RISC engines such as Oracle SPARC and IBM Power still generate huge revenue and profit streams for vendors and continue to be adapted to retain their relevance. Then there are emerging alternatives to x86 that focus more on efficiency than on raw power, most notably the ARM architecture, the heritage of which come from mobile devices rather than from the mainframe. Meanwhile, virtualization layers have reduced hardware dependencies, opening the way for more innovation at the chip and interconnect level. We are tracking new hybrid systems developments that incorporate system area networks, specialist acceleration chips (such as FPGAs and GPGPU) and system-class memory (such as Intel 3D XPoint), to name just three examples. Fast interconnects based on silicon photonics could transform the way we lay out resources in a datacenter, enabling rack-level disaggregation.

Servers

Dual processor, 2U-sized x86 rack-mounted processor modules have become the core building block of most new datacenter builds. Enterprise-class blade systems and high-end symmetrical multiprocessors are being packaged as integrated infrastructure, sometimes also known as converged infrastructure or engineered systems. The blade server is also evolving with new 'composable system' designs that can incorporate pooled memory, storage and networking resources that can be automatically allocated to workloads on-demand. This is really a bringing together of the best of blade and rack architectures. And we are seeing a resurgence of interest in application-specific appliances. As standards evolve, new ecosystems are emerging that are more agile in customizing core x86 system modules (including servers, storage and networking boxes) for specific customer requirements, or providing base-level systems that customers can adapt themselves – we're thinking here of the Open Compute Project and the original design manufacturers that are now reaching out beyond their OEM customers to interact directly with system integrators and customers for the first time.

Integrated Platforms

The idea of integrated infrastructure really began to take hold in 2009 when Cisco entered the server market for the first time with the Unified Computing System and Oracle launched its Exadata database appliance. But a number of earlier developments had paved the way: blade servers, storage virtualization, server virtualization and I/O virtualization, for instance. Since then, the market offerings have followed one of four models: tightly controlled single-SKU packages with integrated management and lifecycle support services; single-purpose optimized appliances with complete software stack from one source; loosely coupled reference architectures retaining some best-of-breed options; and a newer generation of 'hyper-converged' systems that tightly couple compute and storage in a modular, dense form factor. All four approaches involve some convergence at the management layer, and ultimately, the goal is to move toward a hardware-independent, software-defined OS and management layer that ties together standard server, storage and networking hardware modules into a flexible, pooled resource.

Operating Systems

Windows Server has developed more consistently than the boom-bust release cycles of the more familiar Windows client operating system, and in recent years there's been considerable innovation introduced into the platform. But Microsoft faces an uphill battle against Linux in the datacenter – a trend confirmed by Microsoft's own greater adoption and support of Linux alongside Windows. Enterprise Unix sales continue to decline; the holdouts are IBM AIX and Oracle Solaris, but even here we see both IBM and Oracle putting big resources into Linux and their proprietary offerings are clearly moving in that direction. Innovation at the OS level is far from dead, as has been seen by the resurgence of interest in OS-level virtualization or partitioning, now more fashionably packaged as containers or micro services. This is having an impact on the more established virtualization layers from VMware and Citrix, while Microsoft is working hard to add comparable functionality to Windows. And then there's OpenStack and its ecosystem, which looks from a certain angle to be an attempt to rewrite the rules of the operating system. Meanwhile real-time embedded operating systems are coming back into focus as the basis for distributed microservers and the infrastructure required to support the Internet of Things.

Virtual and Cloud Platforms/VDI

VMware continues to dominate the enterprise sector with its virtualization hypervisor and management stack, and it's broadening its remit to address the software-defined datacenter. It's hoping to tie in its dominant on-premises private cloud deployments with new external cloud services. Microsoft is on the exact same course with Windows, Hyper-V, System Center and Azure. The main independent challenger to these efforts is the growing OpenStack community, the focus of many new developments from a new generation of startups. We believe a combination of vendor-developed, software-defined enterprise management tools that incorporate support for selected OpenStack-derived modules and APIs will emerge over the next few years, though currently a fully hardware-agnostic software layer operating at enterprise scale is still aspirational rather than practical.

We also continue to track systems management tools and element managers for specific hardware platforms, but with emphasis on their cross-platform capabilities and their evolution toward broader tools, such as physical and virtual infrastructure management converged infrastructure (networking and storage management in conjunction with server workloads), hybrid cloud management and resource control automation for the dynamic datacenter. This coverage links to related areas in our cloud and datacenter practices. Emerging trends here include real-time operational analytics coupled with automation and machine learning.

Virtual desktop infrastructure (VDI) remains an important part of the virtualization layer and has been revitalized in recent years by the tackling of some long-standing issues – most evidently the cost and performance of storage infrastructure to support virtual desktops, more flexible image management and data layering technologies enabling the deployment of persistent desktops at lower cost, and the shifting of the management control plane into the cloud for on-premises deployments. Fully hosted virtual desktop services from Amazon, VMware and others are also having a significant market impact, as is the integration of bring your own device (BYOD) and broader mobile device management into VDI. VMware, Citrix and Microsoft remain the incumbent players in this space.

Note

In addition to the market dynamics listed above, the Systems and Software Infrastructure 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 Systems and Software Infrastructure. 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

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	Desktop Virtualization Ecosystem	Quarterly
	Cloud-Enabling Technologies	Q2, Q3, Q4
	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.

Toward Software-Defined Infrastructure
Analyst: John Abbott
Publication Date: Q1 2017
As the industry moves to an abstracted approach to a managing infrastructure, there is an opportunity for significant operational savings as well as greater enterprise agility. This report provides an update on this migration.

Rack-Scale Systems: When Will the Commercial Market Take Off (or Will It)?
Analyst: Peter Christy
Publication Date: Q2 2017
Rackscale systems (RSS) are a new datacenter equipment architecture where the componentry is removed from the legacy server or appliance box and instead mounted, powered and cooled by a new version of the equipment rack used with datacenters. RSS have been used for some time by the hyperscale cloud service providers, and they offer a spectrum of benefits including cost efficiencies, configuration agility, procurement leverage, and enabling row- and datacenter-scale application systems. There has been strong interest in bringing this kind of architecture to a broader market of enterprises and second/third tier service providers, especially since Facebook made public some of its proprietary datacenter technology and drove the formation of the Open Compute Project and Intel added rack-scale architecture (RSA) to it datacenter roadmap. This report will cover and analyze these efforts, and forecast the size and timing of these commercial markets.

Systems of Change – How New Workload Demands Are Influencing Enterprise Computing
Analyst: John Abbott
Publication Date: Q3 2017
The blending of old and new workloads is creating new challenges for enterprise infrastructure. This report focuses on the evolving bifurcation of these workloads and will offer new models for supporting them.

OpenStack Pulse 2017
Analysts: Al Sadowski, Jay Lyman
Publication Date: Q3 2017
This report offers an annual 'pulse check' on the OpenStack business models that have evolved over the past four years, including quantitative market-sizing data, regional perspectives, use cases and customer-survey feedback. It covers a variety of software vendors and service providers that are leveraging OpenStack both internally and for commercial offerings, and provides up-to-date insight into the developing OpenStack distribution battles and ongoing debates about functionality and overall project governance.

Preview: Trends in Systems and Software Infrastructure 2018
Analyst: John Abbott
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.