

# Data Center Design for Agile Digital Organizations

IT and application architectures have transformed in the past decade as cloud, big data, and mobile computing have disrupted business processes and applications. Cloud computing offers a particularly attractive value proposition: It gives organizations of all sizes the ability to leverage IT resources as needed. And in this new digital era, anytime, anywhere customer services must be assured.

According to IDC, two-thirds of CEOs at Global 2000 companies will place digital transformation at the center of their corporate strategies by the end of 2017.<sup>1</sup> CEOs recognize the need to evolve into a digital organization and accelerate the pace of innovation to drive competitive advantage, or risk being displaced by more nimble competitors. Fast innovation requires an agile IT foundation in which automation works seamlessly with network visibility, digitally connecting all IT domains and functions together to eliminate silos and deliver end-to-end automation.

For the IT lead, this translates to simplified IT operations enabling rapid innovation for current and future business needs. With organizations placing increased emphasis on scale, agility, and cost, software-driven data center architectures are becoming more prevalent and are key to enabling the transition to a services delivery model.

## The Evolution of Data Center Architectures

There are many different approaches to data center architectures depending on business needs and design considerations. These can range from complete stacks with integrated hardware and software to custom stacks with software and hardware solutions from different vendors, or solutions from the open source community. Each option comes with specific benefits and tradeoffs.

Full stack solutions are positioned as turnkey and fully integrated, but they can increase troubleshooting time and

costs and may eventually create more complexity. For example, they might keep an IT organization from being able to choose specific security or load balancing features, or integrate with their vendor of choice for security or the management layer. Vendor lock-in is common, resulting in increasing long-term costs and a slower pace of innovation that is dictated by a vendor's capacity and strategy rather than a customer's requirements.

A custom stack approach, while requiring the additional engineering resources for integration, can provide tremendous flexibility and cost advantages. For

example, OpenStack combined with a cross-domain automation platform and software-driven data center architecture could be considered for cloud orchestration and management. In fact, many data centers today already include open standards and open source alternatives to integrate multivendor solutions, scale quickly, and reduce costs. In IDC's *FutureScape Worldwide Cloud Predictions 2016*, analysts predict that by 2017, more than 60 percent of enterprises will embrace open source and open APIs for cloud integration strategies.

<sup>1</sup> IDC, "Modernizing Data Center Networks for Digital Transformation," <http://idcdocserv.com/US41721216>, September 2016.

No matter which solution they choose, it is important that organizations plan their data center deployments with future business and technology scalability in mind.

## Composing an Agile Data Center Architecture

Software-driven data center architectures enable flexible hardware and software resource pools, which simplify management while increasing agility. These resource pools can be composed and managed by combining the required resources as needed and releasing them when a specified task is completed. Hyper-scalers such as Google, Amazon Web Services, and Facebook built their Web-scale infrastructures by abstracting such resource pools by leveraging Software-Defined Networking (SDN) and software-enabled automation for flexibility, orchestration, and scale. In addition, the leading Web-scale IT and cloud service providers have demonstrated that next-generation data center design requires not only a shift in architecture, but also an organizational culture that is more collaborative and innovative. This new paradigm of DevOps culture enables

continuous development and continuous integration. Organizations moving to DevOps are able to innovate faster and quickly introduce new services and features.

This requires agility at all layers of the data center network stack and across all technology domains such as compute, applications, and operations. This agility can only be achieved with a combination of intelligence through visibility and intent-driven automation. Visibility and data are required at all layers of the stack to inform decision making. Dynamic automation is required to push down actions to the appropriate level for execution.

This automation/visibility loop is constant, driving demand for open cloud management platforms and DevOps tools to add programmable workflows for dynamic event-driven automation. Integration with other organizational technology domains such as compute and storage requires consistent flexibility and similar levels of programmability for network switches, routers, and the ASICs. The network is thus integrated with the organization's entire IT environment,

culture, and skillsets, including people, process, and policy (see Figure 1).

Embracing this modular approach to data center design means embracing purpose-built, composable solutions that can be integrated to serve specific functions. A composable infrastructure is designed to enable maximum flexibility within and among data centers. The resources—that is, hardware (network, compute, and storage) and software (operating systems, virtual services, automation, and analytics management)—do not need to be in a central location. They can be deployed in any combination across multiple data centers and the cloud.

Composable solutions built on open standards are readily interchangeable; they require neither forklift upgrade nor large-scale data center overhauls. In addition, open standards-based hardware can be further standardized using reference architectures, helping to reduce costs. All of this can be managed from a single, central location via the control and orchestration layers that work across different types of cloud environments.

## DevOps-Inspired, Cross-Domain Automation

As the focus shifts from maintaining infrastructure and applications to rapidly delivering services to users and customers, automating the provisioning, troubleshooting and remediation of services becomes critical. Applications and services create increasing numbers of workflows, which are complex and require coordination across IT silos. Synchronizing them, however, is difficult and inefficient, often resulting in increased delays and reduced agility.

A better approach to managing these workflows is to enable DevOps-inspired, cross-domain automation across the services delivery chain. This allows administrators to orchestrate and

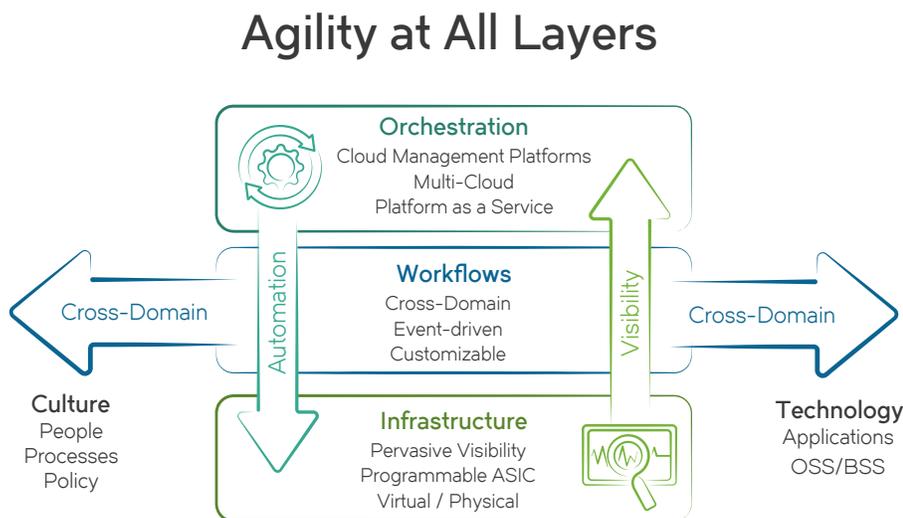


Figure 1: Digital transformation requires organizational agility across all domains.

manage infrastructure with minimal human intervention. With built-in or external tools, the management layer can respond to changes via sensors and take the appropriate actions. Examples include network provisioning, dynamic remediation for common issues, or automated notification updates on configuration changes.

### Visibility across the Data Center

The complex, distributed application and cloud computing environment demands greater visibility. This includes dynamic, rich, and scalable classification and actions at multiple layers from network to workloads, as well as highly flexible, granular real-time visibility of specific traffic flows. This visibility approach must be pervasive delivering the pertinent data in real-time where and when it is needed with minimal cost, operational complexity, or performance disruption. Embedding a purpose-built, dedicated visibility architecture across network software and hardware platforms that easily integrates with popular automation tools enables the intelligent decisions and actions required in this digital cloud computing era.

With the right approach to data center design, organizations can build a flexible, scalable, next-generation infrastructure that integrates with their current infrastructure and IT workflows for maximum IT and operational agility.

### Brocade Composable Data Center Solutions

A leader in data center networking, Brocade helps organizations achieve this digital transformation by providing composable, high-performance networking, and automation solutions. These solutions range from purpose-built data center networking equipment to

DevOps-inspired automation and SDN solutions (see Table 1).

Brocade® Workflow Composer™ offers a cross-domain DevOps-inspired automation platform and turnkey network automation suites that easily integrate with popular management tools and applications to help build and support hybrid cloud environments, multitenant data centers, and Web-scale architectures. By leveraging Brocade data center fabrics—from automated Layer 2 Ethernet fabrics to standards-based Layer 3 IP fabrics for larger-scale data centers—organizations can design a superior underlay for data center virtualization and workload mobility.

Brocade SLX™ Insight Architecture™ and Brocade SLX Visibility Services offered on Brocade SLX platforms deliver a new approach to network monitoring and troubleshooting that makes it faster, easier, and more cost-effective to get the comprehensive, real-time visibility needed for network operations and automation. This innovative approach provides comprehensive visibility from the network to the workload, including the ability to address end-user application or service needs; analyze, automate, and generate reports on context-rich data; and provide the fine-grain targeted visibility needed to tune the network for specific device or service needs.

Brocade data center solutions are built with open standards and integrated with a multivendor ecosystem of data center hardware and software tools. Brocade partners with a wide range of IT leaders, including Dell, EMC, VMware, HDS, HPE, IBM, Microsoft, Nutanix, Red Hat, and Simplivity, and ensures support across heterogeneous data center environments.

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### BENEFITS OF BROCADE DATA CENTER SOLUTIONS

- *Operational flexibility, simplified management, and reduced operational expenses for optimal scale and efficiency for physical and virtual workloads*
- *Turnkey yet fully customizable, cross-domain, DevOps-inspired automation that spans the entire network lifecycle including provisioning, validation, troubleshooting, and remediation*
- *Pervasive and distributed network visibility to inform intelligent event-driven automation and decrease time-to-resolution.*
- *Simplified migration and integration with orchestration and management tools that support a variety of application deployments*
- *Secure data center interconnects for workload mobility across the data center or hybrid cloud deployments*
- *Adaptive foundational network platforms that provide industry leading density and bandwidth with programmable automation and visibility*

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### Building an Agile Data Center with Brocade

Organizations require a flexible data center infrastructure that enables digital transformation while supporting existing legacy infrastructure and IT operations. Brocade composable data center solutions allow organizations to build a custom data center stack, with both hardware and software, at their own pace, using their existing investments. Not only does this help address the interim need for business agility, it also paves the way for the long-term vision of scale and the evolution into a digital business.

For more information about Brocade data center solutions, visit <http://www.brocade.com/datacentersolutions>.

**Table 1:** Brocade data center products and solutions.

### Data Center Hardware

Brocade SLX switches feature unparalleled network visibility and automation for agility in the digital era. Delivering flexible leaf, spine and edge connectivity they leverage the Brocade SLX Insight Architecture and Brocade Workflow Composer automation platform and suites for pervasive visibility and intelligent automation. The leaf and spine switches extend these capabilities with a programmable ASIC that provides Brocade SLX Visibility Services from the physical wire to virtual networks and workloads.	<ul style="list-style-type: none"> <li>• Brocade SLX 9140 Switch</li> <li>• Brocade SLX 9240 Switch</li> <li>• Brocade SLX 9540 Switch</li> </ul>
<b>The Brocade SLX 9850 Router</b> provides a highly scalable 230 Tbps switch fabric capacity with powerful IPv4, IPv6, MPLS, and Multi-VRF capabilities for the most demanding data center use cases. At the same time, it addresses increased automation agility and analytics visibility needs through Brocade Workflow Composer and the Brocade SLX Insight Architecture.	<ul style="list-style-type: none"> <li>• Brocade SLX 9850 Router</li> </ul>
<b>Brocade VDX® switches</b> deliver high performance, high capacity, and high reliability for data center spine and leaf deployments. This single switch family supports Layer 2 and Layer 3 fabrics, network automation, open standards, and extensive scalability for massive data centers.	<ul style="list-style-type: none"> <li>• Brocade VDX switches</li> </ul>
<b>The Brocade MLX® Series of routers</b> provides high-performance IPv4, IPv6, Multiprotocol Label Switching (MPLS), Multi-VRF, and advanced Layer 2 switching capabilities for data center core and data center interconnect use cases.	<ul style="list-style-type: none"> <li>• Brocade MLXe routers</li> </ul>

### Data Center Fabrics

Brocade VCS® (Ethernet) fabrics deliver seamless scalability for Layer 2 data center deployments.
Brocade IP fabrics provide an open, automated, and programmable solution based on a cloud-proven, BGP-based Layer 3 design for large data center deployments.

### Data Center Software

<b>Brocade Workflow Composer</b> , a network automation platform, providing turnkey, customizable, and cross-domain workflow automation for network lifecycle management and integration.	
<b>Brocade Workflow Composer Automation Suites</b> accelerate time-to-value with turnkey network automation suites that are customizable as skills and requirements change.	<ul style="list-style-type: none"> <li>• Network Essentials Suite</li> <li>• Data Center Fabrics Suite</li> <li>• Internet Exchange Points Suite</li> </ul>
<b>Brocade Flow Optimizer</b> application leverages industry standard OpenDaylight SDN controllers to provide network traffic insights improving visibility and control while offering new levels of network automation.	

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