ACHIEVING SOFTWARE-DEFINED EVERYTHING

SDx technologies deliver greater, more granular control over IT environments.
EXECUTIVE SUMMARY

Today, practically all aspects of an IT environment can be delivered via software-defined tools that abstract functionality from underlying hardware. What started a couple of decades ago with the growth of server virtualization has now turned into “software-defined everything,” or SDx. Organizations increasingly use software-defined solutions to reduce costs, manage risk and enhance agility.

Organizations seeking to simplify data center operations and centralize management can turn to software-defined solutions for all aspects of data center infrastructure, including compute, networking and storage. In addition to “traditional” server virtualization, many data center administrators are looking toward containerization to make their applications even more nimble. A combination of software-defined networking (SDN) and network function virtualization (NFV) can create a more consistent and flexible network environment, even across disparate geographic sites. And software-defined storage (SDS) allows organizations to pool capacity from commodity hardware.

Hyperconverged infrastructure (HCI), which brings together networking, storage and compute, often represents organizations’ first steps toward SDx.

A carefully considered strategy should guide any new SDx investments. A trusted IT partner can help organizations with design and implementation, ensuring that software-defined solutions both solve existing problems and push organizations closer to achieving their business goals.

What Is SDx?

Ever since server virtualization became commonplace, allowing data center administrators to use software tools to partition physical servers into multiple isolated environments, software has increasingly become an integral part of every aspect of most IT environments.

Storage. Networking. Compute. All of it now comes in software-defined flavors, and the “SD” prefix is everywhere: There’s SDN (software-defined networking) and SD-WAN (software-defined wide area network); there’s SD-Access and SD-Security; it goes all the way up to the SDE (software-defined environment) and SDDC (software-defined data center).

At this point, it’s simpler to talk about software-defined everything (SDx) than to list every possible abbreviation. Indeed, it’s easy to get lost in the alphabet soup of potential solutions. But what does SDx really mean, and what are some of the most compelling benefits for organizations and IT administrators?

“The overarching mission of SDx is to break down the discrete IT silos (compute, storage and networking) by using software to bridge the technological and organizational gaps.” DevOps.com states. “By giving software systems a starring role in managing different kinds of hardware, the premise is that productivity will increase through more robust network access from both portable and traditional devices.”

SDx represents “truly a disruptive technology shift” that can change the utilization of IT resources such as compute, networks and storage.

This evolution also has the ability to alter the perception of IT in general. As software-defined processes accelerate the implementation of network and data center resources, applications can be deployed in a matter of minutes. In this scenario, an IT department moves to being seen as an enabler of new capabilities and business opportunities rather than a hindrance to them.

While these descriptions give a sense of the potential scope of SDx solutions, it is perhaps more useful for IT professionals to focus on what SDx tools do, what some of their chief benefits are and how organizations are using them to achieve business value.

In short, software-defined technologies abstract the control plane of infrastructure solutions from underlying hardware, allowing greater, more efficient control over IT resources. (Going back to server virtualization, it’s easy to see how this works: Using software, virtualization tools make more efficient use of a server’s physical hardware, allowing data center administrators to run many more virtual machines with a much smaller footprint than would otherwise be possible.) By implementing software-defined technologies for their IT infrastructure, organizations can centralize governance of their IT resources.

The value of SDx for businesses comes in three main areas:

IT and business agility: By emphasizing software over hardware, SDx solutions create a more agile IT infrastructure, helping businesses to respond more quickly and effectively to market opportunities and pressure from competitors. This is especially important for established enterprises that are facing competition from nimble startups, which typically lack the management burdens that often accompany legacy IT infrastructure. Many organizations with legacy infrastructure are finding they must


$14.7 BILLION

The projected value of the worldwide software-defined and virtualized network functions infrastructure market in 2023¹

Implementation SDx solutions to keep up with the efficiency and agility of newer competitors.

**Cost management:** SDx enables IT teams to look at the per-unit cost of IT resources and manage them more effectively at a more granular level. “Software-defined allows for full utilization of resources, more automation and the ability to purchase lower-cost hardware,” notes David Coyle, practice vice president at Gartner.

**Risk management:** Adopting SDx solutions can insulate organizations from both security vulnerabilities and the operational risks that come with inefficient legacy infrastructure, such as unplanned downtime and decreased performance. Many organizations unwittingly put themselves at heightened risk of data breaches and performance problems through inconsistent configurations. SDx automates configuration, enabling consistency across the IT environment and thereby reducing security vulnerabilities and other issues.

**Use Cases**

Drivers of SDx will vary by organization, but a few use cases pop up routinely. One of these is automated resource provisioning; when developers need virtual machines for a project, software-defined infrastructure can automatically provision those resources, leading to increased operational efficiency and improved budget predictability.

Data center optimization is another important driver for organizations considering SDx solutions. Through capabilities such as SDN and NFV, SDx can improve application performance by orchestrating workloads across more private or public clouds.

Finally, the opportunity to simplify the storage environment is a powerful motivator that leads many organizations to take their first steps into a more software-defined IT environment. Software-defined storage abstracts logical storage services and capabilities from the underlying physical storage systems, enabling high-level management — including automation and orchestration — of external storage arrays that act as a single pool of resources. SDx also powers HCI, pooling disk drives and solid-state storage drives from multiple servers and making these resources available across an entire cluster.

**Key Elements of the SDx Ecosystem**

Organizations can leverage SDx to enhance and streamline every part of a traditional three-tier data center architecture, including networking, compute and storage. Through solutions such as HCI, data center administrators can bring together all of these pieces in a modular, scalable solution that provides a pathway to an effective hybrid cloud environment.

**Networking**

Organizations can leverage both SDN and NFV solutions to move toward a more software-centered networking model. Rather than being competitive technologies, these solutions can often be rolled out side by side in a complementary design. SDN is a “big picture” solution that determines network policies guiding the delivery and use of network resources, notes Equinix. Meanwhile, NFV comprises a “wide range of specific functionalities,” such as routers, firewalls and SD-WAN. Both solutions are centrally managed, and both can deliver cost savings and enhanced flexibility for network administrators.

With SDN, much of the cost savings comes from the ability to automate network configurations and changes — which in turn allows organizations to redeploy staff to other projects, reducing operational expenses. Because personnel costs account for such a large chunk of network spending, Equinix notes, even a small reduction in this area can lead to a significant cost benefit. NFV addresses the other side of the cost equation, eliminating the need to purchase specialized hardware for individual network functions. Along with cutting down on equipment costs, this reduces requirements for power, cooling and data center footprint.

Both solutions allow data center administrators to quickly pivot in response to changing demands. The programmable interfaces of SDN solutions enable simple provisioning of new network devices and reconfiguration of existing devices. NFV gives IT shops the flexibility to quickly deploy and decommission functions to support proof-of-concept trials, and to locate functions at the network edge to optimize network security and performance.
As the name suggests, SD-WAN is essentially software-defined and network-centric. An additional 5 percent of businesses running virtual machines in their data centers, according to Spiceworks. An additional 5 percent of organizations plan to adopt the technology by 2021.

The advent of the public cloud has further separated compute power from on-premises hardware, with many organizations investing in Infrastructure as a Service (IaaS) solutions that require essentially zero management on their part. And increasingly, organizations are looking into containerization to make their workloads nimbler. Containers, often managed via an open-source system such as Kubernetes, are essentially very lightweight virtual machines that allow data center administrators to deliver code without additional “overhead” such as guest operating systems. This can lead to an even more efficient use of data center resources than traditional server virtualization, requiring fewer racks, less energy, fewer software licenses and less maintenance.

Storage
For a time, many observers in the IT industry made a distinction between SDS and storage virtualization — with storage virtualization referring to the pooling of multiple storage arrays into one or more logical containers, and SDS referring to a software-defined delivery of features such as deduplication, snapshots and replication. Today, storage virtualization is more commonly understood to be a central component of SDS.

SDS solutions don’t separate storage from hardware but rather add a software layer between the physical storage and any data requests, giving organizations more ability to manipulate how and where data is stored. This added control allows data center architects to build out SDS infrastructure using commodity storage hardware, leading to improved flexibility and reduced costs. Organizations that decouple storage software from their hardware have greater agility to expand storage capacity when needed, enabling more strategic planning that improves outcomes and controls costs. By emphasizing storage software over hardware, these organizations also enable a more flexible posture for upgrading or decommissioning hardware.

Other key features and benefits of SDS include automation, standardized application programming interfaces for management and maintenance, the ability to scale out infrastructure without impeding performance, and transparency into which storage resources are available and at what costs.

Hyperconverged Infrastructure
For many organizations, the first large step toward SDx is Hyperconverged Infrastructure (HCI). These solutions incorporate compute, storage and networking in commodity hardware, making them a simple way for businesses to reap the benefits of software-defined data center infrastructure. One chief draw of HCI is that it is modular and highly scalable, which allows organizations to deploy just a few nodes to start and then increase their investments over time in response to changing demands. Because HCI typically takes far less time and effort to stand up than traditional IT infrastructure, organizations can rapidly expand their environments when needed.

The simplicity of HCI can also provide cost savings, in part because of decreased management burdens. Some organizations report that their total cost of ownership can be 30 percent lower for an HCI cluster than for comparable traditional infrastructure. Additionally, HCI’s scalability enables organizations to fund their investments essentially through strategic planning that improves outcomes and controls costs.
an operational expense model — allowing them to make only a small upfront investment and then pay for additional resources as needed. This approach mirrors the subscription or pay-per-use financing model of public cloud resources; and, indeed, HCI is a central component of many organizations’ hybrid cloud environments.

The Path to SDx

While SDx solutions are meant to simplify the lives of IT professionals, data center administrators may at first find themselves overwhelmed by the array of available options. Any number of tools may yield significant benefits for an organization, but it can be difficult to pinpoint which will be the best fit to help an organization achieve its unique objectives. For an SDx deployment to succeed, the ecosystem must be programmable through application programming interfaces, and infrastructure choices should enable this. Ideally, the number of APIs needed to support the new environment should be kept to a minimum, to avoid introducing unwanted complexity into solutions meant to simplify IT infrastructure.

When considering their environments and how to tie infrastructure together, organizations face an important choice at the outset of the process: to build or to buy. It is certainly possible for seasoned data center administrators to purchase SDx components separately and then build out a software-defined environment by bringing these pieces together with an effective, integrated design that plays to the strengths of each solution. Organizations also have the option to buy preconfigured solutions that deliver SDx capabilities out of the box. VMware Cloud Foundation and Dell EMC VxFlex are two examples of such preconfigured solutions.

VMware Cloud Foundation is a hybrid cloud platform for managing virtual machines and orchestrating containers, built on full-stack hyperconverged infrastructure. The single architecture makes the solution simple to deploy and enables consistent, secure infrastructure and operations across both private and public cloud environments. Because the infrastructure leverages HCI, VMware Cloud Foundation integrates compute, storage and networking in a single solution, eliminating the need for data center administrators to individually source and integrate these components. The solution also consolidates traditional virtual machines and modern container workloads, and it improves application performance and resiliency through load balancing of resource pools across all environments. Organizations that adopt VCF can use VMware vRealize Automation as a front end to provide policy and governance from end to end. The vRealize Automation Cloud Management Platform delivers IaaS and Platform as a Service (PaaS) as a Service self-service to IT development teams via the integrated Cloud Assembly infrastructure-as-code multicloud provisioning service, as well as the Service Broker self-service product catalog and the Code Stream application release automation service.

Cisco Hyperflex is a hyperconverged platform designed as an end-to-end software-defined infrastructure. Cisco designed the platform to simplify deployment, management and support, enabling control that extends beyond the data center to multicloud environments and to the network edge. HyperFlex systems support a variety of applications and workloads no matter where they reside — in an enterprise data center, private or public cloud, or at the edge in a remote location. The solution deploys Cisco Unified Computing System (Cisco UCS) servers and fabric to deliver both software-defined processing and networking (and integrates smoothly with Cisco’s Application Centric Infrastructure SDN products). It also provides software-defined storage via Cisco HyperFlex HX Data Platform software. IT administrators can take advantage of cloud-based management of their SDx environment delivered through Cisco Intersight management as a service. “Together, these elements comprise an adaptive infrastructure that lets you integrate easily with your existing infrastructure,” Cisco states. “The result is a cluster that comes up and configures itself in an hour or less and that scales resources independently to closely match your application resource needs.”

A “buy” approach typically leads to a smoother implementation path but that doesn’t mean a “build” approach is wrong for every organization. Indeed, many organizations can achieve cost savings and deploy infrastructure that is an exact fit for their environments by building out their own solutions. For instance, by building their own HCI nodes using
commodity hardware and designing their own environments to meet specific needs, organizations can sometimes save money both on infrastructure and on software licensing. The challenge, however, is that this approach often results in a slightly more complex architecture, which can lead to configuration problems if organizations are not careful. Many enterprises lack the internal expertise needed to use scripting tools or cloud management solutions to create a layer of governance for their IT infrastructure. To take advantage of the benefits of a “build” approach — without introducing errors — many organizations opt to work with a trusted partner on design and implementation.

Regardless of whether organizations build or buy their new software-defined environments, these investments should ultimately achieve the goals of automation and orchestration within the data center. Automation refers to the execution of individual tasks without human intervention. Within the data center, it typically applies to highly repeatable processes, such as the creation of new virtual machines. Orchestration, meanwhile, refers to the oversight of multiple automated tasks to deliver business value. While SDx technologies deliver automation and orchestration by design, IT service management can help organizations to optimize solutions to take full advantage of these benefits.

For many organizations, the goal of SDx is to create a hybrid cloud or multicloud environment that integrates on-premises IT infrastructure with cloud resources, so that all of these environments function together as a unified pool of resources that can be centrally managed and deployed. Cloud management solutions such as VMware vRealize and Cisco CloudCenter Suite can help organizations to achieve this level of integration.

As organizations consider SDx investments, they must assess their current IT environments, identify their objectives and build a roadmap toward their goal states.

---

**We Get Software-Defined**

With a large and experienced staff of IT infrastructure and industry experts, CDW can help organizations of all sizes to optimize their IT environments with SDx solutions.

CDW’s solution architects can help business and IT leaders to better understand their existing environments, including inefficiencies and security vulnerabilities.

CDW’s experts work alongside internal IT staffers and line-of-business stakeholders to determine specific technical requirements to support organizations’ business goals. Then, they take a comprehensive approach to identifying data center technologies that will best help each organization to meet its IT and business needs.

Many organizations rely on CDW’s team of certified technicians to assist with configuration, custom imaging, asset tagging and tracking, implementation of new solutions, and data migration.

We also offer workshops and assessments to help you understand your situation, including:

- Cloud readiness assessments
- Network assessments
- Automation and orchestration workshops

**CDW Can Design, Orchestrate and Manage a Comprehensive Infrastructure Strategy**

CDW’s simple, smart, scalable and flexible services portfolio provides a fully automated and managed infrastructure across your entire network, whether on-premises, hybrid or in the cloud.

**DESIGN for the Future**

Consult with our team of technology experts to plan a solution that fits your unique needs and optimizes business impact.

**ORCHESTRATE Progress**

CDW Amplified™ Infrastructure services help you build and deploy your custom infrastructure utilizing best practices.

**MANAGE Operations**

Our world-class, certified staff monitors and manages your infrastructure 24/7/365 to ensure operational efficiency and security.

---

Sponsors

Cisco Partner

Citrix

F5

VMware

Want to learn more about how CDW can help you solve business problems with a software-defined IT infrastructure? Visit our Amplified™ Infrastructure services page.