Converged systems have matured into robust platforms that offer substantial benefits, including the right mix of operational and capital efficiencies. This IDC Technology Spotlight outlines the ways converged systems are evolving to support critical business workloads in today's modern cloud-connected world.

**Leveraging Modern Converged Systems to Drive IT Automation and Cloud Operations**

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**Introduction**

Information technology (IT) has been a critical component in the success of businesses around the world for many years. The degrees to which today's organizations can be competitive and ultimately profitable have become inextricably linked to decisions made within their datacenters. Companies have spent many years optimizing their datacenters to maximize service levels, eliminate inefficiencies, and reduce risks within their business. And while companies have seen real returns on these investments, they have relied too heavily on silos of infrastructure and experts who are not well suited to the needs of highly dynamic applications being deployed today. IDC believes the IT industry is going through a rare transformational period that is making such datacenter inefficiencies and silos untenable. These transformational changes are driven, in part, by the global shift toward a truly digital economy that is providing companies with the ability to rethink the products and services they bring to market, how they compete in a world with a changing set of competitors, and how they reach an expanding set of customers.

As such, companies are demanding more from their IT departments than had been expected just a few short years ago. IT departments must now be key stakeholders to important organizational goals such as profitability, time to revenue, mining corporate data for valuable insight, and aligning customer experiences with expectations. IT departments are, in turn, looking to new types of datacenter infrastructure that:

» Leverage automated management tools for greater business agility

» Efficiently scale to support new resource-intensive applications

» Seamlessly incorporate the use of public (or hybrid) cloud

» Accommodate a vast amount of data from the edge

» Use artificial intelligence and machine learning (AI/ML) for data-driven business decision making

In short, IT organizations around the world are shifting their resources toward technologies and reporting structures that eliminate datacenter silos and help focus on business-centric rather than infrastructure-centric decisions.
Benefits and Historical Role of Converged Systems

Removing silos of heterogeneous infrastructure with a consolidated and consistent platform has the obvious benefit of reducing capex and opex. By eliminating discrete hardware and software resources to monitor and manage, IT can reallocate its human resources to more creative projects that advance business initiatives. However, one must be careful that the new consolidated platform doesn't result in new complexities, additional risks, or extra management costs.

There is a proven solution that meets such requirements: converged systems. At a broad level, vendor-provided converged systems represent a consolidation of disparate datacenter technologies that can be acquired, utilized, managed, and supported as a single system. Such systems are designed to be deployed quickly using a modular building block approach including compute, storage, and data protection; networking equipment; and core system infrastructure software for centralized management and automation.

The converged systems market has grown to become a multibillion-dollar market because the benefits provided by these solutions have closely aligned with operational simplicity demands. Cumulative global spending on converged systems surpassed $88 billion over the past 7.5 years that IDC has tracked the market (see Figure 1). Converged systems were originally developed as an alternative to traditionally deployed infrastructure that had become synonymous with management complexity. Much has changed since the early days of this market. Converged systems have matured into robust platforms that offer substantial benefits, including the right mix of operational and capital efficiencies. These on-premises datacenter systems have also incorporated some of the best features of public cloud, thus enabling IT teams to create a seamless, hybrid cloud environment — the de facto architecture for digital transformation. Today, enterprises can implement a private cloud in the datacenter using converged systems integrated with multiple public clouds to create a seamless hybrid cloud environment.

**FIGURE 1: Historical and Forecast Spending on Worldwide Converged Systems**

![Graph showing historical and forecast spending on worldwide converged systems from 2012 to 2023.](source: IDC, 2020)
The Changing Landscape of Converged Systems

Converged system solutions have evolved steadily over the years, with each iteration offering improvements over its predecessors. New generations of converged systems are adding new capabilities and improving upon existing features in many (if not all) of the following ways:

- Removing or reducing complexities related to initial design and deployment of infrastructure
- Ensuring system interoperability, compliance, and optimization by simplifying and automating lifecycle management
- Leveraging software-defined technologies to help reduce initial footprints and scale seamlessly
- Integrating tightly with critical business workloads to avoid interruptions to business productivity
- Automating complex or repetitive tasks to reduce risk of human error and further improve opex
- Increasing the degree to which systems are managed holistically with the broader IT environment and existing workflows
- Supporting cost-effective, reliable business continuity by integrating data protection and disaster recovery solutions
- Leveraging next-generation flash technology and data efficiency tools to support high-performance applications and reduce datacenter resource consumption (e.g., energy and floor space)
- Incorporating cloud operations and seamless connections between multiple cloud environments
- Integrating SaaS-based, predictive analytics for system monitoring, analyzing, and troubleshooting

Considering Dell Technologies VxBlock 1000

Dell Technologies' portfolio of converged solutions goes back to the very early days of the market when EMC (now Dell EMC), Cisco, and VMware collaboratively introduced the Vblock System. The company recognized the growing need to improve operational simplicity related to datacenter infrastructure. Dell's early move within the converged systems market, combined with the status of the company as a trusted global supplier of datacenter infrastructure, has resulted in a long-lived leadership position. Indeed, Dell's converged systems business accounted for 36.7% of the company's $12.5 billion in market value during the nine months ending September 30, 2019.

Today's Dell EMC VxBlock converged systems offer a broad set of technologies able to support diverse datacenter environments and workloads. Each VxBlock is a complete "datacenter" system that lets companies procure, deploy, manage, scale, and refresh core datacenter infrastructure as a single system. Dell designs, fully integrates, and tests each VxBlock System before it ships. With customer input, Dell also configures each system to accept production workloads upon delivery. For operations and lifecycle management, Dell provides single-call support and ongoing pretested firmware and software upgrades for all components.
Over the past 10 years, IDC surveys of VxBlock users have shown that the systems greatly reduce the time IT staff spend on time-consuming, high-risk infrastructure management tasks such as system maintenance, configuration management, change management, provisioning, and patching. These users have reported that VxBlock Systems enabled them to better deliver and run modern applications that are core to their businesses. User quantification of VxBlock benefits included:

- 52% less time keeping the lights on
- 66% more efficient IT operations
- 61% lower cost of operations
- 8 months to payback
- 640% five-year ROI
- 99% less unplanned downtime
- 33% increase in number of new applications per year
- 29% improved application performance
- 30% faster execution of business transactions
- 29% reduced time to run analytical queries

VxBlock Systems are designed to meet the demanding needs of critical business workloads such as applications based on SAP, Oracle, SQL, VDI, and AI/ML; they also support VMware virtualization, Kubernetes, containerization, and bare-metal servers. Because VxBlock is built with enterprise-class compute, storage, data protection, and networking equipment in a scalable, high-availability architecture, it is typically deployed as a platform for consolidating mixed types of critical business workloads and can be leveraged for general-purpose and data analytics workloads. VxBlock Systems are often used in tandem to modernize production and disaster recovery datacenters.

In 2018, Dell Technologies introduced VxBlock 1000, the fifth generation of its converged systems and a major product refresh that:

- **Simplified the VxBlock Systems portfolio.** The new product release moved away from multiple models (each with a particular storage array technology designed for meeting specific workload and business requirements) to a single, more flexible multi-array (and multi-compute) technology capable of supporting all workloads and business requirements.

- **Improved technology choice and system longevity.** VxBlock 1000 uses a new perpetual architecture that concurrently supports multiple types of storage, compute, network, and data protection technologies at the time of purchase while allowing the incorporation of future technologies that can scale or swap out nondisruptively over time.
» Supported efficient and greater scaling of performance and capacity. Customers are able to mix multiple types of enterprise servers, storage, and data protection within a single VxBlock System that can start small and scale independently as needed.

» Improved agility. Adaptive pools of resources are provided that can be apportioned to a diverse set of workload profiles and adjusted to meet changing workload and business requirements.

» Simplified tasks related to lifecycle management. The system uses a single upgrade and patching process for all technologies within the system that are fully tested for interoperability assurance.

To provide a resource pool for mixed workloads, the system can be configured with up to five types of storage arrays, numerous hardware and software data protection appliances, blade and rackmount servers, and LAN/SAN options including NVMe. Starting small, it can expand to 1,120 servers and 100+ petabytes of storage.

Taking advantage of the VxBlock 1000's perpetual architecture, Dell has rolled out a number of new technology components since the 2018 launch of the VxBlock 1000 and has provided a robust roadmap map for new technology introductions. Table 1 shows VxBlock 1000’s currently supported components.

### TABLE 1: VxBlock 1000 Supported Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPUTE</strong></td>
<td>Mixed blade servers and rack servers in one system is supported.</td>
</tr>
<tr>
<td>Cisco UCS chassis</td>
<td>5108</td>
</tr>
<tr>
<td>Cisco UCS B-Series blade servers</td>
<td>2000 M5 - 6440 M5</td>
</tr>
<tr>
<td>Cisco UCS C-Series rack servers</td>
<td>C220 M5 - C420 M5 - C480 M5</td>
</tr>
<tr>
<td>Cisco Fabric Extenders and IOMs</td>
<td>Nexus 2242F6 - Nexus 2342LPx</td>
</tr>
<tr>
<td>UCS 2204XP - UCS 2260XP - UCS 2304XP - UCS 2408</td>
<td></td>
</tr>
<tr>
<td><strong>MAXIMUM NUMBER OF SERVERS</strong></td>
<td></td>
</tr>
<tr>
<td>Cisco chassis</td>
<td>88</td>
</tr>
<tr>
<td>Cisco blade servers</td>
<td>up to 616</td>
</tr>
<tr>
<td>Cisco rack mount servers</td>
<td>up to 1,120</td>
</tr>
<tr>
<td><strong>NETWORKING</strong></td>
<td></td>
</tr>
<tr>
<td>LAN</td>
<td>Cisco Nexus 9336C-FX2</td>
</tr>
<tr>
<td>SAN</td>
<td>Cisco MDS 9148T - 9398T</td>
</tr>
<tr>
<td>Management Connectivity</td>
<td>Cisco Nexus 3110S7T-C, Nexus 9336C-FX2</td>
</tr>
<tr>
<td><strong>STORAGE</strong></td>
<td>Mixed multiple storage options and types in one system is supported.</td>
</tr>
<tr>
<td>Dell EMC Storage</td>
<td></td>
</tr>
<tr>
<td>Unity All-Flash 356F - 450F - 556F - 650F</td>
<td>PowerMax 3000/800 and VMAX All-Flash 2500/500</td>
</tr>
<tr>
<td>Unity Hybrid 300 - 500 - 600</td>
<td>XenlIO X2-S - X2-R</td>
</tr>
<tr>
<td><strong>VIRTUALIZATION</strong></td>
<td></td>
</tr>
<tr>
<td>VMware</td>
<td>vSphere Enterprise Plus (includes VDS) - NSX - ESXi - vCenter Server (bare metal also supported)</td>
</tr>
<tr>
<td><strong>DATA PROTECTION</strong></td>
<td></td>
</tr>
<tr>
<td>Dell EMC</td>
<td></td>
</tr>
<tr>
<td><strong>MANAGEMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Compute</td>
<td>AMP Central for multi-system management includes 4 to 16 C220 M5 servers and a Dell EMC Unity hybrid storage array AMP-3S for single-system management support only includes 2 to 16 C220 M5 servers and a Dell EMC Unity hybrid storage array</td>
</tr>
<tr>
<td>Network TDR</td>
<td>Network TDR: Cisco Nexus 3110S7T-C - Nexus 83232C</td>
</tr>
<tr>
<td>Software</td>
<td>VBlock Central with optional Workflow Automation, Advanced Analytics and Lifecycle Management software - Unisphere - InsightIQ (island) - Secure Remote Services (SRS) - Cisco UCS Manager - Dell EMC PowerPath</td>
</tr>
<tr>
<td><strong>CABINET</strong></td>
<td></td>
</tr>
<tr>
<td>Intelligent Physical Infrastructure (IPI) solution</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Dell Technologies, 2020*
VxBlock Technologies Built In for Hybrid Cloud Operations
VxBlock 1000 users can leverage the system’s storage arrays and data protection appliances to operate a hybrid cloud environment. The native features of these components are often used for backup, replication, and disaster recovery between VxBlock Systems at primary and secondary datacenters. They can also be leveraged in conjunction with managed service providers and hundreds of public cloud providers worldwide (including the hyperscalers: Amazon, Google, and Microsoft Azure). Hybrid cloud scenarios with the cloud-enabled VxBlock include cloud backup, automated disaster recovery, elastic compute services, data analytic services, and long-term data retention.

Integration of VxBlock Central and VMware’s vRealize Suite
VxBlock 1000 expands the benefits offered by its enterprise-class building blocks by tightly integrating VxBlock Central software with VMware’s vRealize cloud management software suite. The integration of these monitoring, management, and orchestration software products results in the set of tools discussed in the following sections.

VxBlock Central
VxBlock Central is a real-time dashboard that provides holistic monitoring of operations within a centralized environment. Users can start within VxBlock Central to see full system status, facilitate lifecycle upgrades, and quickly launch VMware vRealize Orchestrator (for automation tools) and vRealize Operations (for analytics tools). Full system status includes inventory of components, parent-child dependencies, operational health, and compliance with best practice firmware and software release levels. The dashboard displays real-time health and release-level compliance alerts that can be shared and escalated through SMS, email, and API integration with other tools, such as ServiceNow.

VxBlock Central Workflow Automation
VxBlock Central Workflow Automation is a "plug-in" for VMware’s vRealize Orchestrator tool that can eliminate many manual tasks required to configure and modify VxBlock 1000 compute, storage, or networking resources. It delivers a growing library of engineered workflows to the VMware vRealize Orchestrator dashboard, where operations staff initiate automation. These workflows automate in minutes daily administrative tasks that would otherwise take hours to do manually, such as adding new servers, expanding and configuring storage capacity, and setting up an end-to-end service including VMs, servers, network, and storage.

VxBlock Central Advanced Analytics
VxBlock Central Advanced Analytics is a "management pack" for VMware’s vRealize Operations tool, managing the VxBlock 1000 system holistically to ensure workload health, capacity, and performance. This integration delivers analytics in a single vRealize converged dashboard so that operators don’t have to search separate compute, storage, and network tools to visually correlate data from all the VxBlock components. IT teams can now see trends related to the infrastructure performance and capacity of each virtual machine (VM) so they can adjust compute and storage before workloads are impacted by a scarcity of resources; they can also see heat maps and alerts for troubleshooting and resolving conditions that have already impacted workloads. There are also deep integrations of third-party management tools for SAP, Oracle, and SQL — the foundation for many critical business applications — with vRealize Operations. Having a common monitoring dashboard for databases and applications, VMs, and the underlying VxBlock infrastructure offers VxBlock users additional operational efficiencies.
**VxBlock Lifecycle and Cloud-Based Management Directions**

Dell Technologies’ Release Certification Matrix (RCM) methodology provides full-stack firmware and system software release upgrades validated for interoperability. Users can sustain VxBlock components as a single system with significantly less effort and risk of outages than if upgrading separately purchased technology stacks.

The company recently introduced VxBlock Central Lifecycle Management (LCM), a new modular approach for sustaining converged infrastructure with more flexibly and the ability to define the scope of each upgrade. For example, LCM will provide validated releases that can be applied to a single component or groups of components as well as the full stack. This increased granularity and flexibility are designed to make technical upgrades and security patches faster and maintain various component groups at different release levels to suit users' unique technical and business requirements.

LCM release is the first step in Dell Technologies' strategy to offer users a cloud-based management option for VxBlock Systems. LCM is delivered via Dell EMC CloudIQ, a cloud-based storage monitoring service currently handling more than 32,000 storage systems worldwide for 5,500 organizations. Dell Technologies' long-term strategy is to evolve VxBlock Central services with CloudIQ to provide richer converged systems monitoring, interactive analytics, and lifecycle management automation.

**Challenges**

The use of converged systems as a platform for digital transformation and on-premises private clouds has become a key source of demand for these solutions, which represents a new challenge for industry stakeholders. While digital transformation and private cloud implementations look set to drive the next wave of datacenter convergence, such projects are likely to be far more complex and challenging than past market drivers. Technology suppliers such as Dell Technologies and others that want to help customers through this shift will need to show that they understand the changes driving the need for foundational transformation and intend to be true partners throughout the journey.

**Conclusion**

Companies around the world have invested a total of $49.9 billion on converged systems over the past five-and-a-half years. The driving forces behind the adoption of enterprise converged systems have changed several times since these solutions first surfaced nearly a decade ago. Very early adoption of converged systems was driven by companies looking for a platform to consolidate physical and virtual environments that expanded to take up vast amounts of datacenter space. Demand for converged systems then shifted to environments looking for a solution that could provide new levels of operational simplicity and agility while helping reduce risk related to lifecycle management. This remains a critical driver of adoption today, but IDC now sees a sharp increase in the use of converged systems as a platform for digital transformation and on-premises private clouds.
About the Analyst

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Eric Sheppard is a Research Vice President within IDC's Enterprise Infrastructure Practice, covering research on Enterprise Storage Systems, Enterprise Storage Software, Converged Systems, and Hyperconverged Infrastructure. Eric manages IDC's Worldwide Quarterly Disk Storage Systems Tracker, IDC's Worldwide Storage Software QView, and IDC's Worldwide Quarterly Converged Systems Tracker. This broad storage coverage coupled with his extensive international storage market experiences gives him a unique understanding of the many market forces affecting the storage software market. In addition to these responsibilities, Eric frequently contributes to primary research and custom storage projects and regularly presents market trends at industry events.

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