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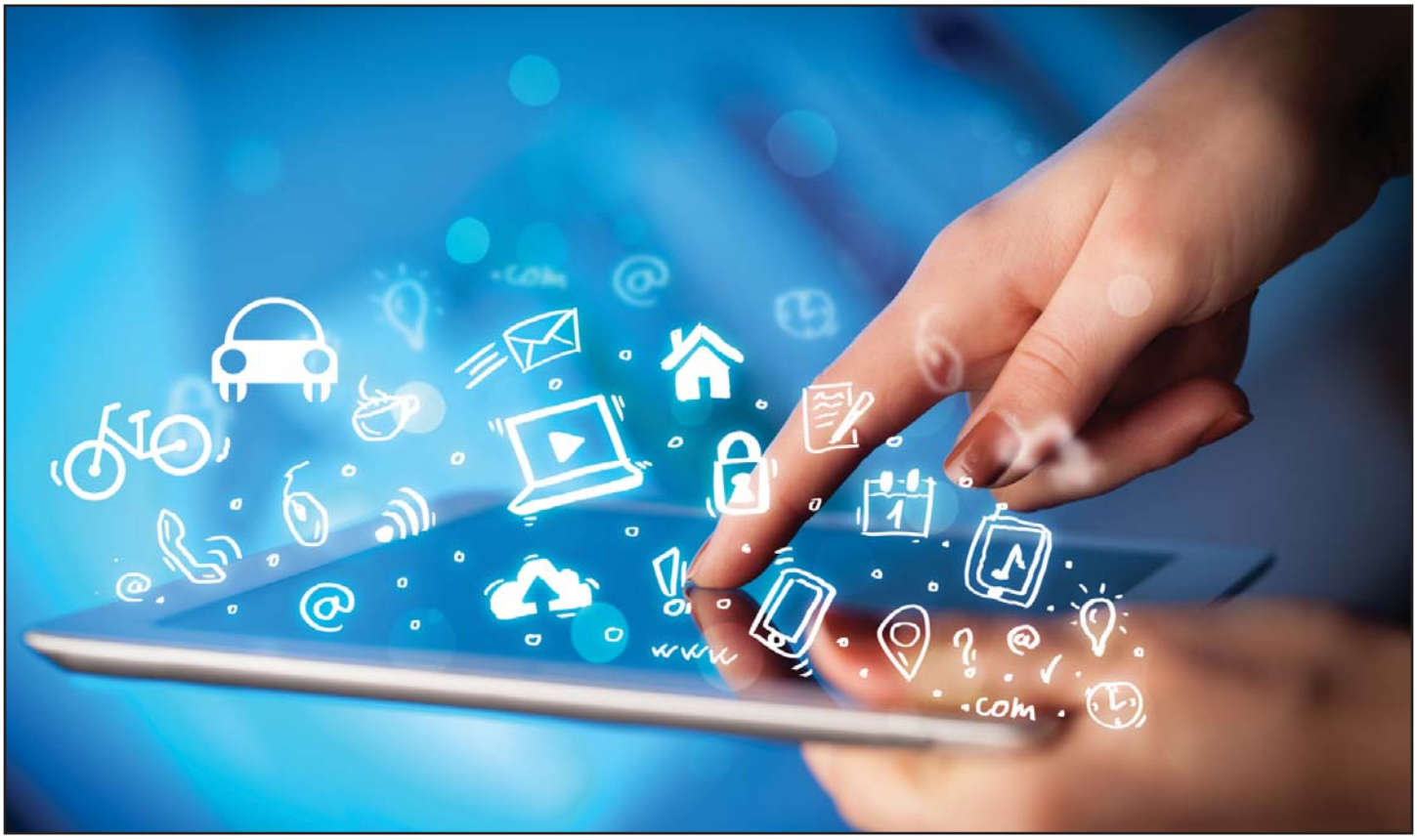

Supporting the Internet of Things

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The Internet of Everything (IoE) involves building valuable network connections between people, processes, data and things. Making this a reality requires entirely new levels of automation and fluidity throughout the network. The Cisco Open Network Environment (ONE) lays the foundation for the IoE by allowing applications and the network to talk to each other in new ways. Cisco ONE goes beyond the basics offered by Software-Defined Networks (SDN) to create a more fully integrated and dynamic solution. The result is a simplified mobile, video or cloud user experience that delights customers and helps service providers reduce their overall investment.

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Sigma Uptime

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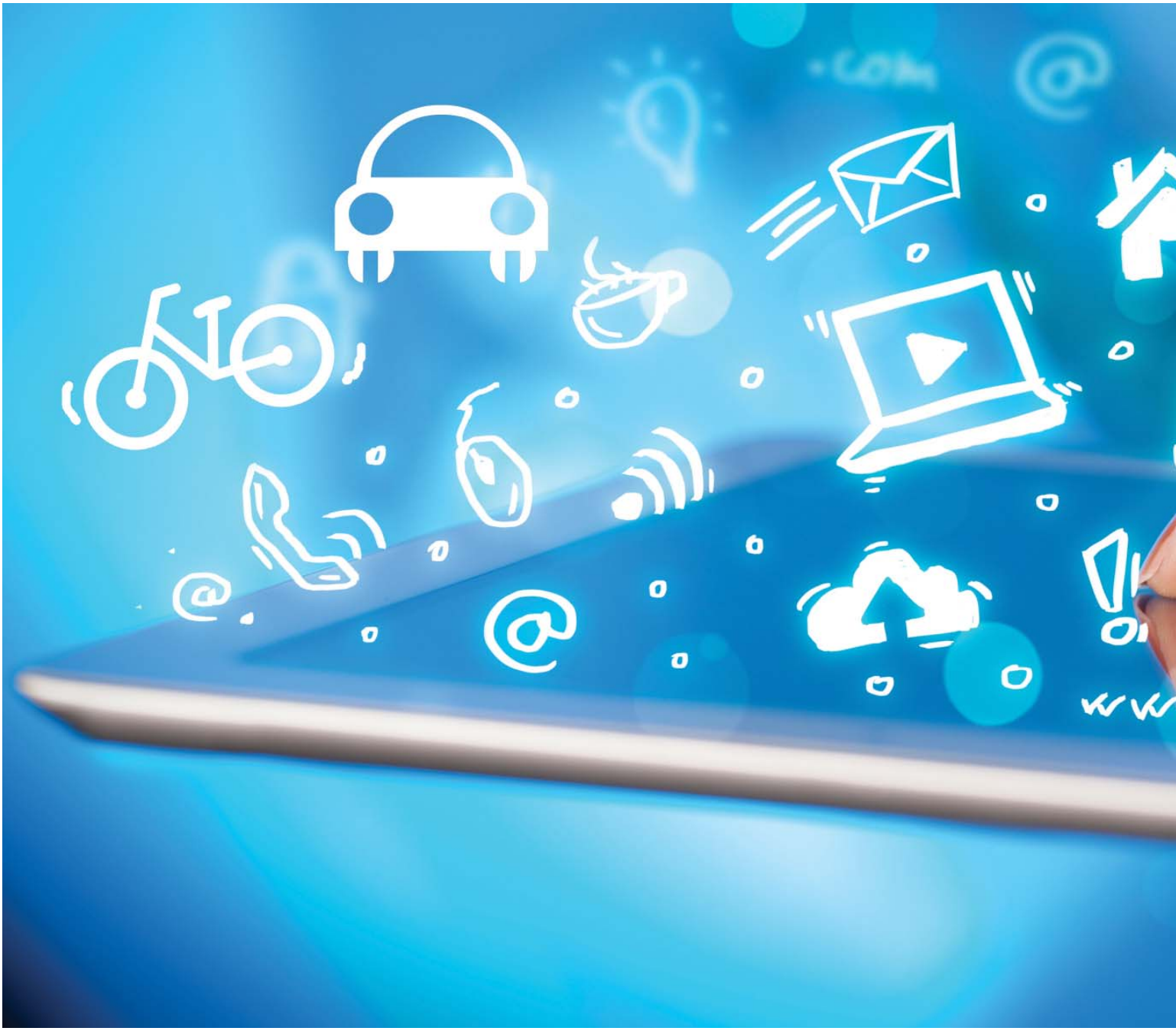

How Will You Support the Internet of Things?

Software-defined networking will enable organizations to manage billions of network-connected objects and tap the 'big data' they will generate.

In tthe so-called "Internet of Things" (IoT), billions of objects ranging from automobiles and airplanes to video games and vending machines will be fitted with embedded technology and linked through wired and wireless networks via the Internet Protocol. There is no shortage of hype surrounding the IoT — one tech executive has called it "the biggest business opportunity in the history of people" — but beneath the hyperbole is an undeniable technology trend with far-reaching implications.

The possibilities for such technology seem practically limitless, with promising use cases in healthcare, manufacturing, farming, transportation and, well, just about anything you can name. It's no longer merely conceptual, either: the IoT is here, now.

Gartner analysts say the IoT already has nearly 3 billion connected devices and will grow to more than 26 billion by 2020 — and that's not counting PCs, tablets and smartphones. Gartner predicts IoT will generate $1.9 trillion in global economic value by 2020, while analysts at IDC peg global revenues in the same year at $8.9 billion.

What those numbers fail to show is the very real impact the IoT will have on enterprise networks. A recent study by Infoblox suggests that existing networks aren't ready to take on the demand that will accompany this

explosion in connected devices. While 86 percent of IT professionals say they understand what will be required of their networks for IoT deployments, 57 percent reported that their current network is already at full capacity and 54 percent see network infrastructure management as an issue for their organizations.

"Network managers are facing the same challenges that system administrators saw when virtualization became prevalent," said Shannon Gillenwater, Product Development Manager, Sigma Solutions. "System administrators who managed dozens of systems were suddenly managing hundreds in a virtualized environment. Network administrators who are now managing hundreds of devices will soon be responsible for thousands when the IoT takes off."

In order to cope with the onslaught, organizations will need a fresh approach to network architecture. That's why the IoT, "big data" and related trends are driving strong interest in software-defined networking (SDN).

Network Management Nightmare

Development of the IoT has been spurred by a number of factors, including the huge increase in IP addresses enabled by the IPv6 standard. Improvements in wireless networking technology and the greater standardization of communications protocols also have been important, as has the development of low-power, small-core microchips that deliver more processing capabilities for smaller devices.

But from a network administrator's perspective, the IoT is an impending management nightmare that makes Bring Your Own Device (BYOD) seem like a cake walk. In addition to managing and securing thousands of devices, administrators will face unprecedented network complexity and scale.

"Traditional network management tools and processes simply won't be able to cope," Gillenwater said. "Organizations looking to capitalize on the IoT will need highly automated approaches to network provisioning, configuration and management."

SDN seems made to order for the IoT. SDN essentially moves the "control plane" of the network away from each individual router and switch on the network to a controller that works with all the devices. It breaks the existing physical boundaries on these devices, making it possible to dynamically define all aspects of the network through software.

"The IoT involves not only billions of devices but multiple wireless access technologies, including Wi-Fi, ZigBee, cellular and Bluetooth, and multiple routing protocols that must be seamlessly integrated into a communication platform," said Gillenwater. "The network will by nature be dynamic, heterogeneous and geographically distributed. Quality of Service requirements will vary depending upon the device and its assigned task. SDN will enable organizations to create a flexible, adaptive network that can respond efficiently to these highly complex and constantly changing requirements."

As a leading champion of the IoT, Cisco has extended its Application Centric Infrastructure (ACI) solution to create an end-to-end SDN architecture designed to meet these demands. The Enterprise Module of the Cisco Application Policy Infrastructure Controller (APIC) gives IT organizations complete visibility into their networks, automating network and policy configuration while managing applications across the WAN and access networks.

Blazing the Trail

According to Gartner, industries leading the way in IoT adoption are manufacturing, healthcare and insurance. The firm says the manufacturing sector will benefit from producing billions of devices and from more efficient tracking of materials and components leading to cost efficiencies. In healthcare, smart slippers and other wearable devices contain sensors that detect falls and various medical conditions and can alert a doctor via email or text message if something is amiss. The insurance industry is exploring sensors in cars in order to provide "pay as you drive" insurance that links the insurance premium to the individual's risk profile.

The transportation and logistics sectors are also among early adopters of the technology and could soon move to the forefront of IoT development, according to Frost & Sullivan analysts. The business consulting firm says the deployment of low-cost, IP-enabled sensors within "things" that move products around as well as within the products themselves creates significant revenue opportunities. For example, the Airbus A380 wide-body airliner has components fitted with sensors to monitor wear and tear in real time. This continually generated data allows Airbus to maintain a dynamic maintenance process and optimize performance.

These automated processes handle the repetitive, device-by-device operational work that is estimated to occupy as much as 90 percent of a network administrator's time, making the IoT feasible.

Really Big Data

The next greatest challenge associated with the IoT will involve the capture, storage, management, analysis and retention of the massive amounts of data generated by all of these connected objects. Think "big data" on steroids.

Organizations can't store exabytes or even zettabytes of data in one gigantic data warehouse — information is far more likely to be locked in a variety of different applications and stored as unstructured files. The first step will be to aggregate the information to be analyzed. Once aggregated, informatics and data science come into play. These disciplines use software and mathematics to discover patterns in the data that humans cannot perceive.

Because this software requires significant processing power, multiple servers are harnessed in a massively parallel application. Data must be transferred to the servers for processing, placing a heavy burden on network resources and creating a bottleneck that slows processing speeds. In some instances, data transfers account for more than half of big data processing time, limiting the ability to capture real-time analytics.

"Big data analytics requires a network that can intelligently scale to meet the bandwidth demands of these data transfers," Gillenwater said. "Because SDN creates a more agile, responsive network, servers and storage communicate more efficiently. Studies have shown that SDN can reduce big data processing times by 40 percent to 70 percent. In fact, the performance gains are so significant that big data may serve as a catalyst for SDN adoption, particularly when coupled with IoT applications."

The Internet of Things is still in its infancy, and it remains to be seen if it will truly become the next great engine of economic growth. However, it is at the very least a disruptive technology that is likely to drive widespread changes and present organizations with numerous challenges and opportunities.

"Many IT organizations are already struggling with the size and complexity of their networks due to the manual device-by-device operational work associated with traditional network architectures," said Gillenwater. "SDN can help eliminate these bottlenecks, and enable organizations to exploit the promise of the IoT."

Counting Costs

Consider many metrics when evaluating TCO of unified communications systems.

The modern workforce has a multitude of business communication and collaboration tools at its disposal, but many of these key tools still tend to exist independently of each other. IP-based unified communications (UC) systems unite telephony, email, voicemail, messaging, mobility, conferencing and more into a single, coherent communications solution.

Although UC systems have been around for nearly 10 years, adoption rates have never really met expectations. A 2013 survey by the IT education company Webtorials found that only 21 percent of companies had fully adopted unified communications.

Sticker shock has been one obstacle to UC adoption. As with any shift to new technology, there are significant upfront costs involved in the move to an IP-based communication infrastructure. Whether organizations are making their first move into Voice over IP (VoIP) or upgrading to a fully integrated UC platform, the shift often involves considerable hardware and software purchases.

However, organizations must be careful that their focus on price does not make them blind to value. In a benchmarking study of the total cost of ownership (TCO) for unified communications, Aberdeen Group analysts found that buyers typically place too much emphasis on upfront cost when evaluating UC systems and vendors.

The Big Picture

While procurement and implementation costs certainly need to factor into the equation, this approach fails to take into account potential long-term operational, maintenance and network savings that can easily offset upfront costs. Aberdeen recommends a more thorough analysis of TCO metrics to establish a clear cost structure.

"Total cost of ownership represents a holistic measure of the complete financial impact associated with the unified communications purchase decision and should be the most important issue for any IT financial stakeholder purchasing a new system," said Hyoun Park, Aberdeen research analyst. "To uphold corporate fiscal and governance responsibilities, decision-makers must fully examine all significant upfront and recurring costs to identify the UC solution offering the greatest value throughout the entire lifespan of the solution."

Even if the goal is to simply reduce communications costs, organizations must consider all factors that impact TCO. To build an accurate TCO calculation, it's important to look beyond the sales proposal in order to balance the short-term costs with long-term operational savings.

Factors to Consider

The 2013 Nemertes Research benchmarking study of IP telephony TCO separates cost data into three categories:

• **Capital:** Includes servers and other data center hardware, software licenses, and desk phones or other endpoint devices.

• **Implementation:** Includes internal staff time and third-party systems integrators and consultants.

• **Operational:** Includes staff time, training and certification plus maintenance contracts and third-party support.

The Nemertes study suggests that product and implementation costs are generally known and fairly consistent, while operational costs can vary significantly from vendor to vendor. Buyers need to evaluate real-world data related to implementation and operations to calculate TCO. For example, a hybrid system with inexpensive digital phones might reduce upfront costs but could wind up limiting access to the full range of UC solutions and benefits.

Even basic UC systems should provide voicemail, email, unified messaging, and web and audio conferencing as components. However, organizations must consider if they are willing to incur higher upfront costs to gain access to emerging components may well be mission-critical in the near future. These elements include a robust mobile client, enterprise-grade videoconferencing, document-based collaboration and social media integration.

Complexity is another important TCO consideration. Mobility, collaboration and videoconferencing applications have greater network overhead than apps such as email and instant messaging. The increased network engineering and monitoring requirements result in increased TCO.

Network readiness also must be evaluated. Implementing VoIP may require upgrades to improve bandwidth and server resources. A poor network design could negate many of the benefits an organization expects to realize from UC.

The Value Proposition

While a host of factors can impact the cost of a UC deployment, organizations must also have a good understanding of the potential value. Long-distance savings has always been one of the chief selling points of IP communications, and while that can be significant in some organizations, it isn't the only way VoIP and UC deliver value. An IP-based system with centralized call control can also reduce trunking, maintenance and staffing costs.

Improvements in processes and productivity may be harder to quantify but are significant nonetheless. A recent survey sponsored by Sonus Networks attempted to identify those savings. Technology decision-makers at 267 large enterprise organizations responded that a fully functional UC infrastructure could improve productivity of selected tasks by 23 percent. By recovering 1.21 hours per employee per day, the average savings is roughly $13,000 per year per knowledge worker employee.

"Our communication modes have been discrete for too long, and the opportunity to bring them together to drive personal productivity is immense," said Wes Durow, Sonus marketing VP.

Businesses today require multiple communications technologies to operate effectively. VoIP-based unified communications systems can integrate, coordinate and manage those technologies for maximum benefit. With so much at stake, those considering a UC system should avoid the temptation to make a decision based solely on upfront costs. By looking at the big picture and analyzing long-term operational costs, organizations will be able to calculate TCO and make the smartest possible decision.

Software-Defined Networks to Boost UC?

Two key groups of communication technology leaders have established a collaborative relationship with the intent of integrating software-defined networks (SDN) into unified communications (UC) platforms. The Unified Communications Interoperability Forum (UCI Forum) and the Open Networking Foundation (ONF) have identified several areas of mutual interest.

The groups plan to research and publish use cases that leverage SDN architectures and protocols to enhance or enable UC, demonstrate the effective deployment of UC solutions supported by SDN architectures, and identify a basic framework for a common northbound interface for UC applications.

SDN separates physical network devices that route data through the network from the policies that dictate how the data packets are routed, making it possible to centrally control and manage network resources. SDN is considered a natural fit with IP communications since both rely on an architecture of higher-level control manipulating lower-layer resources. SDN vendors are already announcing integrations between SDN controllers and IP communications servers, which could allow organizations to control and allocate network resources more effectively and efficiently for UC applications.

"The UCI Forum is pleased to be working with ONF, and we see this relationship as a great way to support SDN integration into UC," said Matt Collier, president of UCI Forum.

Breaking Down Storage Silos

Storage volumes are not mushrooming as rapidly as they were in 2005 and 2006, when annual growth rates ranged from 59 percent to 65 percent. Nevertheless, storage capacities continue to increase 33 percent to 40 percent each year, creating operational and management headaches for companies around the globe.

Legacy storage infrastructures make it difficult for IT to accommodate unpredictable data growth and meet changing demands quickly and cost-effectively. As such, IT managers have been forced to create storage silos to meet the different performance and capacity requirements of various types of applications within the data center. While much storage capacity remains underutilized, IT managers frequently overprovision storage in order to handle spikes in demand.

"Adding spindles to keep up with performance demands causes storage costs to skyrocket and leads to heavier administrative workloads. The problem is particularly acute when organizations overprovision flash for performance-centric applications," said Elias Khnaser, CTO, Sigma Solutions. "Organizations need performance at scale — the storage infrastructure must be able to handle I/O bursts even when nearing capacity."

Nimble Storage has introduced groundbreaking new technology that enables enterprises to meet performance and capacity requirements for any workload in virtualized data centers and cloud environments. Nimble's Adaptive Flash platform dynamically and intelligently allocates storage resources to meet diverse and stringent application demands on a single platform. By minimizing performance and capacity tradeoffs, Adaptive Flash enables the consolidation of all workloads and eliminates storage silos.

Nimble's new Adaptive Flash platform delivers performance at scale, reducing costs, increasing utilization and eliminating overprovisioning.

Balancing Flash and Disk

Adaptive Flash is based upon Nimble's patented Cache Accelerated Sequential Layout (CASL), a CPU-driven architecture that eliminates dependence on disk spindles, and InfoSight, the company's automated cloud-based management and support system. The platform is engineered to efficiently provide organizations with the highest levels of performance. Along with integrated data protection and predictive support, Adaptive Flash gives organizations the confidence to deploy and seamlessly scale their storage infrastructure as their business grows.

Nimble's Adaptive Flash platform provides the performance of flash-only arrays and the capacity of hybrid arrays. The company's new CS700 Series array can handle a variety of performance-intensive enterprise workloads, such as large-scale VDI deployments and high-transaction-volume databases, as well as other performance-intensive server virtualization workloads such as Microsoft Exchange.

The new All-Flash Shelf delivers up to 500,000 IOPS, 64TB of flash storage

and a petabyte of capacity. It provides the flexibility to scale flash gradually up to 16TB per node, or 64TB in a four-node scale-out cluster, delivering industry-leading flash densities. Both of these new products are able to deliver leading performance by leveraging CASL.

"Application workloads that require lots of performance and relatively little capacity will migrate more toward all-flash array architectures, and those applications that require lots of capacity and relatively less performance will probably find hybrid array architectures more cost-effective," said Eric Burgener, research director, IDC. "Solutions like Nimble's new CS700 and All-Flash Shelf give customers significant leeway in establishing the ratio between SSDs and HDDs to offer the flexibility necessary to accommodate a wide range of mixed data center workloads."

Controlling Costs

Although performance-intensive applications benefit from residing on flash, many organizations are simply unable to maintain a flash-only environment. The performance benefits of flash come at a steep price, making it impractical for all but a handful of enterprise applications. Nimble uses data analytics to determine the optimal approach to scaling flash and capacity, enabling organizations to mix flash and disk without creating additional complexity within the storage infrastructure.

The Adaptive Flash platform leverages InfoSight to recommend the exact amount of resources required as application demands change within an enterprise, while delivering excellent storage health and operational efficiency. In addition, Nimble's scale-to-fit approach allows the non-disruptive addition of resources, thus avoiding overprovisioning, underutilization and increased costs.

Nimble built its CASL software architecture from the ground up, with design elements such as fully redundant hardware, no single point of failure and non-disruptive upgrades. Each of these features addresses today's availability challenges, enabling Nimble to provide greater than "five nines" (99.999 percent) of system availability.

"Today's hybrid and flash-only products force enterprises to create storage silos, resulting in increased costs and management complexity," said Dan Leary, vice president of worldwide marketing, Nimble Storage. "Our Adaptive Flash platform will demand the storage industry rethink the way flash can be leveraged within data center and cloud environments. We've built a solution that can span a larger set of workloads with more performance and cost efficiency than any other flash solution on the market."

Your solution to the cloud puzzle

CloudSource from Sigma Solutions

The benefits of cloud computing have been well established, but implementation challenges continue to perplex many organizations. Sigma Solutions' new CloudSource offering is designed to put all the pieces in place for a robust cloud solution. Leveraging partnerships with key cloud vendors, Sigma Solutions provides access to best-of-breed cloud services and architectures, which are combined with our own professional services in a comprehensive cloud delivery package. We'll help you determine the proper cloud strategy, migrate to the most appropriate environment and manage the infrastructure on an ongoing basis. Contact us today to learn more!

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