

HIGH-DENSITY ENERGY-SMART

storage helps reduce
cost of Backup Infrastructure



Introduction

MORE BACKUP CAPACITY AND PERFORMANCE IN LESS DATA CENTER REAL ESTATE SOUNDS IRRESISTIBLE

Ballooning data growth and ever shrinking IT budgets push higher-density disk arrays to the forefront for organizations contemplating investment in new backup solutions. The promise of more backup capacity and performance in less data center real estate sounds irresistible to anyone seeking greater efficiency and cost-effectiveness from their existing IT infrastructure.

But focusing on a single storage criterion is simply not enough; a disk array can offer exceptional density but still fail to satisfy the space efficiency, performance, power consumption and reliability requirements of its users. More storage capacity in less data center space with greater efficiency and lower organizational costs requires a high-density disk array, specifically designed to address challenges with power consumption, heat, vibration and other issues that are inherent in such solutions.



Massive Data Growth Projected

From 2013 to 2020, the digital universe will grow by a factor of 10 – from 4,098 exabytes to 40,978 exabytes. It more than doubles every two years.

THE DATA CENTER POWER / DENSITY PARADOX

Designing and building efficient, reliable storage arrays that can be packed far more tightly with disk drives is not nearly as straightforward as some vendors might have you believe. The notion that high-density backup arrays are mere commodities, essentially interchangeable except for their prices, is both inaccurate and potentially very costly to any organization that buys into it.

The mechanical and electrical design challenges: vibration, high temperatures, excessive power consumption, laborious disk replacement, that high-density backup arrays present are daunting, and they become significantly more difficult as storage density increases.

The total amount of power an equipment rack uses has grown with denser packaging; higher density translates into higher kW per rack. Many data centers were built at a time when 2-3kW of power consumed per rack was common, and there existed more than enough power capacity to support them. But in recent years the average power requirement per rack has doubled to 6-8kW, and can reach as high as 15kW for very dense packaging. Buildings with infrastructures designed 10 years ago are now reaching their power capacity limits in terms of

how many storage racks they can support...while data continues to increase at exponential rates.

Hence the paradox: By trying to solve a space problem, high-density solutions end up creating an entirely new problem...inadequate power. As most facilities don't have enough available power to expand, organizations are then left with few alternatives as they walk through a now-spacious data center that has run out of electrical capacity.

So what can IT professionals do to mitigate this paradox? The answer is obvious: deploy high-density disk arrays that have been purpose-built to provide superior power efficiency. Not only will this increase data center ROI by enabling more racks (and disk capacity) to be deployed in the available floor space, it also delivers a less-intuitive cost benefit thanks to the "cascade effect."

Data Protection Capacity to Mushroom

IDC expects capacity growth for disk-based data protection and recovery hardware will increase by a 21.9 percent CAGR, totaling 15.1EB (exabytes) at the close of 2017.

THE BENEFITS OF REDUCED POWER USE

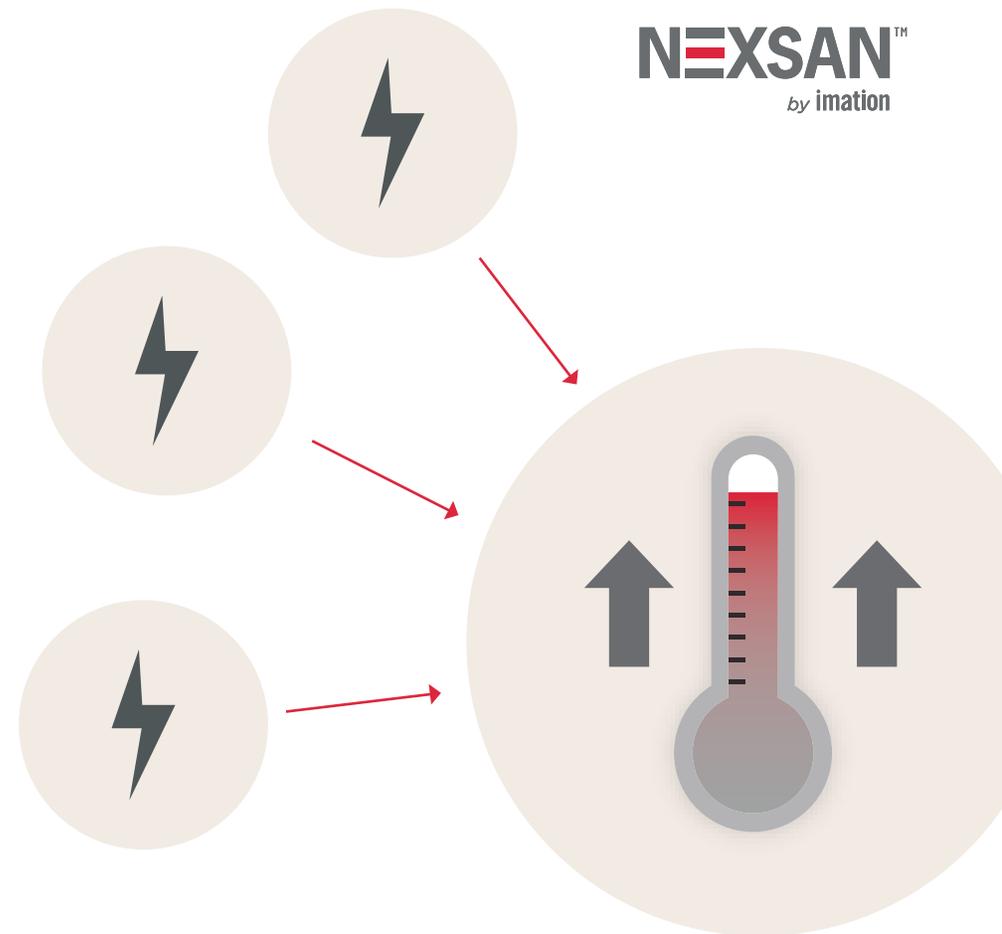
Energy Efficiency and the Cascade Effect

For every 1 watt reduction at the component level (processor, memory, hard disk and so forth), there is an additional 1.84-watt savings on the energy bill. This is known as the cascade effect, and is the result of inefficiencies—or loss of power—from power supplies, power distribution systems, UPS systems, cooling systems, building entrance switch gear, medium-voltage transformers, etc.

Power Makes Heat, Heat Makes Trouble

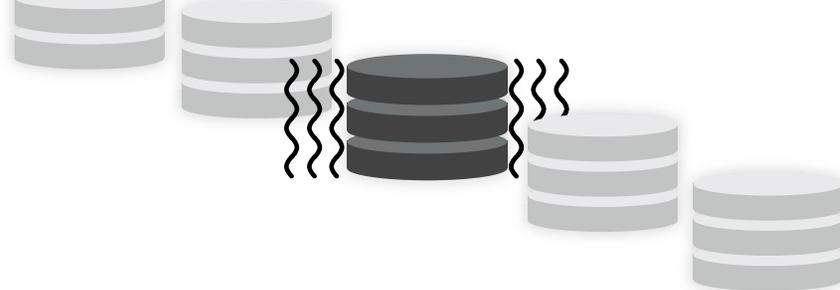
Heat generation, heat transfer, overall airflow and management...all are key considerations when designing an effective high-density disk array.

Preventing heat is more efficient than dissipating it (fans consume power to get rid of heat that is generated by consuming power), and it minimizes the degree to which fans exacerbate another threat to high-density disk array reliability—vibration.



Paucity of Protection

In 2013, while about 40 percent of the information in the digital universe required some type of data protection, less than 20 percent of the digital universe actually had these protections.



THE BENEFITS OF REDUCED POWER USE

Vibration: Nemesis of High-Density Storage

Rotational vibration (RV) is generated by all disk drives, stemming from the two motors (spindle and actuator) within the units. Vibration can disrupt alignment between the head and tracks, forcing the drive to recalibrate itself before it attempts to read or write data; this significantly reduces net throughput performance.

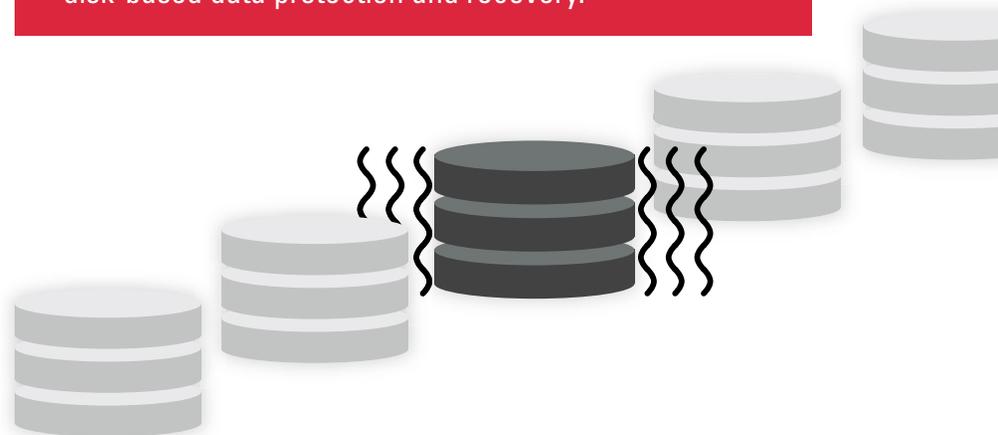
There are several steps that can be taken to address this challenge. First, high-density backup arrays should employ enterprise-class disk drives with superior RV tolerance, which will help to ensure more precise positioning of the read/write head over a platter's data tracks.

Second, the drives should be installed using vibration-dampening bracketry, and mounted within the enclosure in such a way that the vibration of adjoining drives is out-of-sync with its neighbors, thus ensuring their respective vibrations tend to cancel each other out rather than reinforce them (similar in concept to noise-cancelling headphones).

Furthermore, cooling fans can be a significant source of vibration, particularly when they are run at high speed to help alleviate excessive system operating temperatures. The solution is to reduce disk drive power consumption, which decreases the heat generated by the drives and thus enables the fans to run more slowly (which then produce less vibration and use less energy).

Disk-Based Data Protection Revenues Growing

IDC projects that nearly 25 percent of the total revenue in the worldwide disk system market will be used for disk-based data protection and recovery.



NEXSAN E-SERIES: HIGH-DENSITY BACKUP DONE RIGHT

The various challenges posed when designing a reliable and efficient high-density backup array are significant, but they can be resolved with innovative approaches and technologies that address energy consumption, heat management and vibration control. While many vendors are unwilling to make the costly commitments that such solutions demand, Nexsan E-Series refuses to compromise.

Manufacturing high-density disk arrays for over a decade, Nexsan has acquired a wealth of experience that enables it to provide high-density backup solutions with an unrivaled combination of reliability, energy efficiency, capacity, performance and flexibility. The E-Series maximizes backup array storage density and power efficiency in a minimal footprint, consuming less than one-third the power and one-third the rack space of conventional backup arrays, thus dramatically reducing backup infrastructure costs.

Available in configurations that hold up to 60 disk drives (with the option to add expansion units), E-Series high-density arrays complement this enormous available capacity with the ability



to mix and match capacity-optimized HDDs, performance-optimized HDDs and SSDs to accommodate primary or secondary storage applications. This flexibility is only possible because, unlike many other vendors' high-density arrays, the E-Series is purpose-built to deliver extraordinary reliability when operating under 24x7 enterprise-class workloads.

Overcoming the challenges presented by high-density disk arrays (for example, the power/density paradox discussed earlier) requires a thorough understanding of the technical issues involved...and the engineering expertise to design innovative solutions to those issues.

SMARTER ENERGY SAVINGS

Nexsan AutoMAID[®] (Automatic Massive Array of Idle Disks) is a power-saving technology designed to manage energy consumption through a comprehensive policy-based approach. AutoMAID[®] has the ability to spin down drives to lower energy consumption between data references. When configured for Level 1 operation AutoMAID[®] delivers sub-second response times to the first I/O request, and remains at full power for every subsequent I/O request until enough idle time has elapsed to activate AutoMAID[®] energy savings once again.

AutoMAID[®] disks have five power management states

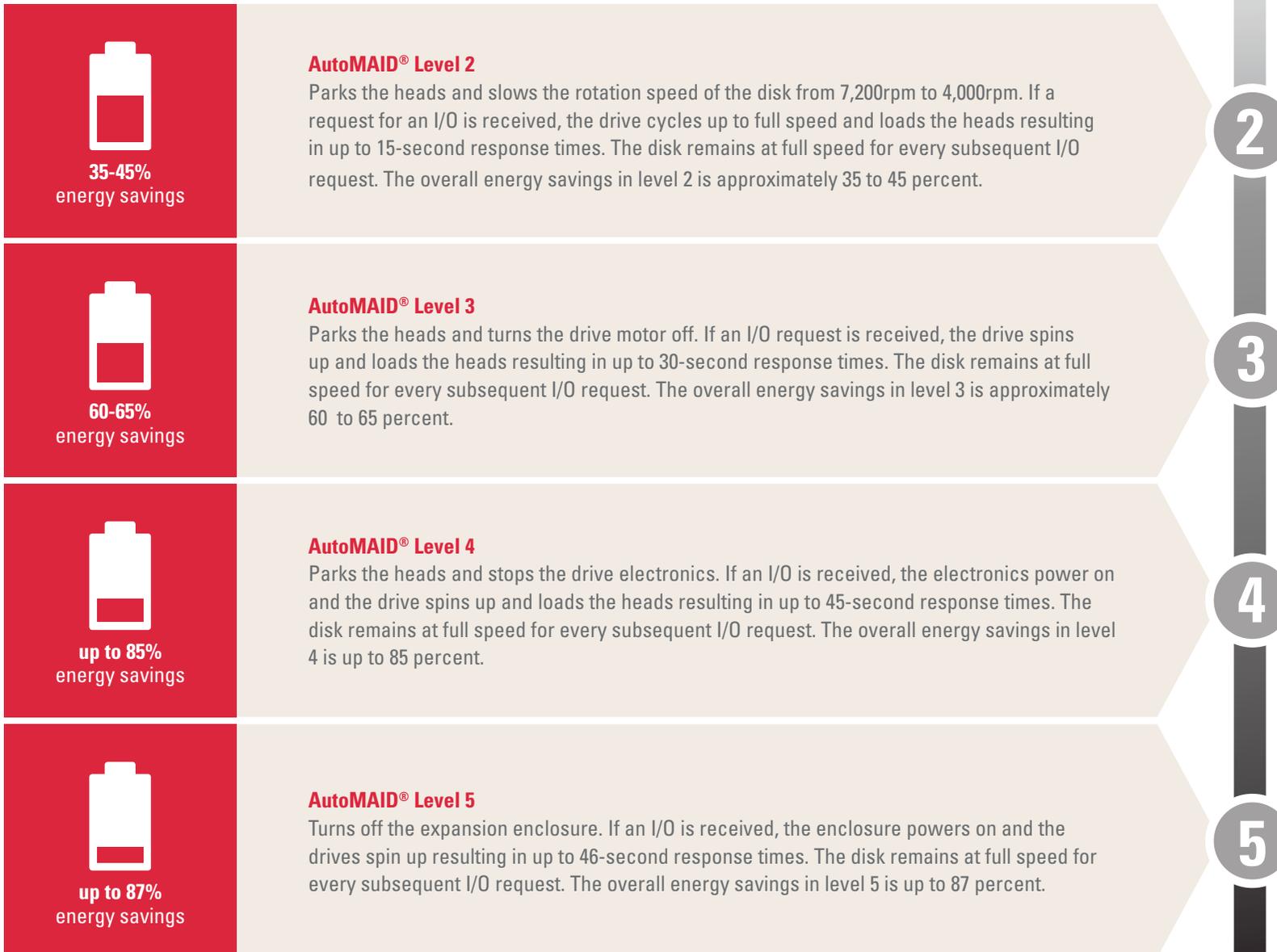


15-20%
energy savings

AutoMAID[®] Level 1

Parks the heads and powers them down by policy or command. However, the actual drive continues to spin at full speed. If a request for an I/O is received, the heads simply wake up and load data with under 1-second response times and remain at full speed for every subsequent I/O request. The overall energy savings in level 1 is approximately 15 to 20 percent.

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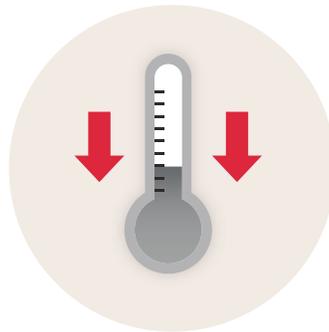


ADDITIONAL BENEFITS OF NEXSAN E-SERIES



COMPREHENSIVE ANTI-VIBRATION

To combat the performance and reliability degradation caused by excessive vibration in high-density arrays, Nexsan employs Anti-Vibration Technology which includes installing drives in sturdy drawers, mounting those drives in counter-rotating couplets to counteract vibration of the adjacent drive, isolating groups of drives and utilizing vibration-deadening hardware.



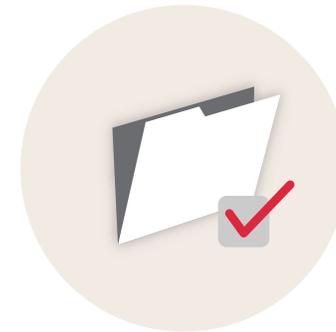
ADVANCED COOLING FEATURES

Nexsan Cool Drive Technology™ uses Pulse Width Modulation (PWM) speed-controlled fans that push air over the components from a fan in the front, additional fans that pull air out the back, and well-engineered air channels that go straight from the front to the back of the chassis, providing superior cooling for each drive. Mounting the drives in counter-rotating couplets also ensures that cooling airflow specifically targets the hottest parts of each drive (the electronics).



EASIER SYSTEM MAINTENANCE

Servicing of drives or fans can be accomplished by just pulling out a drawer—**while the system is being actively used, and with no downtime required.**



SUPERIOR DISK DRIVE RELIABILITY

Nexsan's commitment to reliability includes stress-testing disk drives before they are installed in E-Series disk arrays, and testing again after installation to screen out sub-par drives. Nexsan has achieved **one of the lowest drive failure rates in the industry—just 0.03 percent—** while the industry average is approximately 4 percent.

MAKE THE THEORETICAL BENEFITS OF HIGH-DENSITY ARRAYS A PRACTICAL, COST-EFFECTIVE REALITY

The allure of high-density backup solutions is undeniable; offering the ability to deploy far more storage capacity in less data center space, they hold out the promise of greater efficiency and lowered costs to organizations of every size. However, achieving those benefits requires a high-density disk array that has been specifically designed to address challenges with power consumption, heat, vibration and other issues that are inherent in such solutions.

Nexsan E-Series high-density arrays comprehensively solve those challenges by incorporating intelligent power management capabilities. They deliver greater reliability, lower operating costs and less drain on data center electrical capacity. Innovative cooling and anti-vibration technologies further enhance reliability, and ensure consistent performance.

Simply put, the Nexsan E-Series makes the theoretical benefits of high-density arrays a practical, cost-effective reality.

Want to hear more on this topic? [Download the full white paper.](#)



ABOUT IMATION

Imation is a global data storage and information security company. Imation's Nexsan portfolio features solid-state optimized unified hybrid storage systems, secure automated archive solutions and high-density enterprise storage arrays. Nexsan solutions are ideal for mission-critical IT applications such as virtualization, cloud, databases, and collaboration; and energy efficient, high-density storage for backup and archiving. There are more than 11,000 customers of Nexsan solutions worldwide with more than 37,000 systems deployed since 1999. Nexsan systems are delivered through a worldwide network of cloud service providers, value-added resellers and solutions integrators.

For more information, visit www.imation.com/nexsan.

