Networked Storage Brawl

Pick A NAS With Some Sass

As the price of a hard drive storage falls, adding extra capacity to your desktop for music and movies becomes less painful. What really hurts, though, is when a hard drive failure takes your MP3 collection or library of high-def transcodes with it. Sure, you could protect against a crash by doubling up on disks and tapping into the RAID 1 functionality that's likely built into your motherboard already. But such a strategy will only take care of one PC at a time, and by the time you're done, you still end up with important files scattered all over the house.

The answer is centralization via networked storage. Pull the Word essays and Excel budget sheets from the workstation in your office. Grab the home movies and photo albums from the HTPC in the living room. Back up the music on your Zune. Get everything in one place, streaming all of those files across a Gigabit network (even 802.11g wireless works for watching a movie), and you've simultaneously taken care of organization and protection. The technology pays for itself, especially given the low price of high-speed routers and switches enabling snappy performance across the house.

We've rounded up five NAS devices ranging from diskless enclosures priced just north of $100 to tricked-out multidrive setups tipping the scales at $1,000. All but one center on Gigabit Ethernet. Of course, if you're loath to spend hard-earned cash on what essentially amounts to a miniaturized PC, we'll also talk about the ups and downs of rolling your own storage box.

StorCenter ix2
$479
Iomega
www.iomega.com

The StorCenter's chassis is incredibly small, which makes for a compelling reason to buy your next NAS instead of building one using leftover PC hardware.

How We Tested

Benchmarking networked storage is tricky business. There are innumerable workloads you could apply to a NAS drive to test its performance and yet not once convey a result that makes real-world sense. Intel saw this issue and developed its own software environment to generate meaningful scores and facilitate deep analysis. The NAS Performance Toolkit (www.intel.com/design/servers/storage/NAS_Perf_Toolkit.htm), as Intel calls it, measures the performance of HD video and recording over a network. It can emulate a scheduled backup, mimic the content creation behavior of a video-editing app, or simply tax the file transfer capabilities to and from a networked appliance. In order to evaluate the storage devices in this roundup, we ran the full battery of tests in Intel's Toolkit on a Core i7 965 Extreme platform with 6GB of DDR3-1333 on the 64-bit build of Windows Vista. All of the results you see are reported in MBps. Naturally, higher is better.

Iomega StorCenter ix2

We tend to exercise caution when looking at storage hardware with capacity already built in. After all, the prices on complete NAS systems don't tend to fluctuate, while hard drives have become incredibly cheap very quickly. At $479, (and figuring $220 in cost at today's prices for the drives themselves), you're paying just over $250 for Iomega's hardware and technology. That's not altogether bad considering the StorCenter ix2's user friendliness.

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

The StorCenter's chassis is incredibly small, which makes for a compelling reason to buy your next NAS instead of building one using leftover PC hardware. Basic power and activity lights on the front are easy to interpret, while power and reset buttons on the back are clearly labeled. Iomega includes two USB 2.0 ports and one Gigabit Ethernet port. When you attach a printer to one of those USB ports, an integrated print server shares it with other networked systems.

You won't find much documentation detailing the StorCenter's hardware platform, so we took our sample apart in order to investigate. Of course, the two 1TB hard drives take up most of the device's tiny chassis. A single PCB mounted atop the disks hosts Marvell's 88F5182 Feroceon storage and networking SoC (system-on-a-chip). Although the component runs as high as 500MHz, Iomega clocks the Feroceon at 400MHz and attaches 128MB of DDR to its integrated controller. The StorCenter uses 4MB of Spansion flash memory to hold its lightweight firmware, which is easy to access and configure. (Configuring the NAS itself is also a piece of cake.)

Despite the 88F5182 Feroceon's long list of system-oriented features, it isn't the most advanced storage platform. As a result, Iomega only makes two operating modes available: RAID 1 and JBOD. It follows, then, that the StorCenter ix2 is positioned as a backup device first and foremost. To that end, Iomega includes a copy of EMC's Retrospect Express software.

More advanced users will appreciate some of the content-sharing and interoperability features. For instance, UPS compatibility enables unattended system shutdown without risking data loss should the power go out. Indexing support delivers keyword searches inside Acrobat, Word, and Excel files. Moreover, an integrated UPnP media server works with DLNA (Digital Living Network Alliance)-certified media players streaming content to consoles, digital picture frames, and audio players.

The only real problem we see with streaming high-bitrate data is the StorCenter's transfer performance. In almost every one of our tests using Intel's NAS Performance Toolkit, throughput lagged behind competing NAS devices by a significant margin. Perhaps most worrying are the HD playback and recording numbers. Although you could undoubtedly store Blu-ray-quality video on the StorCenter ix2 and stream it to a playback device, accessing two streams would likely affect playback in a negative way. Four streams would almost certainly wreak havoc on frame rates, according to our bandwidth figures.

At the end of the day, we think Iomega's StorCenter is a sharp-looking component able to handle backup. It doesn't include a wide range of features, nor is its performance particularly noteworthy. However, its simple configuration routine and bundled EMC Retrospect Express software do endear it to mainstream buyers looking to simply centralize data without any frills.

Netgear ReadyNAS Duo

Netgear is best known for its networking hardware, but that didn't stop the company from acquiring Infrant Technologies back in 2007 and assimilating the latter's storage product family. The ReadyNAS lineup spans inexpensive home devices to enterprise-class rack-mounted chassis running Linux. If you want to play at the high end, a 1U, 4TB array costs right around $3,000. The ReadyNAS Duo is a *tad* more affordable, available for as little as $400. At that entry-level price point you get 500GB of capacity from a single drive—no RAID. Should you decide to spring for a second disk of the same capacity, Netgear's X-RAID feature will automatically mirror data onto the second drive to protect against a mechanical failure.

We have a bit of a conundrum, though. Let's say you add another hard drive for $80, enabling RAID 1 functionality with 500GB of total capacity and taking you to the same $480 price tag as Iomega's StorCenter. Because the Iomega's offering includes a pair of 1TB drives, it holds a clear capacity advantage. What makes the ReadyNAS Duo worth just as much with half of the space? We'll cut right to the numbers on this one: Performance is what sets Netgear's offering apart.

Although the ReadyNAS Duo only has one hard drive installed by default (compared to high-end units, such as Western Digital's ShareSpace, which has four disks in RAID 5), it's able to lay down faster scores than either the StorCenter ix2 or the ShareSpace. Only the two enclosures that shipped without disks are able to push more bandwidth. If speed is a factor

Netgear's X-RAID feature will automatically mirror data onto the second drive to protect against a mechanical failure.

ReadyNAS Duo
$399.99
NetGear
www.netgear.com
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in your NAS purchase, then the ReadyNAS' performance might make up for what it gives up in capacity. Of course, you could always just spring for the 1TB version, which sells for $679.99. But let's face it: 500GB isn't worth a $280 markup.

Beyond its smoking performance, Netgear's entry-level NAS is also more configurable than the Iomega unit, thanks to a storage-oriented hardware platform. If you open the left side panel, you'll see the logic board's backside with a 256MB DDR400 SO-DIMM attached. The other side of the PCB boasts an IT3107 network storage processor originally designed by the Infrant team. Using the IT3107, Netgear is able to tack on 64MB of NAND flash memory for the appliance's operating system, three USB 2.0 ports (supporting flash and hard drives, printers, and battery backup systems), and Gigabit Ethernet.

Three applications complement the hardware package: RAIDar, Netgear's discovery utility; NTI Shadow, a backup app that is compatible with Windows or Mac OS X; and the advanced Web-based setup routine. Enthusiasts with a basic understanding of networking technology will have no trouble discovering the ReadyNAS Duo, configuring its services, creating shares, and mapping drives without needing to consult a manual.

MobileSTOR MS2UTN+
$142
Sans Digital
www.sansdigital.com
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Simplicity is perhaps the MobileSTOR's most defining attribute.

The biggest reason to buy Netgear's NAS is its speed. We're a little uneasy about the single drive installed by default. With storage prices where they are now, it makes more sense to advocate network storage as a means to protect important data around the house. And with just one hard drive vulnerable to failure, you don't achieve that until you add a second drive. The ReadyNAS Duo's price seems a bit high, but the 500GB model is available online for roughly $50 less than its MSRP.

Sans Digital MobileSTOR MS2UTN+

As the only non-NAS enclosure in this roundup, Sans Digital's MobileSTOR MS2UTN+ can still be used as a central repository for surrounding workstations if you configure it as a direct-attached (connected to a particular workstation) device shared over the network. Granted, this configuration introduces its own interesting complications, such as additional loading on the workstation's host processor and saturation of that machine's network connection as client systems access it. But at a

Network Attached Specs

	Iomega StorCenter ix2	Netgear ReadyNAS Duo	Sans Digital MobileSTOR MS2UTN+	Synology DS209+	Western Digital ShareSpace
HDD trays	Two	Two (One empty)	Two	Two	Four
RAID modes supported	RAID 1, JBOD	RAID 1, JBOD	Spanning, RAID 1, RAID 0, SAFE33, SAFE50, JBOD	RAID 0, RAID 1, JBOD	RAID 0, RAID 1, RAID 5
Host interface	GbE, USB 2.0	GbE, USB 2.0	USB 2.0, eSATA	GbE, USB 2.0, eSATA	GbE, USB 2.0
Max capacity	2TB	500TB	2TB	3TB	4TB
Warranty	One year	Three years	One year	Two years	Three years
Weight	4.85lbs.	4.56lbs. (empty)	3.8lbs. (empty)	2.16lbs. (empty)	10.78lbs.
Additional features	EMC Retrospect Express Backup w/ unlimited licenses	Hot-swappable trays, NTI Shadow backup software	Auto-rebuilding, 80W PSU, RAID alarm, 1.6-inch fan.	AJAX-based management console, Synology backup software	Push-button USB transfer; network backup software (3 licenses)
Price	$479	$399	$142	$489	$999
CPUs	●●◖	●●●◖	●●●	●●●●◖	●●●◖

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price under $150 for the empty enclosure, DAS sounds mighty appealing.

Simplicity is perhaps the MobileSTOR's most defining attribute. The cube-shaped enclosure is incredibly compact, yet it sports two hot-swappable 3.5-inch hard drive trays released by sticking a paper clip inside the bay (similar to the latch on a powered-down optical drive). Despite its size, the MS2UTN+ still weighs almost 4 pounds as a result of its beefy metal frame. Three LEDs and a mute button adorn the enclosure's front, reflecting power, thermal status, and the health of your RAID array. If there is an alarm, you can acknowledge and silence it with the mute button.

Flip the box around and you'll see its two available interfaces: eSATA and USB 2.0. Without question, the 3Gbps eSATA connection is your best bet for aggressive performance. USB 2.0 maxes out at 480Mbps, capable of bottlenecking fast drives in a striped array. The back of the unit also has a knob responsible for setting the device's operating mode. Its seven positions really only correspond to five actual modes: Big (spanning), JBOD, FAST (RAID 0), SAFE (RAID 1), SAFE33, and SAFE50. SAFE33 creates two drive volumes, where the first third is mirrored and the remaining capacity is spanned, and SAFE50 creates a 50/50 split.

We didn't bother dismantling the MobileSTOR, which is fairly effectively sealed up, but Sans Digital tells us the MS2UTN+ is powered by a Silicon Image 5744 chipset. The SteelVine storage processor, as Silicon Image calls it, handles the onboard RAID processing. There's also an internal 80W power supply, which is more than ample for driving a pair of SATA hard drives and the box's own internals.

To test the MobileSTOR's performance, we connected it to the eSATA port on Asus' Rampage II Extreme motherboard. Although the enclosure also works with Linux and Mac OS X, we stuck to benchmarking under 64-bit Vista using Intel's NAS Performance Toolkit. Take a look at the benchmark chart and notice that the MS2UTN+'s transfer rates are substantially higher than any of the other units. This is because the scores reflect transfer rates over a direct, 3Gbps eSATA connection. Sharing the drives over a network for remote clients to access will add a layer of overhead and take a toll on throughput. So, with Sans Digital's MobileSTOR hooked up to a workstation directly, expect performance that paces the speed of an internal disk. However, as networked storage shared through a workstation, we think you'd be better served by a dedicated NAS drive not reliant on a host workstation for suitable performance and uptime.

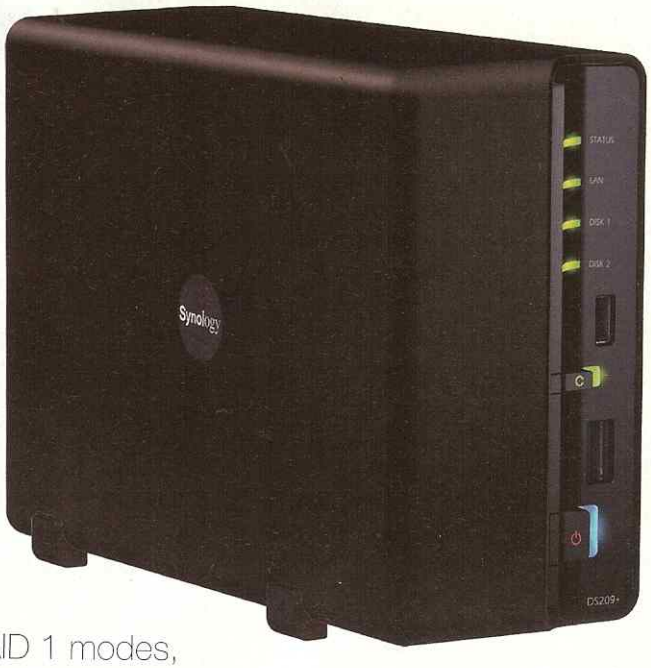
At its stock price of $142, the MS2UTN+ ships sans hard drives. Our review unit included a pair of 750GB Seagate Barracudas. For the sake of comparing this enclosure's value to its networked competition, we'll consider adding a pair of 1TB Barracuda 7200.11s to its bottom line at $109 each. So, for just over $350, you get up to 2TB of capacity (or 1TB if you prefer data protection via RAID 1) in a DAS box that performs admirably as a local storage space connected via eSATA.

Synology Disk Station DS209+

You don't want to go through the trouble of rolling your own NAS out of leftover PC parts, but the idea of paying inflated prices for a box with disks already installed offends your delicate power user sensibilities. Meet Synology's Disk Station DS209+. As a NAS enclosure with two vacant drive bays, you might be wondering how Synology can get away with charging $489—more than Iomega's 2TB StorCenter. In short, the DS209+ is a significantly more powerful appliance.

Under its hood are an 800MHz processor and 512MB of DDR2 memory. We're not sure who makes the CPU (its heatsink didn't want to come off), but a connected 4-port PCI-E Marvell SATA controller suggests that the SoC is more advanced than any other processor we've discussed. The rest of the enclosure's features are fairly standard fare: two internal SATA connectors, one external eSATA connector, three USB 2.0 ports, and Gigabit Ethernet.

There's only so much you can do with two hard drives; Synology supports RAID 0 and RAID 1 modes, taking full advantage of the hardware available. Best of all, you're the one who decides whether to install 750GB disks, or if there's a



Disk Station DS209+
$489
Synology
www.synology.com
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Synology supports RAID 0 and RAID 1 modes, taking full advantage of the hardware available.

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special sale on 1TB drives, to go that route instead.

Our concern with a DIY box like the DS209+ is its fit and finish, because the manufacturer has to take user-serviceability and a longer compatibility list into consideration throughout the design process. To some degree, Synology's DS209+ falls victim to those concessions. The enclosure is incredibly easy to disassemble, but built of cheap-feeling plastic instead of metal, which Netgear and Iomega use in their boxes. It's also quite a bit larger (no doubt to make working under the hood easier). Those compromises aren't deal breakers, though. The switches and USB/eSATA interfaces feel solid. Moreover, the exterior shell is an attractive shade of matte black. The *pièce de résistance* is a 60mm cooling fan that spins at variable speeds according to thermal load; even at its middle setting, the fan is nearly quiet. The smaller Netgear and Iomega products are both louder.

The 800MHz processor and large memory pool translate into exceptional performance for Synology. We armed the DS209+ with a single 1TB Samsung Spinpoint F1 drive, and it managed to win eight of 12 tests (not counting the Sans Digital MobileSTOR, which was directly attached via eSATA). A pair of drives set to run RAID 0 would be even faster, but again, RAID 1 is the way to go in a two-drive enclosure responsible for protecting important files.

Getting the DS209+ configured is a piece of cake, and the accompanying software is extremely well-polished. Where most competing devices employ very-obviously Web-based admin panels, the DS209+'s Disk Station Manager 2.0 is driven by an AJAX-based interface, so the look and feel are more application-like than a typical browser-based config. Synology also includes its Data Replicator 3 backup software, though the DS209+ also supports EMC Retrospect, Symantec Backup Exec, and Acronis True Image (none of which are included).

The Synology DS209+ is, without doubt, expensive for a diskless NAS enclosure. You could easily build a Core 2 Duo-based machine for a similar price once the cost of supplying storage is factored in. But the compact chassis, quiet operation, comprehensive management tool, and exceptional performance come together to make Synology's offering our favorite for folks more interested in using NAS than building it.

Western Digital ShareSpace

Armed with four drive bays and more extensive RAID support than the other NAS devices, Western Digital's ShareSpace 4TB is the juggernaut of this roundup. It isn't small and it's not light. But thanks to WD's subtle styling, it looks really sharp.

The ShareSpace is essentially an SFF PC. It sports Marvell's 88F5281 SoC, a more advanced version of the Feroceon processor found in Iomega's StorCenter. The dual-issue chip runs at 500MHz, includes PCI-E connectivity (to which WD attaches a 4-port Marvell SATA controller), PCI-X, Gigabit Ethernet, USB 2.0 support, and an integrated memory controller. Western Digital doesn't go into much depth on the ShareSpace's hardware, but we were able to find a pair of 512Mb DDR2 memory modules on the ShareSpace's logic board, totaling 128MB. Plug a flash drive into the front USB 2.0 port and press the transfer button. The ShareSpace sucks up the data on the flash drive. Plug a pair of external USB hard drives into the back to expand the ShareSpace's capacity beyond its 4TB internal limit.

Western Digital draws on its expertise as a storage vendor to make the ShareSpace as efficient as possible. Its four 1TB hard drives belong to the GreenPower family, which spin at 5,400rpm. There's a stigma associated with 5,400rpm drives that they're poor performers. However, the GreenPower drives do surprisingly well in the benchmarks because they help keep power consumption in check. By default, the ShareSpace's drives are organized in a RAID 5 array, which offers the best balance between capacity and data protection. (RAID 0 and 1 are both supported, too.) In RAID 5, parity information is written across the four drives so that if one disk fails, you don't lose any information.

The Homebrew Factor

No discussion of NAS is complete, especially in the midst of power users, without acknowledging the viability of DIY networked storage. There's a good chance you've built a handful of PCs, at least. If you have one lying around that's been replaced by more modern hardware, it'd likely make a competent storage platform, even in its old age.

Granted, that doesn't mean you could repurpose a dusty Pentium III platform right away. It needs the right network interface, a capable storage controller, ample memory, an enclosure able to hold a few hard drives, and a complementary operating system. Depending on just how geriatric your mothballed machine really is, adding or replacing the components to get it up to speed could outstrip the cost of an off-the-shelf NAS.

Of course, your performance requirements will scale up and down depending on the operating system you choose to use. On one end of the spectrum are very lightweight approaches, such as FreeNAS (www.freenas.org), a BSD distribution supporting software-based RAID, dynamic DNS, a number of different file systems, and iSCSI. On the other, it's tremendously easy to recycle an old copy of Windows XP. In either case, a Pentium III, Celeron, VIA Nano, or inexpensive Athlon X2 processor would work fine. Arm the system with between 512MB and 1GB of memory, drop an inexpensive SATA RAID controller card into a PCI or PCI-Express slot, and start adding hard drives. ▲

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ShareSpace
$999
Western Digital
www.wdc.com

Armed with four drive bays and more extensive RAID support than the other NAS devices, Western Digital's ShareSpace 4TB is the juggernaut of this roundup.

The tradeoff is a loss of space. Formatted in RAID 5, the 4TB ShareSpace offers just under 3TB.

Performance is good, too. The RAID-protected ShareSpace trails the 500GB Netgear enclosure in most benchmarks but manages to push ahead in the directory copy tests. It beats Iomega's StorCenter across the board, putting it in the middle of our pack.

Perhaps the largest obstacle to overcome is the ShareSpace's $1,000 price tag. A 1TB WD drive sells for about $100 online, meaning you pay around $600 for the NAS enclosure itself. That's a tough pill to swallow when the Synology DS209+ sells for less than $500 and gives you the same RAID 1 protection. Western Digital does add value by bundling backup software and licenses, letting three workstations automatically save important information to the NAS. Unfortunately, the backup app didn't care for our 64-bit installation of Vista and crashed each time we started it. Although the rest of Western Digital's setup routine is intuitive enough to be self-guiding, the only reason we can see justifying the extra cost would be if you needed the the ShareSpace's capacity. ▲

by Paul Cross

Speeding Over Ethernet

To test each of our units, we used Intel's NAS Performance Toolkit, which taxed these storage appliances in a number of areas. We should note again that because the MobileSTOR MS2UTN+ is a direct-attached unit, performance numbers will be significantly higher than the other drives, which we tested over a LAN connection. Expect lower results if you use the Sans Digital unit as a shared drive connected to a networked PC.

Intel NAS Performance Toolkit*	StorCenter ix2 2TB	ReadyNAS Duo 500MB	MobileSTOR MS2UTN+	DS209+	ShareSpace 4TB
HD Video Playback	10.1	23.6	52.8	30.7	23.1
2x HD Playback	11	36.1	28.7	29.4	26.3
4x HD Playback	11.7	38.7	27.4	36.6	23.8
HD Video Record	11.4	18.7	84.2	39.1	11.6
HD Playback and Record	11.3	22.6	44.5	26.7	15.7
Content Creation	8	9.2	5.5	13.2	8.8
Office Productivity	19.5	20.9	39.4	5	18
File Copy to NAS	8.1	12.4	89.3	32.9	9
File Copy from NAS	14.2	29.3	53	31.6	24.4
Dir Copy to NAS	3.7	4	44.3	17.5	4.5
Dir Copy from NAS	8.4	8.6	28.8	19.1	11.5
Photo Album	14	10.1	28.5	7.5	14.3

* Results in MBps

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