Two advanced NAS drives for small IT departments

We tested two rack-mounted NAS units for home users and small businesses which want to expand their IT department.

The market for semi-professional NAS-units is growing. The "toaster" models now come with six to eight discs and can be rack-mounted rather than shoved under the desk.

The Storcenter Pro ix4 200r from Iomega and Ready NAS 2100 from Netgear are desktop models which have had a makeover in the form of 1U racks to better suit business purposes.

The Iomega Storcenter Pro ix4-200r is a 1U high-speed NAS server with room for four SATA II disks with up to a terabyte of space on each. The discs are hotswap-type discs, which makes swapping discs easy. Storcenter Pro ix4-200r has a one-gigabyte ethernet port (RJ 45) and three USB ports (one on the front). The unit has a power-supply unit.

Many protocols

Storcenter Pro ix4-200r has a fine set of network protocols. Apart from the obligatory CIFS protocol, it also copes with NFS and Apple file sharing protocol (AFP). We can access partitioned units with ftp. There is also iSCSI support for block data traffic.

Iomega is network-based with a program which is installed on the computer from which we will administer the unit. When the unit has been identified, we can proceed to the administration console via a web reader and TCP port 8888. The processes are a model of simplicity, but we don't think Iomega will automatically make network units available on the local computer without being asked.

No refuse option

Iomega has to overcome a lot of integrity issues before we get to the administration interface. For example, we have to approve changes it makes to firewall settings and set up its IP address with a dynDNS service called TZO. There is no option for refusing these changes.

The interface is a typical home-user design with five tabs. The Home tab shows a number of short cuts for functions in other places. The Dashboard tab gives an overview of the system's status.
**Facts & marks**

<table>
<thead>
<tr>
<th>Product</th>
<th>Storcenter Pro ix4-200r</th>
<th>Ready NAS 2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier</td>
<td>Iomega Corporation</td>
<td>Netgear</td>
</tr>
<tr>
<td>Website</td>
<td><a href="http://www.iomega.com">www.iomega.com</a></td>
<td><a href="http://www.netgear.com">www.netgear.com</a></td>
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<tr>
<td>Price, excl. VAT</td>
<td>17,500 (2 TB)</td>
<td>20,500 (4 TB)</td>
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<tr>
<td>Program version</td>
<td>2.0.4.41587</td>
<td>4.2.5</td>
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<tr>
<td>Administration tool</td>
<td>web interface via local program</td>
<td>web interface</td>
</tr>
<tr>
<td>CIFS (smb/smb2)</td>
<td>yes/no</td>
<td>yes/no</td>
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<tr>
<td>nfs 3/nfs 4</td>
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<td>yes/no</td>
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<tr>
<td>http/ftp/webdav</td>
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<td>iscsi/fc</td>
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<tr>
<td>Max. number of discs in mainframe</td>
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<td>Max. total number of discs</td>
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<tr>
<td>Disc type</td>
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<td>Mixed disc types in same frame</td>
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<tr>
<td>Snapshots</td>
<td>no</td>
<td>yes, of entire unit.</td>
</tr>
<tr>
<td>Cloning/replication</td>
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</tr>
<tr>
<td>Compression of block data traffic.</td>
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<td>no</td>
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<tr>
<td>Thin volumes (thin provisioning)</td>
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<td>no, but manually expandable volumes with x-raid 2</td>
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<td>Antivirus</td>
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<td>Ethernet port trunking</td>
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<td>RAM/cache memory</td>
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<td>Max. RAM</td>
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<td>Energy consumption</td>
<td>91 Watt</td>
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<tr>
<td>Annual energy cost (SEK 1/kWh)</td>
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<td>639</td>
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</table>

**Marks**

| Performance | 10 out of 20 | 13 out of 20 |
User or admin

The User tab controls the extremely simple user management functions. A user can only be an ordinary user, i.e. only access the storage functions, or an administrator with full access. By clicking the Shared Storage tab we create and partition network units. This function is also easy to use.

The final Settings tab gives us access to the more exciting functions. Storcenter Pro can be equipped with four discs which can be configured in a raid 5 set. The first page simply gives information on disc status, but a link takes us to the disc configuration, where we can select three other ways of configuring the discs: mirror-based data protection, parity-based data protection, and without data protection. The first instance involves raid 1+0, the second raid 5 and the final instance JBOD. A plus is that we can see directly how much useable hard disc space the different raid alternatives give.

Good illustrations of the disc configuration options. It is also useful to see directly how much practical storage surface the other alternatives give. The fact that we can see information on
which raid level is involved is typical of the product. With the aid of the illustrations, we can however see that it involves raid 1+0, 5 and 0.

**Basic configuration**

Iomega allows us to optimise performance by turning on write buffering or jumbo frames on the network. The buffering can be always on, always off or only on with linked UPS. Disc management in Iomega is, as it appears, very simple. For the more demanding organisation, this however is not an advantage, rather the opposite is true. We cannot configure the discs individually or use thin provisioning.

In a similar manner, the configuration governs most events. If, for example, we want to send warnings by e-mail, this is easy to do, but we can't control which events will trigger a message. Logs are available but only give a brief description of each event. The user groups can be configured with the same "depth" as the users. Quota only limits how large a catalogue can be, and cannot be defined per user. Remote access can be set up via the abovementioned TZO by creating a website for the product. In Security, we can enable a function which ensures that only administrators can access the administration, and Update lets us easily upgrade internal programs.

The exceptions relate to the areas which are hardly seen as the most important for an IT department but are not aimed at the home user: the transfer of film and images from cameras, printer servers and of course the downloading of torrents.

_Simple but also very basic configuration_ Iomega Storcenter Pro ix4-200r is not suitable for professional users. This illustration shows the status page.
Ineffective optimisations

The Iomega Storcenter Pro ix4-200r performance is mediocre. Not that Storcenter Pro ix4-200r is slow - it's in the same class as the quicker "toaster" models on the market, but the performance is nothing to writing home about with regard to the professional use, other than for small businesses. There are two methods for making traffic quicker: jumbo frames and write buffering. This however makes little difference and to be honest is hardly noticeable. It is easy to force Iomega to use a lot of disc space, which then reduces the speed tenfold or more if we compare it with using a test file located in the cache memory.

We have tested performance with Iometers, with and without these optimisations, without affecting the result. On the contrary, activating the write buffer appears to reduce the speed in the tests on the maximum operations per second. Only when we want to transfer large quantities of data to the disc do the optimisations have a positive effect. Iomega at most allows 10,383 i/o operations per second (without optimisation), evenly divided between read and write operations. The corresponding figure for bandwidth is 96 megabytes per second, this figure is also best without optimisation and evenly divided between write and read operations.

If we perform the same tests on an ISCSI unit, the number of i/o operations compared with the cache memory will be much better, with up to 21,136 i/o operations per second, virtually a 100% increase. Unfortunately this is accompanied by a big fall to only 33 i/o operations per second for the disc, a moderate 73 megabytes per second in bandwidth for the cache memory, and only 34 megabytes per second bandwidth for the disc.
Number of i/o operations for cache memory over iSCSI. As expected, unlike with CIFS, iSCSI is not as dramatic. Good, but a bit better for Netgear.

Number of i/o operations for disc over iSCSI. Clearly worse for Netgear, but in accordance with expectations. Iomega has problems and almost crashes.
Bandwidth for cache memory over iSCSI. Actually worse than for CIFS. Only the partially tested Iomega wins.

Bandwidth for disc over iSCSI. Very little deterioration for Netgear, but worse for Iomega.
Response time for cache memory over iSCSI. Not much to say - almost light speed!

Response time for disc over iSCSI. The explanation for Iomega's poor result in the test with the number of i/o operations for disc over iSCSI. The response time is terrible!

Expandable volumes

Netgear Ready NAS 2100 Business Edition is named by the other participant in the test. It is a 1U unit with four disc slots for SATA II discs and up to eight terabytes of disc space.

There are two network ports for gigabit ethernet and two USB ports on the back. There is one USB port and an extra feature in the form of a safety copy button on the front. Pressing this button, provided we configured the copy function, makes the system run the defined copy jobs. Like Iomega, Ready NAS 2100 has only one power supply unit, but the amount of fans means that the sound level is a bit less intrusive.
Netgear (top) has six fans although the one on the far right seems to be redundant. They are not exactly hot air guns, but the heat values are quite good. Iomega gets the hottest.

Detail from the hottest fan. Iomega (below) blows hot air at a temperature of 38.6 degrees.

Multiple discs via USB

The discs can be configured with raid 0.1 and 5, and with a configuration called X-raid 2. This gives double parity and dynamic expansion of volumes. The discs are hotswap-type discs. One disc can also act as a "hot spare", i.e. a spare disc. If the internal discs are not enough, more can be connected via USB.

The volumes are controlled by the "flexraid" system, which enables expandable volumes. Users can access the volumes via several protocols, including SMB/CIFS for Windows NFS v2 and v3 for Linux/Unix, AFT for Mac, http/https and Web DAV. Rsync and Secure Rsync are also
supported. The icing on the cake is that we can set up iSCSI targets for block data traffic.

Administration of Ready NAS 2100 takes place in a web reader over https which works well. A bit of tinkering is required before we get to the administration, as we have to check in the DHCP server which address the machine has accessed, but after that everything goes smoothly. At the first login, a guide starts up and we define network settings, an administrator account, etc. The guide can be accessed from the normal interface at any time.

The administration interface looks good and the many buttons on the left raise expectations of interesting settings options. The first we come across however is a status window with information on internal programs, disc usage and the like. Wherever we are in the interface, the status of volumes, discs, temperature and fans is always visible.

A much more user-friendly administration interface with more depth to the configuration is provided by the Netgear Ready NAS 2100, which has a status panel which gives a good overview.

Redundant network ports

As Ready NAS 2100 has two network ports, we can combine them so that they work in tandem. One can then take over if the other fails.

The network settings are otherwise standard, plus we can use VLAN. There is also the option to use jumbo frames. The Ready NAS 2100 can also act as a DHCP server if required. The settings for users and groups are really good, with good detailed control options. We can connect the unit to our active directory and let it manage the users. There are good options for importing user and group lists. We can control which home catalogues users will have, if they will be able to
connect to ftp, set quotas, etc.

Under Services, we can define settings for the above-mentioned protocols, plus a few others. In many cases, this only involves switching the support on or off, but in some cases, for example for ftp and http/https, we can also define simple settings. Netgear also supports a number of functions which could well be of interest to home users.

Each connection protocol has good, but not terrific, settings options. This illustration shows us the partitioned volumes we have created and which protocols we can connect to them. NFS is not among them only because we did not activate the protocol.

Other raid levels

The volumes (or LUNs to be more accurate) can, as mentioned, be created with other raid levels, where x-raid 2 is the basic setting across all discs. We can't discover how to change this, but nor is there any real reason to do so. Partitioned volumes are then created in the required sizes and can, as mentioned before, be expanded.

The ability to take snapshots of the entire unit is an interesting function. This doesn't apply to specific volumes, which you would normally expect, but it is better than nothing. To do this, we have to create a dedicated space for the data which is created when a snapshot is taken.

The partitioned volumes can be accessed with the above-mentioned protocols and the settings for them are either very good or average in all cases. Netgear seems to have put a lot of effort into the safety copy functions. This is not completely redundant, as Ready NAS 2100 will in all probability be used just for safety copying.
Ready NAS 2100 also supports Apple Time Machine and those who prefer Linux or Unix will appreciate the support for Rsync.

The Ready NAS 2100 system can also send warnings by e-mail to up to three addresses. We can define which type of warnings will trigger a message. Like Iomega, there is also simple support for all SNMP versions.

Relative superiority

There is no doubt which product has the best configuration options. Administration in Netgear Ready NAS 2100 is not in any way remarkable. Compared with more professional systems, it is actually fairly poor, but the Iomega equivalent is quite simply so bad that Netgear's administration is remarkable in comparison.

Performance follows the same pattern, albeit that the differences are minor. For the most part, Netgear is quicker overall. Iomega only wins one sub-test.

Ready NAS 2100 is no great shakes either; it's no match for example for Sun Storage 7100 which won our test in the May edition of TechWorld, but it comes top among "toaster NAS" with a few gold stars. Performance is okay for smaller business, but unsuitable for a large computer centre.

All on or all off

Ready NAS 2100 has a whole range of performance optimisation options. In our tests we simply used the "all on" or "all off" options. All on means that we switched on the disc write buffer and faster CIFS write operations and switched off the journal entries.

Previously we also mentioned the jumbo frames and "oplocks". The latter enables clients to store a copy locally. We did not use this function in our tests, that would be cheating, but it can in actual fact make a difference to the user experience.

The optimisations are also effective in certain cases, including in the iops tests, where options such as write buffering do not come into play as all data is contained in the RAM.

Ready NAS 2100 achieves at most 11,024 i/o operations per second for the cache memory, almost equally divided between read and write operations, and without optimisation. For the disc, the number of i/o operations falls substantially, as expected, to 399, but in this case the optimisation does help. Without optimisation, the figure is 327.

The bandwidth for the cache memory is very good, with 99 megabytes per second, a figure which in all cases begins to get close to the network limit. For the disc, the figure is 86 megabytes per second, and optimisation plays an important role. Without optimisation, we are stuck with 63 megabytes per second. For the iSCSI volume, this takes the overall speed up to 21,444 i/o operations per second for the cache memory and exactly 500 for the disc. The figures
for the bandwidth are 69 megabytes per second for the cache memory (this is the exception where Iomega is quicker) and 64 megabytes per second for the disc

**TechWorld's conclusion**

None of the products will attract IT departments with professional systems. Interest will mainly come from businesses that have expanded and have spare racks to fill with simple storage devices.

Storcenter Pro ix4-200r is the easiest to use. The functions appeal to home users, but home users do not need racks. Also, the sound level (also applies to Netgear) is far too high. We think that small businesses want more functions and configuration options, as well as better performance, than Iomega Storcenter Pro ix4-200r can offer.

Netgear Ready NAS 2100 gives more and is better suited to small IT departments. There was really no comparison, it was a walkover victory for Netgear.

**Facts**

**Best in test**

Netgear Ready NAS 2100 performs much better when compared with Iomega Storcenter Pro ix4-200r. Netgear may well suit smaller organisations, but is not suitable for larger businesses. Iomega is known as a product for home users or close companies.

Netgear Ready NAS 2100 is the best in test.

**Scenario**

Really professional NAS units are too expensive. The desktop models feel too amateurish. There is still space to fill with storage devices in the newly purchase rack. Can the rack models from home user suppliers fill the gap?

**How the test was carried out**

We used well-known Iometers which are often used for this purpose. We tested the NAS units in two ways. Partly we wanted to use the discs as much as possible, partly we wanted to run against the cache memory. In the first case, we created a ten gigabyte volume, with a ten gigabyte test file in the volume. Because the file was larger than the NAS' cache memory, it was forced to write down (partition) the file to disc, which made the transactions slower.

We also created a one megabyte test file. This had guaranteed space in the cache memories and the operations went very quickly. All disc groups were raid 5 or raid 6. All tests were also run with a ten gigabyte iSCSI volume.
We included three Iometer measurements: the number of i/o operations per second (iops), the number of megabytes per second, and the average response time during the iops test. We used different configurations for the iops and megabyte tests. In the former, we used small transaction data (512 bytes) and lots of transactions, in the latter, large transaction data (32 megabytes) and few transactions.

We ran all tests both with and without optimisation.

In all tests we assumed a server with Windows Server 2003 R2 with a professional network card from Intel and a one gigabyte network (without other types of interference).