



# **Solutions Guide: Flexible Storage Systems with Intel® SSR212MC2 and Open-E Data Storage Server**

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Channel Platform Solutions

Part Number: xxx



## Document History

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Intel® Active Management Technology requires the platform to have an Intel® AMT-enabled chipset, network hardware and software. The platform must also be connected to a power source and an active LAN port.

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## Glossary

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**AppleTalk** – Protocol collection from Apple for using files and printers jointly on the network;

**Block-based** – Type of data exchange in which individual data blocks of hard disks are requested directly; used in → SAN for the transmission of RAW data; especially important for databases, which must check the integrity of the data;

**Bonding** – Interconnectivity of several physical network cards into a common logical channel in order to increase the bandwidth and system stability; according to IEEE 802.3ad the Link Aggregation Control Protocol (LACP) is used here;

**CIFS (Common Internet File System)** – Expanded version of → SMB with NT domain support;

**Direct Attached Storage (DAS)** – Mass storage connected directly to a server;

**DOM (Disk On Module)** – Flash storage card that contains the pre-configured Open-E storage operating system; it is plugged into the internal USB slot of the main board; advantages: faster boot times, no individual power supply necessary, separation of operating system and user data;

**Fibre Channel (FC)** – Standard protocol for high-speed transmissions on → Storage Area Networks; access to hard disks occurs → block-based; each FC device is identified uniquely via → World Wide Node Number and → World Wide Port Number; plug-in cards for FC adapters are called → Host Bus Adapters;

**Host Bus Adapter (HBA)** – Hardware components for the network connection of storage devices via → Fibre Channel, → iSCSI or → SCSI;

**Initiator** – Designation for a client that establishes the connection to a → Target via → iSCSI or → FC;

**Intel® I/O Acceleration Technology (I/OAT)** – Efficient input/output processing in Intel® QuadCore and DualCore CPUs as well as on appropriate chip sets and network interfaces; eliminates bottlenecks;

**Intel® Multi-Core** – Processor technology with two or more computing cores on one chip; basis of Intel's® platform strategy;

**Intel® SSR212MC2** – Hardware platform for storage servers from Intel; code name McKay Creek; 2 units, rack-mounted, 12x SAS-/SATA connections;

**iSCSI (Internet → SCSI)** – Storage over TCP process; takes care of the operation of storage protocols such as → SCSI via TCP/IP; the server functions here as → Initiator, the mass storage as → Target;

**Logical Unit Number (LUN)** – Designates virtual drive units in the → SAN;

**Logical Volume** – Abstraction between hard disk and file system; arises through the partitioning of a → Volume Group;

**McKay Creek** – Code name of the → Intel® SSR212MC2 storage server;



**Multi-Pathing** – function with which a server reaches a storage device via several → HBAs; used for failover and load distribution; a physical → Volume can be configured via the → Logical Volume Manager with several paths;

**Network Attached Storage (NAS)** – Storage devices connected directly to the local network;

**NFS (Network File System)** – Network file system developed by Sun Microsystems; Unix pendant to → SMB;

**RAID (Redundant Array of Inexpensive Disks)** – Pooling of several hard disks into a logical drive; depending on the set-up, it may increase data security and/or performance;

**SAS (Serial Attached → SCSI)** – Serial successor to → SCSI; uses fast point-to-point connections between the devices;

**SATA (Serial Advanced Technology Attachment)** – Data bus for the connection of hard disks, works with serial point-to-point connections;

**SCSI (Small Computer Systems Interface)** – Standardized parallel interface and bus system; several models defined with different speeds; technical capacities exhausted with Ultra-320 SCSI;

**Shared Storage** – Technical term for jointly-used storage, used by several users, programs or program instances;

**SMB (Server Message Block)** – Communication protocol, primarily for file and print services; integrated into Windows; also used by Samba;

**Snapshot** – Snapshot/virtual copy of a → Logical Volume; changes to the Original Volume are recorded → block-based;

**SSR212MC2** – → Intel® SSR212MC2;

**Storage Area Network (SAN)** – Individual network for the incorporation of storage subsystems to servers;

**Target** – Server that for → iSCSI and → FC provides storage space for the → Initiator;

**Volume Group** – Combination of several → Logical Volumes into a logical group;

**World Wide Node Name (WWNN)** – Unique number of a → Host Bus Adapter; comparable to a MAC address of network cards;

**World Wide Port Name (WWPN)** – Unique number for each port of a → Host Bus Adapter; usually very similar to the → WWNN;



# Flexible Storage Systems with Intel® SSR212MC2 and Open-E DSS

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## About this guide

With solutions guides like this one, Intel® would like to help partners and resellers evaluate high-performance IT solutions and implement them successfully. This guide provides the necessary knowledge for this and extensive background information for testing and putting flexible storage systems with Intel® SSR212MC2 and the Open-E Data Storage Server (DSS) software into operation.

**Target group of this document:** This guide is intended for technical personnel at system integrators and resellers. It explains in a practical manner how storage systems on the Intel® SSR212MC2 hardware platform are installed, configured and administered with the Open-E DSS operating system.

**Practical relevance:** Special attention is paid to detailed instructions, which show step by step how you set up the various storage strategies in practice. Concrete application examples also show the flexible deployment possibilities of the storage platform described in practice.

This guide treats the following main aspects:

- Beneficial aspects of flexible storage solutions
- Advantages of Intel® SSR212MC2 and Open-E Data Storage Server
- Architecture of Intel® SSR212MC2 and Open-E Data Storage solutions
- Recommended configurations
- Guidelines for the installation of Open-E DSS
- First steps and frequently-used configurations (step by step)
- Application scenarios
- FAQs
- Additional literature
- Support, reference sources



# Introduction

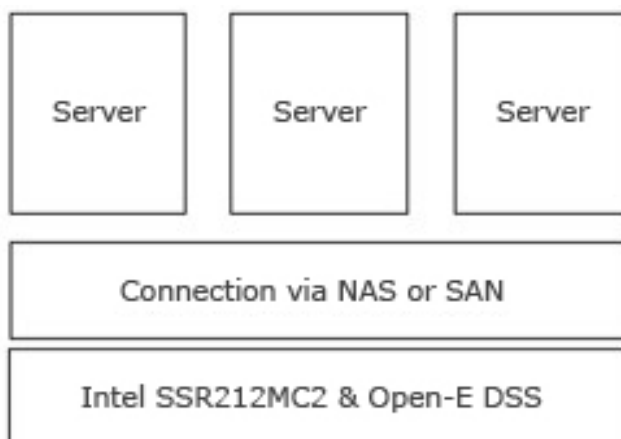
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## Solution overview

Intel® SSR212MC2 stands for the high-capacity Intel Storage Server (code name McKay Creek) and designates a hardware platform that can be used optionally for direct attached storage, network attached storage or in storage area networks. One of the main advantages for customers from small and medium-sized companies is the flexible nature of the hardware: 2x quad-core support (Xeon 5300), 12x SAS/SATA connection (mixed assembly possible), up to 32 GByte RAM, up to 12 TByte storage space (limited by the capacity of current hard drives), RAID 0,1,10,5,50, 4-port Gbit Ethernet and NICs with iSCSI-boot support are only some of the configuration possibilities.

The storage operating system Open-E Data Storage Server (DSS) is perfectly-attuned to Intel® SSR212MC2 and certified for the platform and for the optional components. The "solution for your storage" offers you precisely that; a custom-tailored storage system for your applications that is faster, more flexible and more reliable than the competition. With the innovative storage operating system Open-E DSS, the software publisher exhausts the capabilities of the Intel SSR212MC2 platform for the first time. The special thing about this: Open-E DSS is already pre-installed on an internal USB flash module (disk on module) and with the unique Web interface, no special knowledge is required even for the configuration of the most eccentric storage strategy.

The great advantage for customers: Open-E DSS is optimally attuned to the McKay Creek platform and has been subjected to an extensive certification process. Just plug in the USB module, boot the storage server and take advantage of the different options via the intuitive Web interface.



**Storage solution with Intel® SSR212MC2 and Open-E DSS**





## Benefits and advantages for your customers

Especially among small and medium-sized companies, company data is frequently the most important commodity. And the challenges to the correct storage strategy are great. Those responsible for IT must get a grip on constantly-increasing needs for storage space and ever-higher performance requirements without investing a fortune in storage systems. Breathing down the necks of companies of all sizes are **quickly-increasing costs, high legal requirements** for data archiving, and **problems with process management**.

Naturally the goal must be that those responsible for IT should not always have to worry about storage solutions. Instead, a flexible strategy is required, which can be adapted to new requirements with little effort. The storage solution Intel® SSR212MC2 and Open-E Data Storage Server is especially beneficial for customers who strive for a maximum of security, robustness, and flexibility in their IT, but who, at the same time, appreciate easy operation.

The main advantages for customers:

- **More flexibility:** Thanks to flexible expandability with standard components such as SAS/SATA hard disks, RAID controllers, network cards with iSCSI boot support and the set-up of NAS or SAN (also simultaneously), customers can create their individual storage solutions from cost-effective standard components. The possibilities range from simple file-server services for workgroups to exchange operation on through to the high-availability storage for databases.
- **Better scalability:** Be equipped today for the storage requirements of tomorrow. With Intel® SSR212MC2 and Open-E DSS you can start small (with NAS, for example) and expand the storage system stepwise (to FC-SAN, for example). The storage solution grows with the requirements of your IT processes and supports you in thin provisioning.
- **Higher performance:** Thanks to the extensive performance potential of the Intel® Multi-Core architecture with I/OAT and the broad support of Open-E DSS for these technologies, the Intel® SSR212MC2/Open-E combination speeds up IT processes.
- **Quick installation:** Open-E DSS is already completely pre-configured and is delivered on an internal USB flash module. For the installation, the module only has to be plugged into an open USB slot on the motherboard. Upon the first start, Open-E DSS automatically sets up all hardware components of the storage server; there are no installation scripts and you don't have to worry about installing drivers. After a few minutes you're ready to go; you don't have to spend days installing software. Extremely practical: since the operating system is on a Flash card, you can use all hard disk connections for user data.
- **Easy administration:** Regardless of whether NAS, SAS, backup, replication or system snapshot. With the innovative Open-E Web interface, the set-up of storage solutions is child's play.

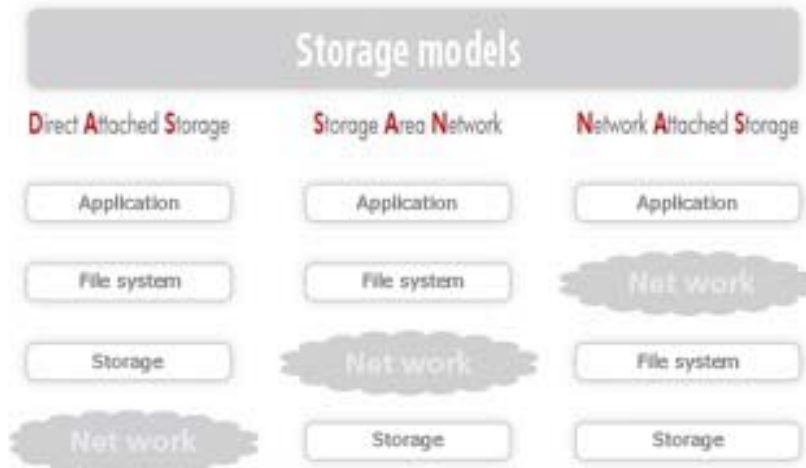


- **Integrated security and increased availability:** Broad support for RAID, backups, replication, system snapshots and the robust pre-configured operating system Open-E DSS are guarantors for the security of your data. Thanks to the strict separation of storage operating system and data, your storage environment is constantly protected against viruses.
- **Low costs:** Thanks to the easy deployment of standard components, customers can put together an optimal storage system at a reasonable price. You also save operating costs when you use Open-E Data Storage Server and Intel® SSR212MC2, for with the intuitive Web interface, you can make all settings faster.
- **New possibilities:** Companies can use new possibilities for the deployment of shared storage, optimize processes and thus develop a competitive advantage.
- **Broad hardware support and premium support:** Open-E DSS is certified for use on Intel® SSR212MC2 and the optionally-available additional components. The interplay between operating system and hardware components was tested extensively. Professional support agents await your questions.

## System architecture of storage solutions

With Intel® SSR212MC2 and Open-E Data Storage Server there are three storage models available to realize your storage strategy: Direct Attached Storage (DAS), Network Attached Storage (NAS) and Storage Area Network (SAN) (optionally via iSCSI or Fibre Channel).

With DAS, the storage is connected directly to the system, that is, for example, to your database server. With NAS, the storage system engages directly in the local network, which enables access for all connected systems (shared storage). Important: a NAS system always offers file system-based services. A storage area network acts differently. With SAN, an additional network separates the local network from storage resources; access occurs block-based.



## Network Attached Storage

NAS systems are storage solutions that are connected directly to the local network. They work file-based; this means that they have an individual file system and offer services on this basis, for example, via SMB or NFS. The organization of the shared storage occurs through file shares, so-called shares.

Important: each system that wants to use the shared storage must support the file system used. With Intel® SSR212MC2 and Open-E DSS you can set up a NAS system with a few mouse clicks (for details, see page 15). The brilliant part: for access control, you can use existing directory services such as LDAP or Active Directory.

With Intel® SSR212MC2 and Open-E DSS you can also combine NAS and SAN functions. That is, you do not have to specify a storage strategy from the very beginning. Nevertheless, the question when NAS is better and when you are better off with SAN is important.

Use the advantages of NAS systems:

- **Cost-effective components:** NAS systems exist without expensive hardware. NAS applications do not require high-end processor performance.
- **Integrated file server:** A NAS appliance can be operated without further ado as a basic file server on a simple network. Additional server software is not necessary as for iSCSI.
- **Fit for heterogeneous networks:** NAS devices offer very good support for a multitude of file access protocols, so that they ease data exchange on heterogeneous networks substantially.
- **Simple operation:** NAS devices are very easy to operate. They are easy to administer; user and group affiliations can be inherited from a directory service.



- **Data security included:** NAS devices already contain integrated mechanisms for backup, data synchronization and data replication.

But NAS systems are not the best solution for every purpose. Network Attached Storage has the following disadvantages:

- NAS systems are not 100% compatible with Microsoft Access Control Lists (ACL)
- Most database systems such as Oracle or Microsoft Exchange (except for SQL) cannot work with NAS devices
- For NAS devices, data backup and replication occur on a file basis For Open-E solutions, the replication occurs on the block level, which means that only the modified data blocks must be transferred to the second device

## Storage Area Network

With a SAN you are much more flexible than with NAS and you must no longer rely on file shares. From a purely structural point of view, with a SAN you create an additional network between your server and the storage systems used. For the connection, iSCSI and Fibre Channel come into consideration. The servers require initiator software in order to be able to address the enabled SAN resources (targets). The management of the connected storage occurs like the management of local hard disks.

With iSCSI, a storage-over-IP procedure is used, also called IP-SAN. Here, SCSI data is packaged in TCP/IP packages and transmitted over the network.

iSCSI gives you the following advantages:

The essential advantages of iSCSI systems are clearest in their flexibility when used in larger system environments:

- **Seamless integration:** Storage devices can be incorporated seamlessly into existing SAN environments
- **Performance advance:** iSCSI can be used for high-availability and high-performance clusters (e.g., Oracle RAC)
- **Extended DAS:** An iSCSI connection can also be configured as an especially flexible DAS system - the local SCSI bus is sort of extended through the network
- **Fit for databases:** iSCSI works with database applications such as Oracle or Microsoft Exchange
- **Foundation for virtual machines:** Virtualization software such as Xen, Virtual Iron or VMware can use iSCSI targets
- **Mirror over IP:** iSCSI allows - like SCSI itself - easy mirroring of data via an IP network
- **Top throughput:** Via iSCSI, you can use integrated MPIO characteristics (Multi Path I/O)
- **OS-compatible:** iSCSI targets are 100% compatible with the operating system used



- **Giant storage:** With iSCSI, you can build giant storage pools with volumes in the tera and petabyte range

Disadvantages of iSCSI:

- The effort required to accommodate SCSI commands and SCSI data packages in TCP/IP packages makes high requirements of the hardware resources: the Intel® SSR212MC2 has the computing power required for this.
- In contrast to the NAS technology, iSCSI offers no stand-alone devices. Rather, their operation requires either an additional server or special (client) software for joint access to data.
- The file system of an iSCSI system depends on the operating system used, i.e., the common file access from the network through clients with other operating systems requires an additional software instance.
- Another disadvantage are the costs that arise for the license fees of the additionally-required file sharing or management software.

## Summary: NAS versus SAN

Network Attached Storage (NAS) offers storage solutions everywhere where the concern is the storage and archiving of files and common access from the network - also from different operating systems or clients. Whether for small or medium-sized companies, typing pools, law offices or agencies with large multimedia holdings, NAS is a cost-effective storage solution for their storage purposes.

For the storage of database systems on the network, except for SQL-based ones, Network Attached Storage is not a solution. For such requirements, the industry has developed the technology of Storage Area Networks (SAN), which, in many cases, can be implemented with iSCSI components. Advantage of iSCSI: for an IP-based SAN, administrators can use the usual administration tools and security mechanisms, and they can rely on their existing expertise. However, iSCSI only makes sense in connection with a fast LAN infrastructure: with approximately 120 Mbyte/s throughput, the performance on a 1 Gbit Ethernet is sufficient for database applications for approximately 100 users (data occurrence: approx. 15 Mbyte/s). A 10 GbE infrastructure is appropriate for virtualized servers or databases in order to be able to achieve the desired performance despite centralized storage due to lower latency times and higher data throughput. The Intel® SSR212MC2 offers the necessary resources for a high-performance SAN.

Through the combination of iSCSI and NAS as independent functions in a storage device, the Open-E Data Storage Server can close the gap between NAS and iSCSI systems and provide a truly unified storage solution. Thanks to the available Fibre Channel target function, Open-E DSS can be used still more universally in networks and structures of all types. Thanks to the provision and use of FC targets, Open-E DSS can act as a gateway for the user network and assume a central position in the storage infrastructure.



## Architecture of Intel® SSR212MC2

The Intel® Storage Server SSR212MC2 is the optimal foundation for all of your storage projects (the Intel® SSR212MC2R model also contains the RAID controller Intel® SRCAS144E). The complete system offers two advantages in particular: on the one hand, it is a very flexible platform that meets the highest demands and can be used as NAS or in SAN. On the other hand, through the extensive use of industry standards, Intel gives users the opportunity to use cost-effective standard components.



### Intel® I/O Acceleration Technology



This new technology completes storage solutions purposefully with hardware support for significantly speeded-up I/O (read/write procedures) in the fixed storage and network access area. The entire platform thus participates in efficient I/O processing, so that the processors are unburdened.

I/OAT reduces the protocol overhead of TCP/IP by up to 30%. This means still less load for the CPUs. Here, of course all LAN features such as bonding and VLAN are retained. But it's not just the better performance that speaks for I/OAT; Intel has also improved scalability and system stability. The support for several gigabit Ethernet ports for up to 10 Gbit interfaces speaks for itself.

### Intel® Multi-Core Technology

Enormously-increased power with low costs and clearly-reduced power consumption are the key features of Xeon processors with QuadCore and DualCore functionality. In the Intel® SSR212MC2, there are optionally two processors of the 5100 or 5300 series (assembly with just one CPU is also possible). Open-E DSS uses all advantages of this multi-core platform.

The top features of the 5300 series are: Intel hyperthreading technology, fully-buffered DIMM memory and Intel® Smart Cache as guarantors of high-power storage platforms. Produced with the 64 nanometer process, the CPUs have the reserves for all your storage tasks. Nothing more stands in the way of the optimization of your processes. And the RAM equipment with 32 Gbyte (8x fully-buffered DIMM) is more than sufficient.



### SAS/SATA combination

Just one example of the flexibility of the SSR212MC2. Anyone who is not concerned about the last ounce of power can assemble a server with cost-effective SATA hard disks. If later on there are higher performance requirements, these 12 connections can also be used for SAS hard disks. And a mixed assembly is also possible: thus, users with SATA hard disks can operate a shared storage for Office files and, at the same time, maintain a database with high load via iSCSI connection with SAS hard disks. Via the SAS RAID HBA SRCAS144E in the Intel® SSR212MC2R you receive support for 32 hard disks (12x internal, 20x external).

### iSCSI boot function, 4 Port Gbit Ethernet controller

The technology in the Intel® SSR212MC2 is designed for pure power and will catch the eye of every user. A second glance is worthwhile in any case, for Intel has also prepared beautifully detailed solutions. Thus, network cards in the Pro/1000 series can start natively via iSCSI. This means that you can operate a server on the network without hard disk, which boots on restart via image from an iSCSI target. This function was previously only available on expensive iSCSI HBAs. The 4-port Gbit Ethernet cards also allow you to accelerate data traffic via bonding. Of course, you can also implement Fibre Channel solutions. For this, there are 4 Gbit HBAs as optional components. 10 fans ensure sufficient cooling in the system; these can be replaced individually in ongoing operation.

Intel® Storage Server SSR212MC2 Specification	
<b>Storage capacity</b>	Upgradable to 12 TB - 12x 1000 GB (7.2k RPM) SATA drives
	Upgradable to 3.6 TB - 12x 300 GB (15k RPM) SAS drives
<b>Hard disk connections</b>	12 serial attached SCSI (SAS) or serial ATA (SATA) hot pluggable
<b>Supported hard disks</b>	3.5" SAS or SATA
<b>Processors</b>	Dual-core Intel® Xeon® processor (5100 series), 1066 MHz FSB with 4 MB L2 cache
	Quad-core Intel® Xeon® processor (5300 series), up to 1333 MHz FSB with 8 MB L2 cache
<b>RAM capacity</b>	8 slots, upgradable to 32 GB
<b>RAM type</b>	Fully buffered DIMM (DDR2-533 or DDR2-677)
<b>RAM slots</b>	8x 240-pin FBDIMM slots
<b>Controller onboard</b>	On-board Vitesse VSC410* micro-controller
<b>Temperature sensors</b>	Two temperature sensors underneath the rear wall board for monitoring
<b>Client connection</b>	Via Internet protocol Small Computer System Interface (iSCSI) Dual GB/s Ethernet
Front cover	
<b>Function keys and LEDs</b>	Power button, reset button, ID button power LED, error LED, ID LED
<b>Input/output connection</b>	1x 5-pin Mini USB





Rear cover	
<b>Function keys and LEDs</b>	NMI button, ID button
<b>Bus bar</b>	1x IEC AC
Input/output	
<b>PCI</b>	SSR212MC2R: 1x PCI Express* (PCIe) x8 slots, 2x PCI3 x4 slots, 1x PCI X slots SSR212MC2: 2x PCIe x 8 slots, 2x PCIe x4 slots, 2x PCI X slots
<b>USB</b>	4x USB 2.0
<b>Serial connection</b>	1x DB9 9-pin
<b>Video connection</b>	1x Standard VGA
<b>LAN connection</b>	2x 10/100/1000 MB RJ 45
<b>Other connections</b>	1x PD2 mouse/keyboard
Chassis	
<b>Form factor</b>	2U rack (supports low-profile PCI add-in cards)
<b>Height</b>	87.9 mm
<b>Width</b>	447 mm
<b>Depth</b>	707 mm
<b>Weight</b>	approx. 20 kg (without hard disks) approx. 30 kg (assembled)
<b>Color</b>	Black, silver
<b>Rack support</b>	Rail mount (four-post rackmount)
System cooling	
<b>Blower</b>	Chassis includes 10 system blowers (hot-swappable)
Power supply	
<b>Configuration</b>	850W

## System architecture of Open-E DSS

Open-E Data Storage Server is a flexible storage operating system and is already proving itself in its fourth generation. Open-E DSS distinguishes itself from other solutions through its numerous unique features: it is delivered completely pre-installed and pre-configured on an internal USB-DOM (Disk-on-Module) Flash module, which only needs to be plugged into the server system. There are no complex installation routines; just plug the module into the Intel® SSR212MC2, boot the server, and in 5 minutes you're ready to go and set up NAS or SAN.



Open-E Data Storage Server detects all the hardware automatically and sets up the drivers for the SAS and RAID controllers, FC-HBAs and Ethernet cards. The flexible foundation of the operating system ensures quick, stable and secure operation. Via the intuitive Web interface, even the set-up of complex storage systems is easy and clear.





The main advantages of Open-E DSS:

- **Easy installation**, administration and monitoring of the storage systems
- **Top performance** thanks to support for the newest Intel technologies
- **Outstanding scalability** thanks to support of industry standards
- **Support for many hardware components** for RAID or SAS (certification for Intel® SSR212MC2)
- **Security** thanks to extensive backup functions and separation of operating system and user data
- **Strong team:** Intel® SSR212MC2 and Open-E are optimally attuned to one another and, since they are based on standard components, enable the quick and efficient implementation of all your customers' storage projects
- **Premium support:** Thanks to the many years of close cooperation between Open-E and Intel, the experts at both companies have accumulated extensive expertise, which they are pleased to share with customers.

Innovative functions such as the clever combination of SAS and SATA technology put you in a position to increase availability and flexibility in the easiest way possible. The support for all decisive storage technologies such as iSCSI and Fibre Channel are the basis for central management, secure data management on through to very efficient disaster recovery scenarios.

## Secure

The optimized operating system offers the greatest degree of security for the stored data. The journaling file system runs in an extremely stable fashion, updates can be installed without downtime, and roll-backs are possible at any time. With built-in hardware monitoring and expanded backup functions as well as extensive RAID support, your data is in the best hands. For the optimization of the update process of Open-E Data Storage Server, the USB-DOM contains a copy of the operating system. In the case of an error during updating, the storage system can simply be switched over to the previous version of Open-E Data Storage Server.

## Efficient

The current study "IT Trends 2007" by Capgemini and sd&M ([http://www.sdm.de/web4archiv/objects/download/pdf/1/studie\\_ittrends\\_lr.pdf](http://www.sdm.de/web4archiv/objects/download/pdf/1/studie_ittrends_lr.pdf)) shows that the optimization of IT costs is on the plan of nearly every IT manager. Here, the costs associated with maintenance and service of the infrastructure represent a special challenge. Open-E DSS saves time thanks to its intuitive Web interface, even with the most complex configurations.

## Intuitive

Use the strengths of open source without foregoing operating comfort. Open-E DSS offers a Web-based user interface for quick access to all settings and functions.



## High-performance

With Adaptive Load Balancing (ALB), 4-port Gbit Ethernet and the USB-DOM hardware for 30% faster starts, DSS sets the course for high performance. The pre-configured broad hardware support (for example, for RAID and SAS controllers) ensures that for your money, you get optimal performance for the hardware you're using.

## Reliable

The pre-installation of Open-E Data Storage Server on an internal Flash card guarantees higher reliability than an operating system on mechanical hard disks. The separate Flash medium for Open-E Data Storage Server minimizes the risk of virus infections and downtimes. If the operating system crashes, a system can run again within 10 minutes when it is started from a new Flash module or a demo CD-ROM.

In addition to DSS, Open-E has two additional products in its portfolio: Open-E NAS for building a shared storage and Open-E iSCSI for SAN connections.

- **Open-E DSS:** The universal solution for NAS, iSCSI and Fibre Channel. The unified storage system fulfills all wishes when it comes to variety of functions, performance and flexibility.
- **Open-E NAS-R3:** This version is conceived exclusively for the construction of a Network Attached Storage. This way, you can implement joint access to project files.
- **Open-E iSCSI-R3:** Suitable for Exchange Server or database applications, this version offers optimal support for IP-SAN.



## Solutions Guide

The present guide describes step by step how you implement the appropriate storage strategy in practice. In addition to the selection of hardware and software, you will learn in detail how the start-up of an Open-E Data Storage Server on Intel® SSR212MC2 works. Furthermore, you will get an overview of the Web interface for the configuration of Open-E DSS as well as instructions for the most important configuration steps.

### Components of a storage environment

For the construction of storage solution, you need the appropriate configuration of Intel® SSR212MC2 and an operating system from Open-E. In the next step, we have compiled recommended hardware configurations for some sample scenarios:

1. Shared storage for Office documents in workgroups with 20, 50 and 200 users
2. Hosting of an Exchange database for 50 users
3. Operation of 10 virtual servers with VMware

Partners and system houses offer professional consulting services for the appropriate hardware equipment tailored to your IT environment ([www.open-e.com/partner](http://www.open-e.com/partner)).

### Hardware

Shared Storage 20 users		
Intel® SSR212MC2	CPU	Intel Xeon 5130 2.0 GHz
Open-E NAS or Open-E DSS	RAM	1 Gbyte
	Hard disks	6x 320 Gbyte SATA
	NIC	2x Gigabit onboard
	RAID	SW-RAID 5
Shared Storage 50 users		
Intel® SSR212MC2	CPU	2x Intel Xeon 5130 2.0 GHz
Open-E NAS or Open-E DSS	RAM	2 Gbyte
	Hard disks	8x 200 Gbyte SATA
	NIC	2x Gigabit onboard
	RAID	SW-RAID 5
Shared Storage 100 users		
Intel® SSR212MC2	CPU	2x Intel Xeon 5130 2.0 GHz
Open-E NAS or Open-E DSS	RAM	4 Gbyte
	Hard disks	10x 320 Gbyte SATA
	NIC	2x Gigabit onboard + Intel Pro 1000/PT Dual Port
	RAID	HW-RAID 5



Exchange database 50 users		
Intel® SSR212MC2	CPU	Intel Xeon 5320 1.86 GHz
Open-E iSCSI or Open-E DSS	RAM	2 Gbyte
	Hard disks	8x 200 Gbyte SAS
	NIC	2x Gigabit onboard
	RAID	HW-RAID 5
10 virtual servers with VMware		
Intel® SSR212MC2	CPU	2x Intel Xeon 5335 2.0 GHz
Open-E iSCSI or Open-E DSS	RAM	8 Gbyte
	Hard disks	8x 200 Gbyte SAS
	NIC	2x Gigabit onboard + Intel Pro 1000/PT Quad Port with iSCSI boot
	RAID	HW-RAID 5

## Software

The selection of the correct operating system from Open-E is really easy. With the Open-E Data Storage Server, you are the most flexible. You can set up both a NAS and a SAN solution (iSCSI and FC).

Specialized solutions are Open-E NAS-R3 and Open-E iSCSI-R3, which can be used exclusively for shared storage or iSCSI connection.

## Reference sources

### Intel® SSR212MC2 and additional Intel® hardware components

You can get Intel® SSR212MC2 from the familiar sources.

For information about which hardware components are supported, technical specifications and firmware updates, please visit <http://www.intel.com/support/motherboards/server/ssr212mc2>.

### Open-E Data Storage Server

You can download a free trial version of Open-E Data Storage Server as an ISO file from <http://www.open-e.com/demo-cd>. Just register on the specified page with your name, company and e-mail address, and burn the file onto a CD.

For all information about Open-E products, please visit <http://www.open-e.com/products>.

A list of resellers and distributors is available at <http://www.open-e.com/partner>.



## Installation & Basic Configuration

### Installing the Open-E DSS Flash module

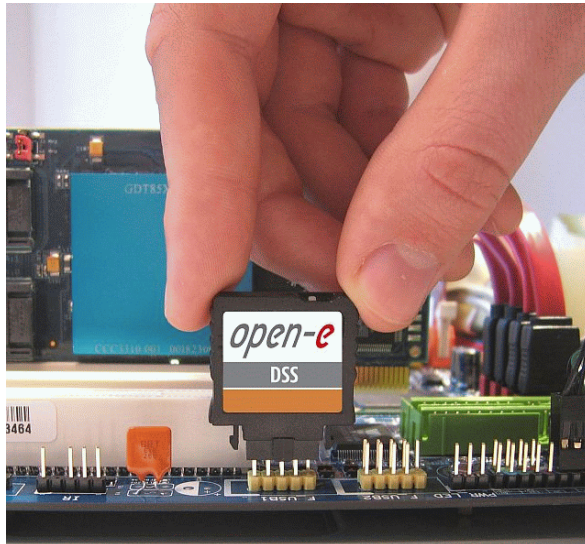
The preparations for a storage system with Open-E Data Storage Server are child's play and will not take you even 10 minutes. This way, users save time, which they can use to concentrate on their business. There is no day-long set-up and installation. To install the Open-E module, you need the following components:

- **Intel® SSR212MC2**
  - **Hardware components: CPU, RAM, hard disks, cabling**
  - **Open-E DSS internal DOM**
1. Open the housing of the Intel® SSR212MC2. Consult the Quick Start user's guide included with the storage server to install the hardware components.





2. Find the internal USB connections on the mainboard (possibly covered by the cover for the slot for 2.5" boot drive) and plug the Flash module with Open-E DSS into one of these connections.



3. Close the housing of the SSR212MC2 again, place it in your server rack, and cable the server.

## Open-E DSS basic configuration

Now you can boot your server. Important: The basic configuration of Open-E DSS must be carried out on the console. For this, you must connect a monitor and keyboard directly to the SSR212MC2.

1. Open-E DSS boots the system, detects the hardware present and incorporates it.



- Open-E DSS presents a welcome screen with the most important information about the software version and the network settings made.

```
Welcome to Open-E Data Storage Server (Press F1 for help)
-----
Model:                               Open-E Data Storage Server
Version:                             1.30.DB00000000.2819
Release date:                         2007-08-24
S/N:                                  99657225
Licensed storage capacity:            16 TB

Network settings:
Interface 1:   eth0      IP:192.168.0.230/255.255.255.0
Interface 2:   eth1      IP:192.168.1.220/255.255.255.0

HTTPS settings:
          port:          443
          allow from:    all
```

- The standard IP address is 192.168.0.220, standard gateway 255.255.255.0. If the IP address displayed is different, DSS has taken it from an active DHCP server on the network.
- You can display the functions of the console with [F1]. There you can see that you can change the IP address with [CTRL] + [ALT] + [N], for example.

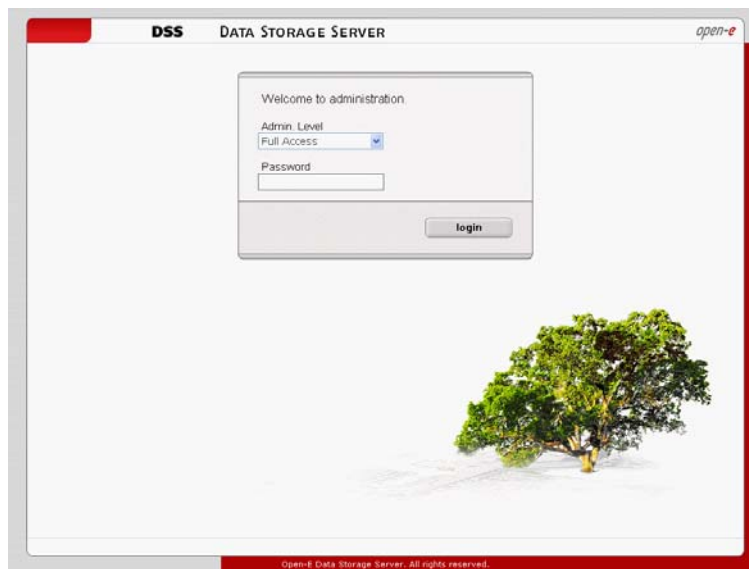
```
----- Help -----
You can use below key sequences (C-means 'Left Ctrl',A-'Left Alt'):
C-A-N - to edit static IP addresses
C-A-P - to restore default factory administrator settings
C-A-I - to restore default network settings(IP, BONDING)
C-A-T - to run Console Tools
C-A-X - to run Extended Tools
C-A-W - to run Hardware Configuration
C-A-F - to run Fibre Channel Tools
C-A-H - to display hardware and drivers info
F2    - to display all network interfaces
F5    - to refresh console info
C-A-S - to shutdown the system
C-A-K - shutdown / restart menu
----- (100%) -----
EXIT
```

As soon as Open-E DSS is available via a valid IP address on the network, the configuration can be done conveniently from a client on the network. There, only a Web browser is required. For tips for handling the console tools, see page 15.



## Calling up and configuring the Web interface

1. Start the Web browser (such as Firefox, Internet Explorer or Safari) of your choice on a computer on the network and connect to the IP address of DSS. Warning: The default address is `https://192.168.0.220` or `https://dss`. For the actually-assigned IP address, see the boot screen or call up the server console with [F2]. The server in the picture can be reached at the IP address 192.168.0.230.

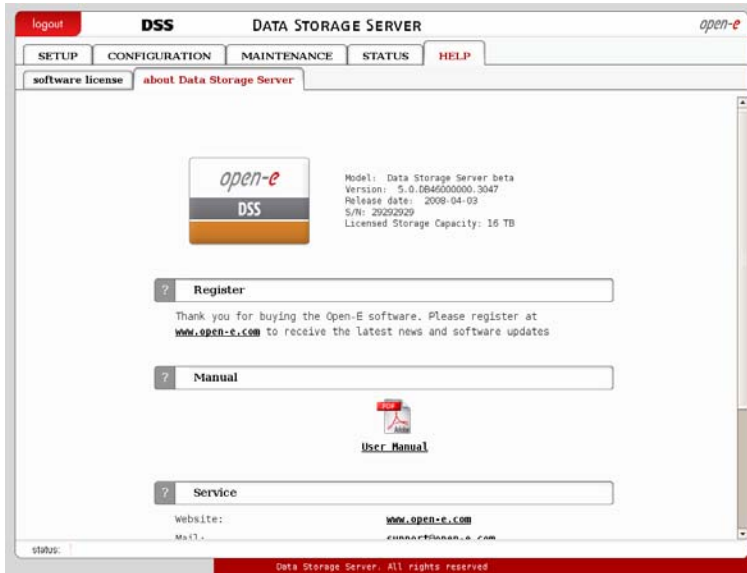


2. Accept the encryption certificate. Since Open-E DSS only supports intranet shares, a worldwide validity check of the certificate is not necessary.
3. The default password is `admin`. Warning: the password query is case-sensitive; this means that `admin`  $\neq$  `ADMIN`.





- The first thing you will see is information about the DSS version, manual as PDF and the service and support contacts.





- Via **SETUP/GUI** you can set the language to **English**; to do this, click **apply**.

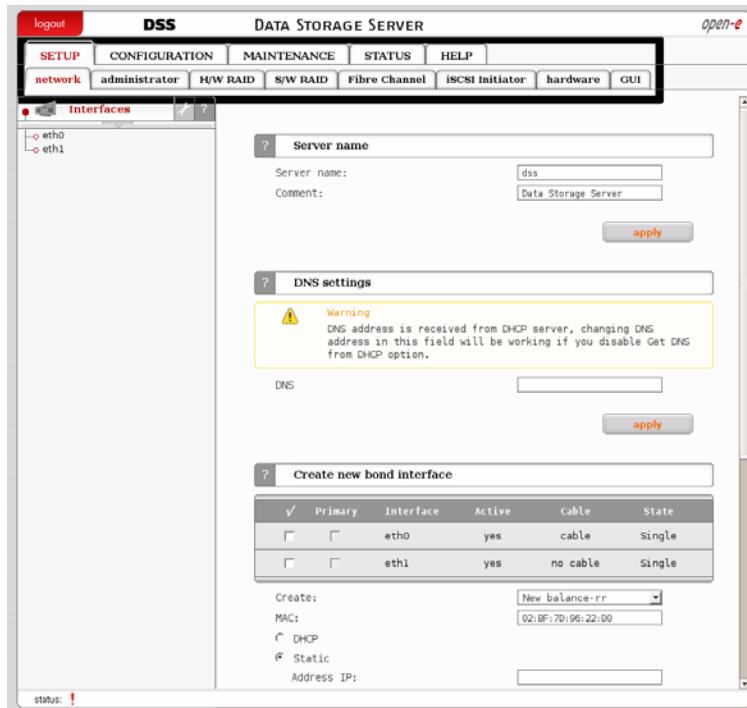




## Configuration

### Overview of Web interface

The administration of Open-E DSS occurs almost exclusively via the Web interface. Only in special cases do you need to rely on the console tools (for information about these, see page 15). In the lower left corner a status indicator shows whether everything is OK with the storage system. In addition to the menu entries, two icons will help you: You can use the "Wrench" icon () to adjust the display; use the question mark icon () to access the direct help. The easy-to-operate GUI is divided into five main areas, which you can reach via the tabs at the upper edge: **SETUP**, **CONFIGURATION**, **MAINTENANCE**, **STATUS**, **HELP**. Depending on which of these tabs you select, the tabs on the level below change.

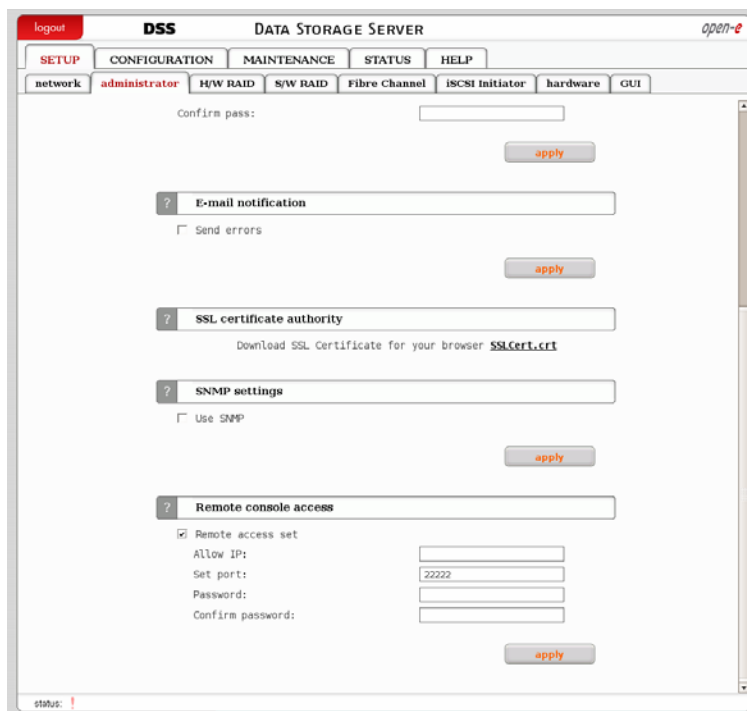


Web interface with tabs for navigation at the top edge



## SETUP

In this area you will find the tools for basic server configuration. Here you set up the **network** parameters (server name, DNS, DHCP, proxy, Ipsec). Click on one of the interfaces listed under **Interfaces** to get detailed information. Here you can also set the → Bonding for network cards. Under **administrator**, you regulate the access settings on the server (port, administrator password, remote console via SSH) and switch e-mail notification and SNMP function on.



### Administration and access settings for Open-E Data Storage Server

Via the **H/W RAID** and **S/W RAID** tabs, you set the RAID functions of the storage server. Warning: H/W-RAID is only already integrated for the SSR212MC2R via the included Intel RAID-Controller SRCAS144E and can be configured via the Intel RAID Web Console 2. Via the **Fibre Channel** tab, you make the most important settings for the FC-HBA, and via the **iSCSI Initiator** tab, you can enter an iSCSI target with portal IP address, port and optional CHAP authentication (Challenge Handshake Authentication Protocol).

Via the **hardware** tab, you manage the power button and time settings of the server as well as optional UPSes (uninterruptible power supplies). Via the **GUI** tab, you can set the language to **English** or **German**.



## CONFIGURATION

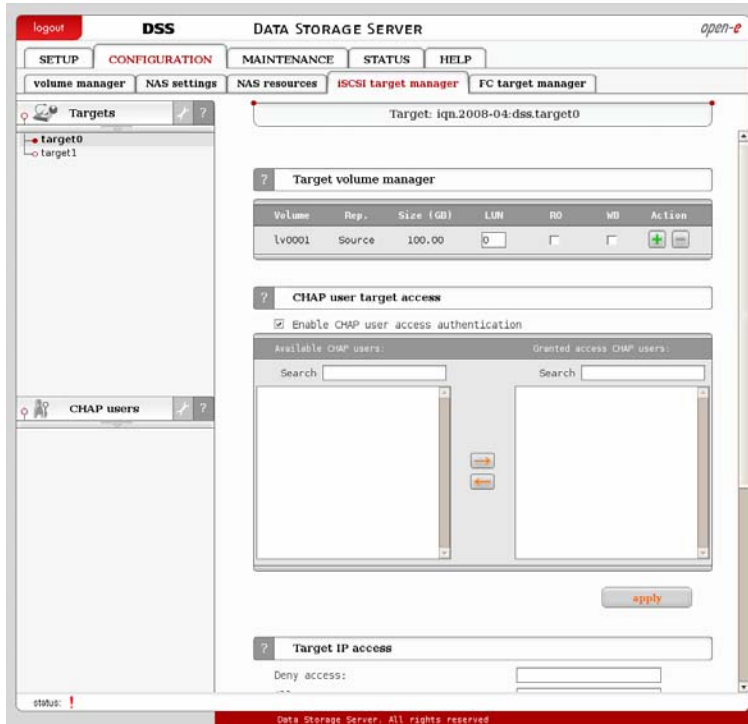
Using the **CONFIGURATION** menu element, you make the central settings for your storage system. Here, you manage the volumes, as well as NAS, iSCSI and FC systems.

The central tool of Open-E DSS is the **Volume Manager**. Here you can create → → **Volume Groups** and **Logical Volumes**, which allow you flexible use of the hard drives and RAID arrays (units). You can search for volumes (**rescan**) or use the **Unit manager** to create logical volumes. The hard disk finder helps with the determination of the physical disks that are built into the storage server. The problem: if you use Hardware-RAID, the entire storage space appears as one logical volume. With the hard disk finder, you can at least determine which disks are in which unit (observe the LED indicator on the server).

Via the **NAS Settings** menu item, you specify the basic conditions for the jointly-used network storage. Under this are the authentication method (Primary Domain Controller, Active Directory, LDAP, workgroup), access protocols (FTP, Appletalk, SMB, NFS, http), synchronization of the user and group ID with a NIS server as well as activation of backup and replication agents. You can also add an optional anti-virus engine and create the database for the local backup.

On the **NAS resources** tab, you will find all functions for creating and managing shares and you can control access on user and group levels. You can access the functions via the menu items in the left column (**Shares, Users, Groups**). For the shares, you can allow access via access control lists. Click an individual share in order to control access via SMB, FTP or AFP; you can also enable access via NFS and http here. Furthermore, you will also find the settings for the replication agents. Under **Users**, you assign access to the existing shares flexibly; you can also make the same settings on the group level.

With the **iSCSI target manager**, you can create and manage iSCSI storage space. The authentication can be set up via CHAP. For individual iSCSI targets, you limit access to particular IP addresses here.

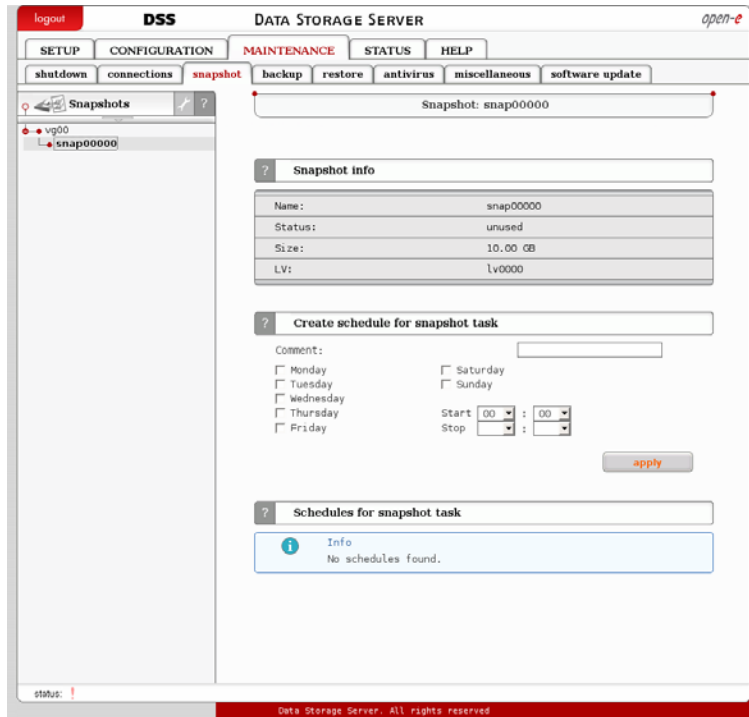


Management of the iSCSI targets with authentication

## MAINTENANCE

With the tools that Open-E DSS makes available on the **MAINTENANCE** tab, you can manage your storage system with a few mouse clicks. The extensive functions of DSS are divided up clearly across eight tabs (**shutdown, connections, snapshot, backup, restore, antivirus, miscellaneous, software update**).

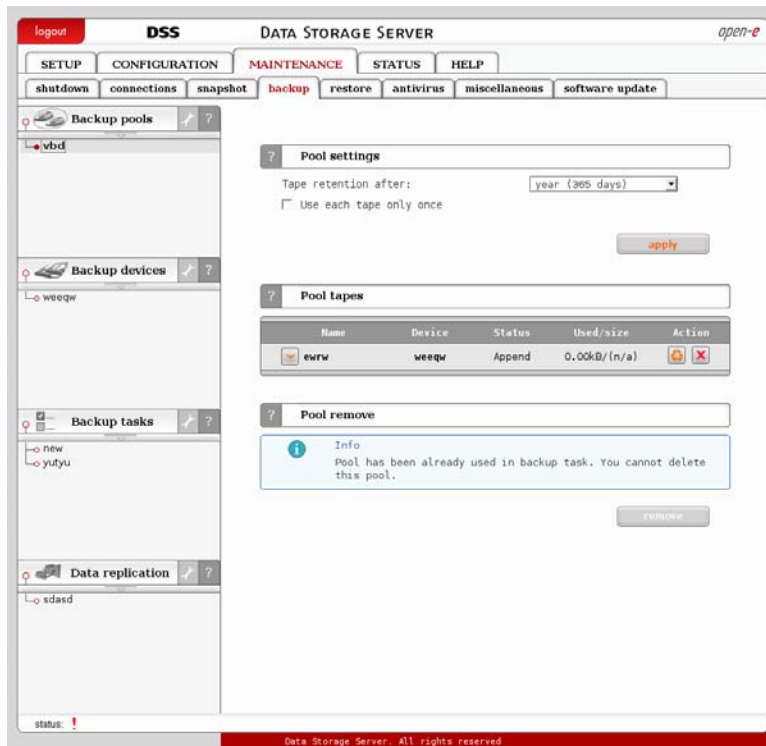
Via the **shutdown** tab, users can switch off or restart the storage server. This happens either manually or on a schedule. You can reset the current NAS, iSCSI and FC connections via **connections**.



### Information about individual snapshots with scheduling

The **snapshot** tab shows all defined snapshots of volumes. Thus, you have a powerful tool for making consistent backups of data that changes during the backup process. With a snapshot, you freeze the state of a logical volume. All changes are saved on the snapshot volume. Here, you can set up a schedule for each defined snapshot. Warning: so that this will work, you must assign a file share (NAS) or target (iSCSI) to the snapshot. Snapshots for which there is no fixed schedule can be started and stopped manually.

Under **backup** you have all your data backups at a glance. The menu at the left edge shows you the different options: you can create virtual tape drives (**Backup devices**), define backups (**Backup tasks**) and set up replication (**Data replication**).



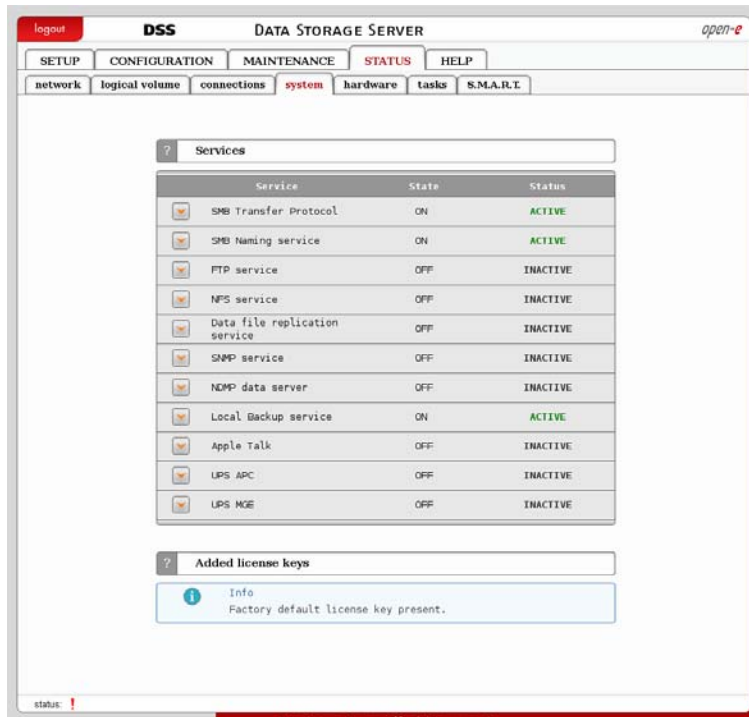
### Overview of Backup devices, Backup tasks, and Data replication

Just a click away from backup is the **restore** menu option. There you will see your backup tasks sorted by date; with this practical search function, you can search purposefully for individual backups. Under **antivirus**, you can set which shares should be checked when by a virus scanner. With **software update**, you can update Open-E DSS or return to an earlier version. Warning: most DSS updates require no reboot; in case of changes to the operating system core, however, a reboot is necessary.

## STATUS

Via the **STATUS** tab, you can always keep an eye on your storage server. Structured in fine granules in seven submenus (**network**, **logical volume**, **connections**, **system**, **hardware**, **tasks**, **S.M.A.R.T.**), you can learn everything you need to optimize your storage systems here.

All network interfaces and the settings for standard gateway and DNS servers are in the **network** area. Click the interfaces listed (e.g., eth0, eth1) in order to call up specific characteristics such as MAC address or DHCP configuration. Under **logical volume**, you will see defined volume groups and the free storage space. For dynamic volumes, you can also call up statistical information.



### Overview of all services including their associated status

Currently-existing connections are displayed under **connections**; the services offered by the server are under **system**. Under **hardware**, you can call up the status of the UPS, the installed controllers with their drivers, as well as log file and RAM information. In addition, you can call up server statistics here.

Important: the **tasks** menu item informs you about all defined tasks, regardless of whether they are snapshots, backups, replication or antivirus. In addition, you can view the running tasks and the log files here.

## HELP

Under **HELP**, you will find the license conditions (**Software license**) as well as support information and the manual (**About Open-E Data Storage Server**). With the **Add license key** entry, you can expand the maximum possible storage space conveniently. Open-E offers you licenses for 4, 8, 16, 32 and 64 Tbyte ([www.open-e.com/products](http://www.open-e.com/products)).

## The first steps

Log into the Web interface of Open-E DSS as described on page 15. Before you start the configuration, you should first change the access password.





1. Click **SETUP/administrator** and enter a new password under **Administrator password**.

2. With a click on **apply**, the new password becomes effective.  
Important is also that the storage server must work with the correct system time from the very start. Otherwise it can happen that your backup tasks planned for the weekend start up on a weekday.



1. Via **SETUP** and **hardware**, you will find the **Time zone settings** and **Set Time** menu items.

2. Under **Time zone settings**, you can select a time server on the Internet with which the SSR212MC2 automatically compares the local time. Important: select **Europe/Berlin** as the time zone. So that this works, you must place a checkmark in the box next to **NTP server** under **Set Time**.
3. Alternatively, you can set up the time and date manually (**Manual** checkbox) or use the local time of the PC from which you access the Intel® SSR212MC2 (**Use this PC time**).

So that you don't always have to run into the server room for console access, you can set up a SSH access.



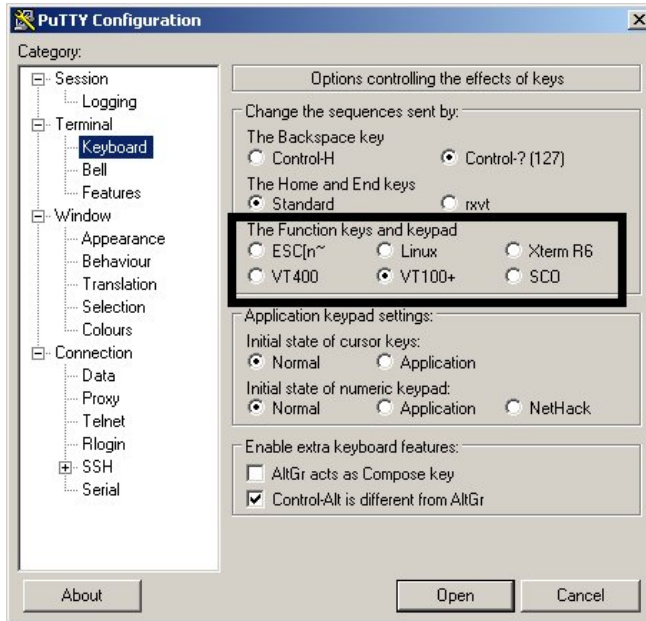
1. To do this, change via **SETUP** and **administrator** to the **Remote console access** option.

The screenshot shows the DSS (Data Storage Server) configuration interface. The top navigation bar includes 'logout', 'DSS', 'DATA STORAGE SERVER', and 'open-e'. Below this, there are tabs for 'SETUP', 'CONFIGURATION', 'MAINTENANCE', 'STATUS', and 'HELP'. Under 'SETUP', there are sub-tabs for 'network', 'administrator', 'H/W RAID', 'S/W RAID', 'Fibre Channel', 'iSCSI Initiator', 'hardware', and 'GUI'. The 'administrator' sub-tab is active. The main content area shows a 'Confirm pass:' field with an 'apply' button. Below this are several sections: 'E-mail notification' with a 'Send errors' checkbox and an 'apply' button; 'SSL certificate authority' with a link to 'Download SSL Certificate for your browser SSLCert.crt'; 'SNMP settings' with a 'Use SNMP' checkbox and an 'apply' button; and 'Remote console access' with a checked 'Remote access set' checkbox, 'Allow IP:', 'Set port:' (containing '22222'), 'Password:', and 'Confirm password:' fields, and an 'apply' button. The status bar at the bottom shows 'STATUS: !' and 'Data Storage Server. All rights reserved'.

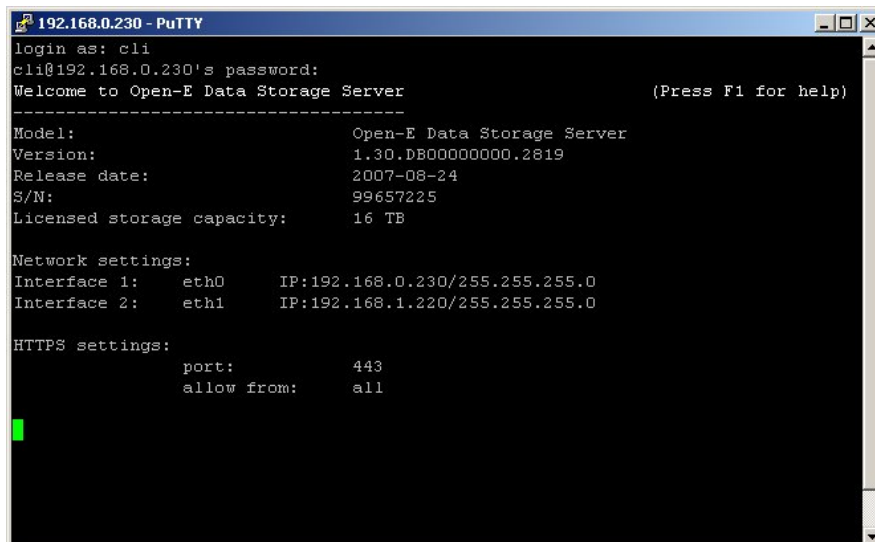
2. Allow remote access only from a specific IP address, enter a port and select a password that has at least eight characters. Click **apply**.



- From a Windows client, you can now connect to the server console via a client such as PuTTY (warning: for PuTTY, you will have to activate the setting **VT100+** for the function keys under **Terminal/Keyboard**).



- Please note: you must always log in with the user name **cli**. You cannot change this default setting.

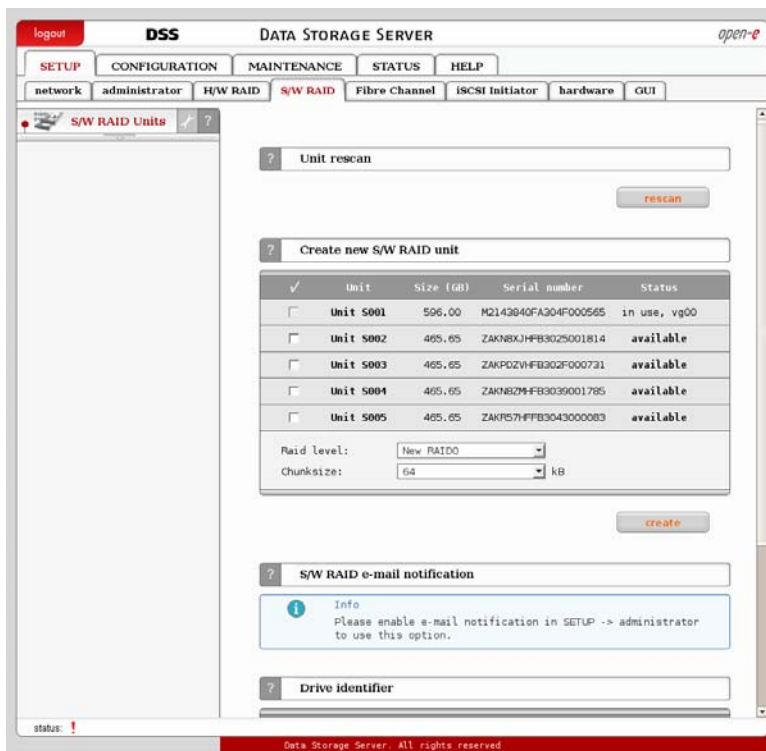




## Setting up a RAID array

The first setup step is to configure the RAID. If you are using a hardware RAID controller (already included in the Intel® SSR212MC2R), you must first take care of the basic settings in the controller's BIOS. Follow the instructions in the manual. You can set up the high-performance Open-E Data Storage Server software RAID conveniently via the Web GUI. Tip: a good strategy is also the combination of hardware and software RAID, with which a RAID 5 is also mirrored.

1. Click **SETUP** and then **S/W RAID**. All available units (physical hard disks and disk arrays for the HW RAID) are displayed.
2. Select the units with which you would like to realize the software RAID.
3. To do this, combine the corresponding RAID level and click **create** in order to create the RAID connection (you will find background information about RAID levels in the Open-E DSS manual). The display for the units used changes; it indicates **in use** and the RAID level.

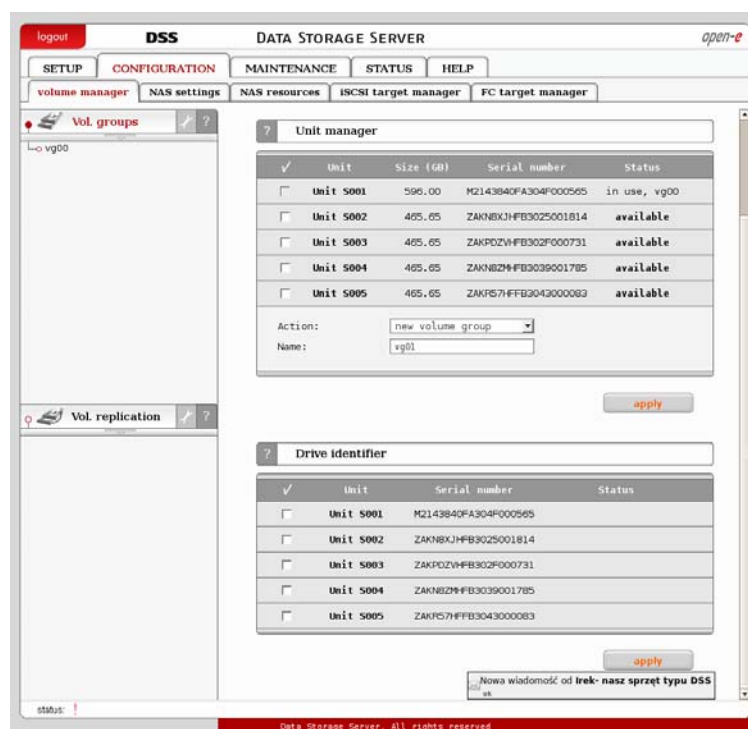




## Preparing volumes

Open E-Data Storage Server works with a logical volume manager that offers you an abstract view of the installed storage systems. The advantage: you work with logical volumes that function across disk and array boundaries. Volumes can be expanded in ongoing operation. Thus, your storage system has the greatest possible flexibility.

1. Click **CONFIGURATION/volume manager**.
2. The **Unit manager** now shows you the units. These are either individual hard disks or networks created by hardware or software RAID.

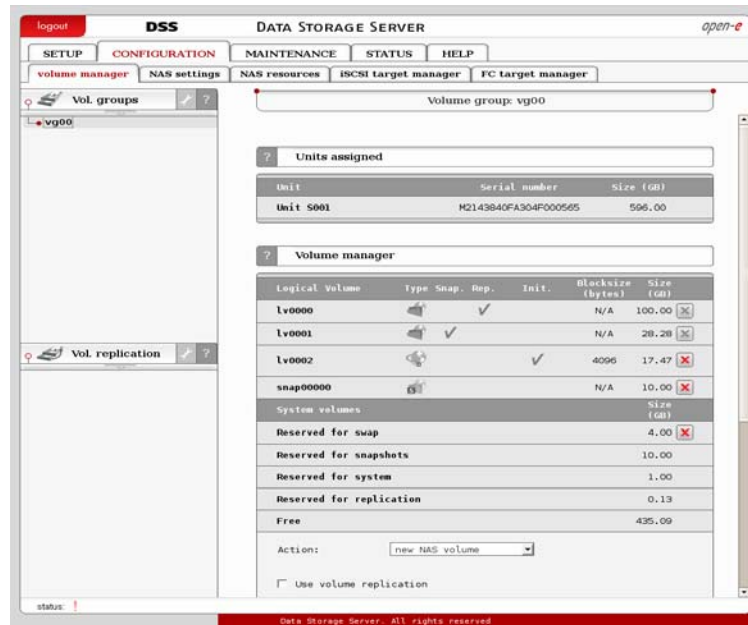


3. Select the units that you would like to combine into a volume group and click **new volume group**. A volume group is just an abstract administration unit for the built-in storage.

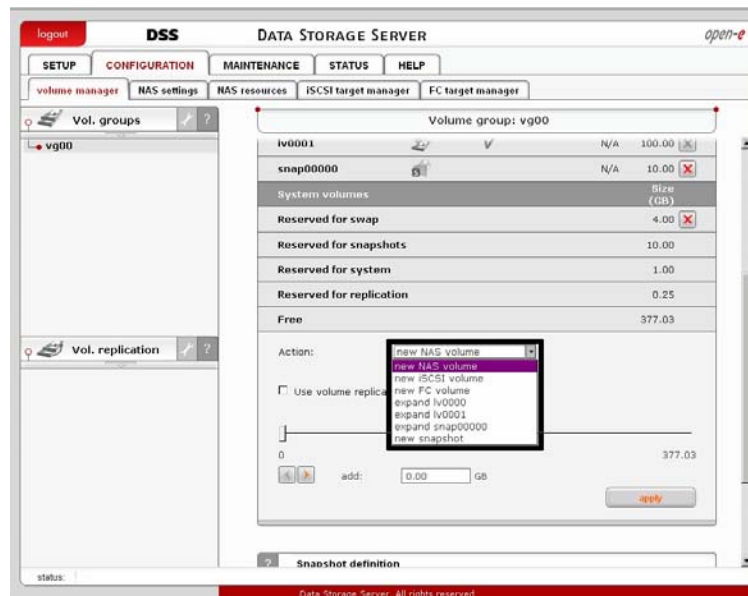
A volume group can be subdivided logically into smaller units, into so-called volumes. Volumes behave with respect to the volume group like partitions to hard disks. Conceivable are volumes for a shared storage for Office documents or iSCSI volumes, which accommodate virtual machines by VMware ESX Server.



1. In order to create volumes, click the corresponding **Vol. group** (default name vg00, vg01, vg02...).



2. Under **volume manager**, you can create new volumes for NAS, iSCSI or Fibre Channel or expand existing volumes.

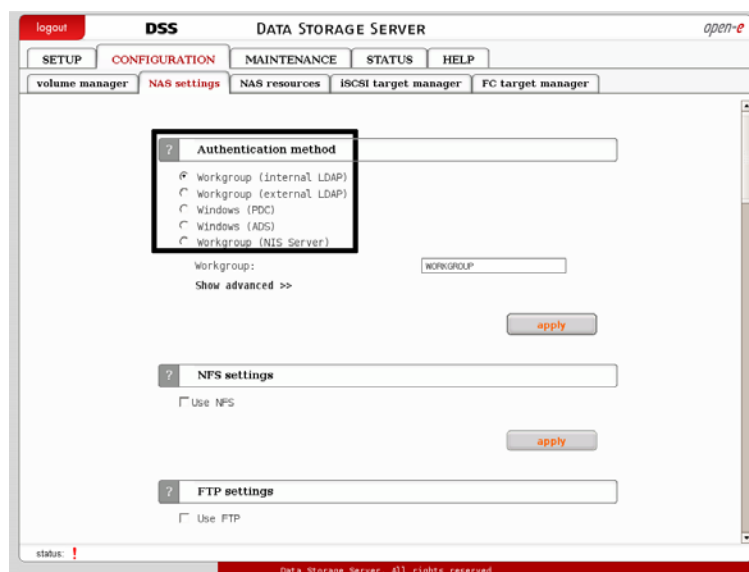




## Setting up a NAS system with shares

A Network Attached Storage and network shares can be set up with a few mouse clicks. This way, you can create a share for commonly-used Office data easily. Via **CONFIGURATION** and **volume manager**, you can create a new NAS volume in a volume group (see also page 15).

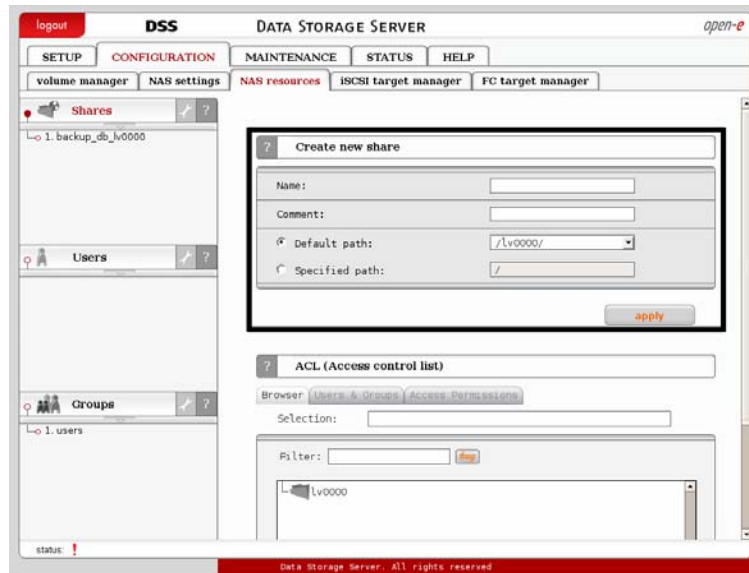
1. Under **CONFIGURATION/NAS settings**, you can specify the basic conditions for the joint storage, for example, the type of authentication.







2. With **CONFIGURATION** and **NAS resources**, you can create a network drive via **Create new share**.



3. Select a name for your share, if necessary change the path and click **apply**.

The menu on the left side displays the shares created under **Shares**. In order to make additional settings such as access authorizations, click the share in question. Warning: newly-created shares are ready to use right away; however, it may take a few minutes until the network drives are displayed in the Windows network of each client. You can set up access via NFS, FTP, http and the authentication under **CONFIGURATION/NAS settings**.

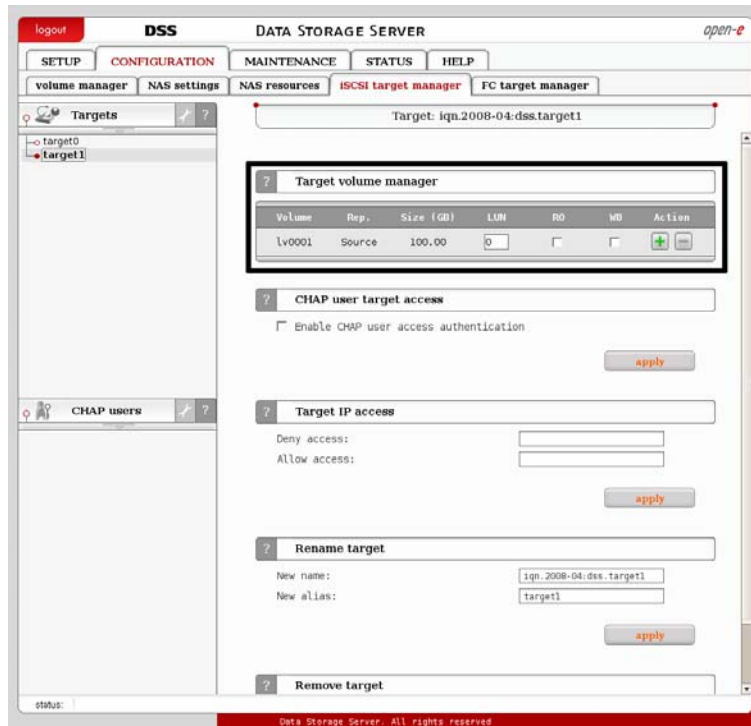
## Setting up an iSCSI system

Create a new **iSCSI volume** (see also page 15) via **CONFIGURATION** and **Volume manager** in the corresponding volume group.

1. Then click the **iSCSI target manager** tab.
2. Under **Create new target**, click the **apply** button (you can select whatever alias you wish; default is target0, target1, target2,...)

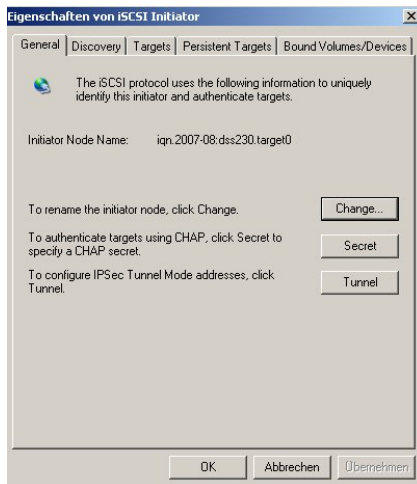


3. Click the new target in the left column and assign it to the logical volume that you have created under **Target volume manager**. To do this, click the green plus sign under **Action**. The numbering of the LUNs is regulated automatically by the system. However, you can change the numbering manually if an application requires this.



4. Via the **CHAP user target access** menu item, you can enable CHAP authentication and thus control access to the iSCSI target purposefully.

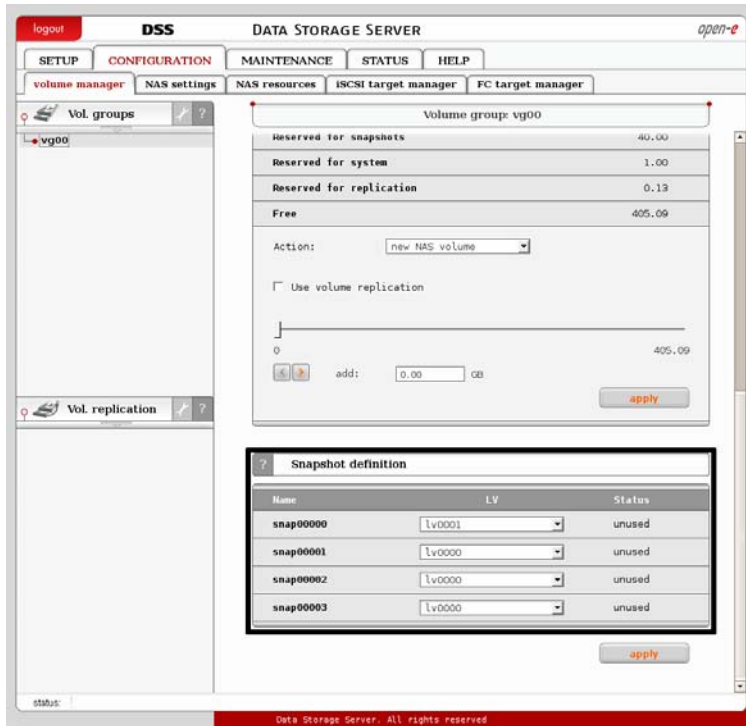
For access to iSCSI targets, connected systems need initiator software. Microsoft delivers this for free for Windows 2000, XP and Server 2003 as a download (Google search for "MS iSCSI Initiator"); Windows Vista already has it integrated. Insert a target portal under Discovery (IP address of the storage server). Then you will automatically see the targets provided there. The VMware ESX Server also has a software initiator that establishes the connection to iSCSI targets and works together well with Open-E Data Storage Server.



## Configuring backups

Open-E Data Storage Server includes all functions for local backups and support for external backup solutions (Veritas, Dantz, Brightstare). An especially elegant method is a local backup with the built-in snapshot function, for with that, important data can be backed up without downtime and additional software. The idea behind this is the freezing of the state of a data volume at the start of the snapshot. The users work starting at this moment with a virtual data stock, for which all data changed since the snapshot start is saved on a separate partition (on the snapshot volume). The storage of the changes occurs on block level, that is, independently from the file system. The changes are only taken over on the actual data partition if the snapshot is ended or removed. Through a special share, which is only accessible to the administrator, it is thus possible to make a complete backup of the data stock during ongoing operation. The snapshot function is completely transparent for the user on the network.

For each snapshot, you must create an individual logical volume (cf. also page 15) using **CONFIGURATION** and **volume manager**. The snapshot volumes are called snap00000, snap00001, ... and you have to assign them to the volume to be backed up. Please note that the content of the data volume is not copied into the snapshot. Instead, a copy-on-write technique is used: this means that only for changes to the data (write) is a copy written to the snapshot volume; otherwise, the snapshots contain no data, just references to the original files. Therefore, you must select the size of the snapshot volume so that it can accommodate all changed data. If the storage space of the snapshot is insufficient, the changes are not lost; instead, the snapshot task is ended and all changes are made to the original volume. Warning: the frozen state is then no longer available.



Calculate the storage space for snapshots generously. If, for example, you delete and then restore 30 Gbyte of data, these are two changes that will require 60 Gbyte storage space on the snapshot partition. You are on the safe side if you provide approximately three times the storage space required for the changes per snapshot.

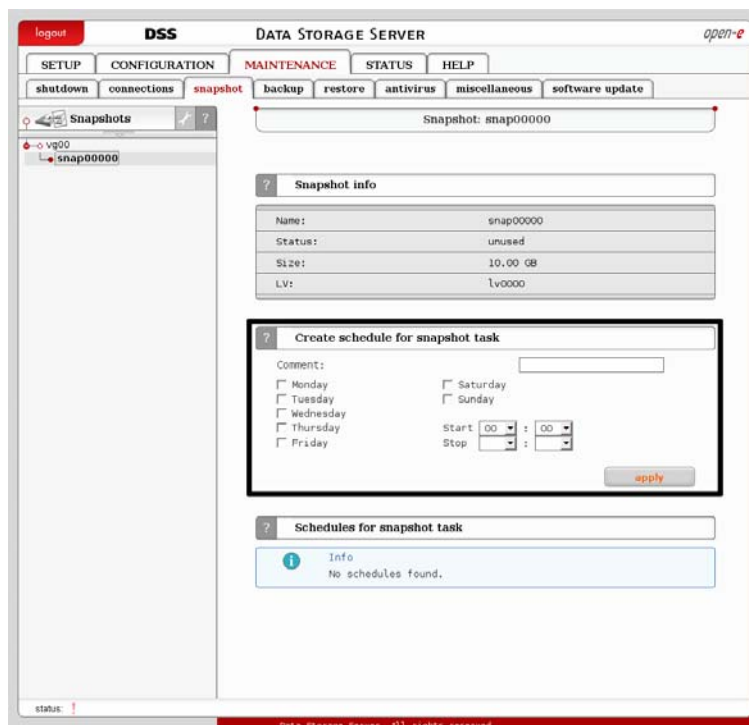
If the storage space in the snapshot directory is insufficient, then the currently-active snapshot is cancelled immediately and removed. Here, you will not lose any data; instead, the virtual data stock up to this point that the users see is written to the file system. The snapshot, that is, the state that was frozen, is then no longer available.



## Restoring deleted files quickly

In practice, files are often deleted or changed unintentionally by users on a shared storage. In this case, it is too complicated to restore complete backups from tape drives; after all, the concern is only the restoration of a few files. Snapshots with a fixed defined start time allow administrators to quickly access earlier versions of a file. The administrator can freeze the data stock at any intervals and rely on this history at any time. If a user has unintentionally overwritten the annual report with other content, it is sufficient to know the approximate time of the mishap and the administrator can then simply restore the correct file version. Assuming corresponding system resources, it is possible for up to 10 snapshots per volume to be active at the same time (20 snapshots in total).

1. To do this, create a snapshot as described on page 15 and assign the logical volume whose status should be frozen.
2. Using **MAINTENANCE** and **snapshot**, select the newly-created snapshot on the menu on the left side.
3. Under **Create schedule for snapshot task**, define a start time.

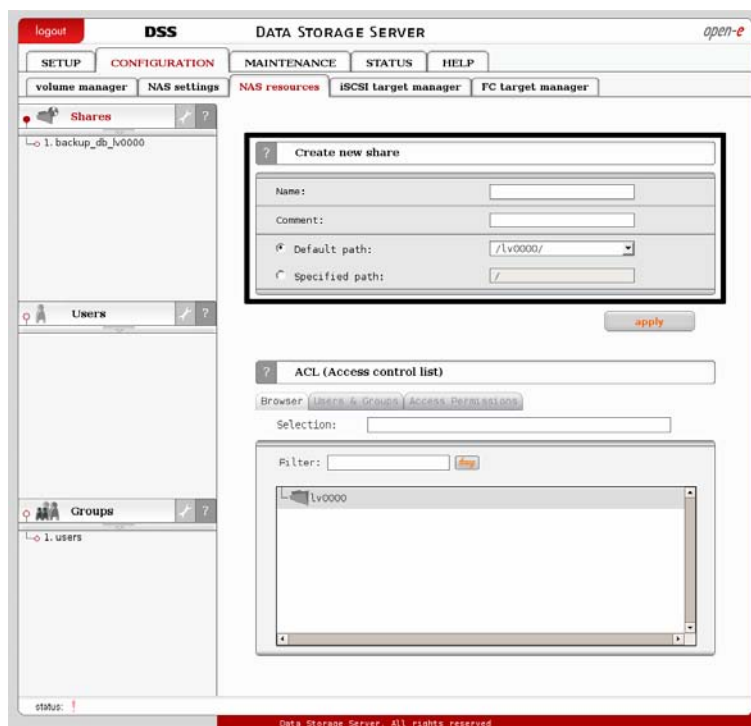




If you want to have three versions of a file on hand per day, you must define three snapshots. Assuming that your office hours are 9:00 AM to 6:00 PM, then snapshot 1 could be from 9:00 AM on, snapshot 2 from 12:00 PM on, and snapshot 3 from 3:00 PM on. Thus you have the state of the data at 9:00 AM, 12:00 PM and 3:00 PM on hand. If you execute these snapshots from Monday to Friday, you have three interim states of your data on hand for each day.

Access to the snapshot is configured quickly. For a snapshot of an NAS volume, proceed as follows:

1. Create a new share as described on page 15.
2. Under **Specified path**, assign the snapshot to the new share.



3. Click **apply**.

Now you can access the new share as usual and restore the original files.

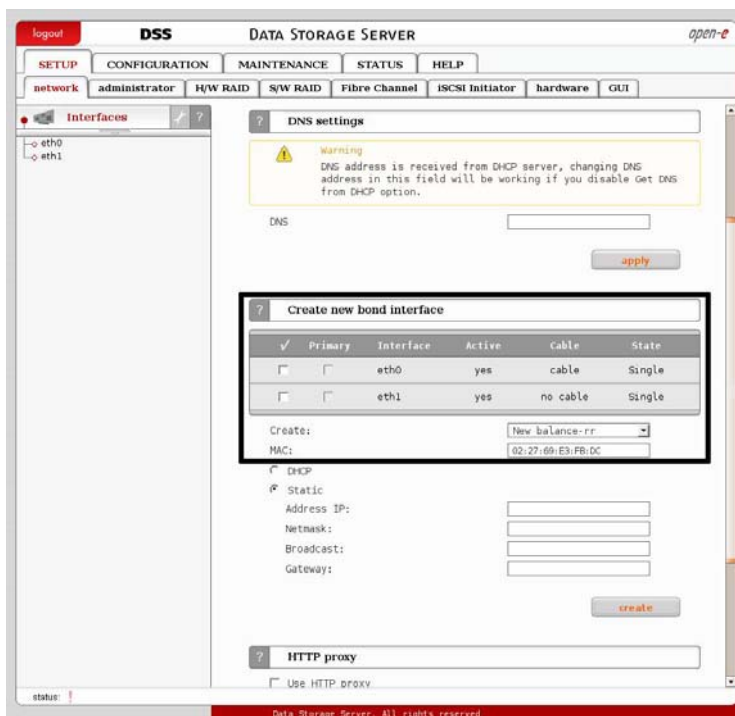
With snapshots of iSCSI targets, access works as follows:

1. Under **CONFIGURATION** and **iSCSI target manager**, create a new iSCSI target. Tip: it's best to change the default name and to add the keyword "snap" so that you know immediately that this view is of a snapshot.
2. Click the new target on the left side in the menu under **Targets** and assign the iSCSI snapshot as volume.
3. Now you can access the snapshot via the iSCSI initiator of your operating system as on any other iSCSI volume.



## Setting up network bonding

With bonding, you can combine several network cards logically into a quick connection. You can do this under **SETUP/network** with a click on **Interfaces**. Then scroll down to **Create new bond interface**. Now, select the corresponding interfaces that you would like to combine via the checkbox (up to 8 are possible). For the accessibility, you can either assign a fixed IP address or rely on a DHCP server on the network. Important: Using **Create**, you can select the bonding mode from a drop-down menu:



- **New balance-rr**  
The data transfer occurs according to the round-robin process; here, the packets are distributed one after another across all available network cards (advantages: error tolerance and load balancing).
- **active-backup**  
In this mode, only one network connection is active. The second interface is only used in case of error (advantage: error tolerance).
- **balance-xor**  
Network cards are assigned fixed target addresses. The XOR process is responsible for the assignment (advantages: error tolerance and load balancing).





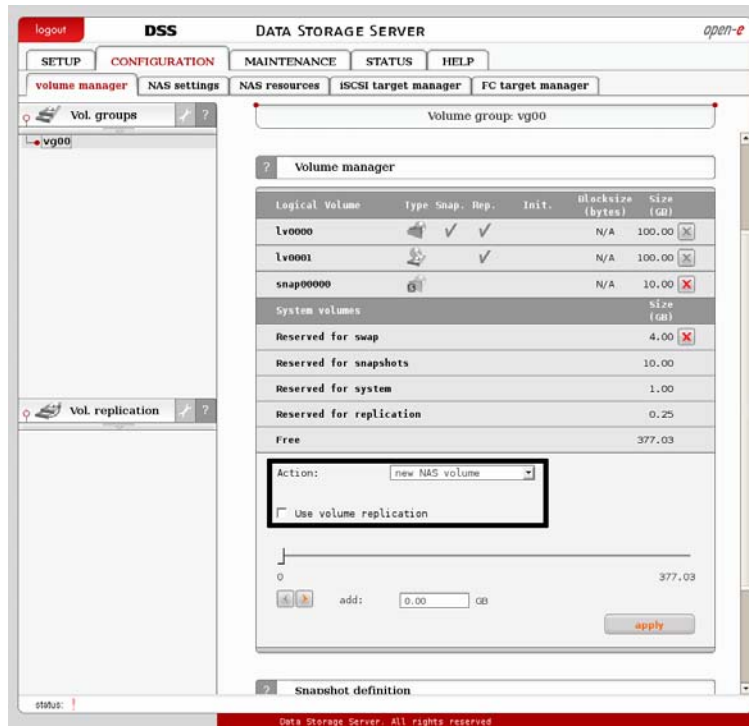
- **Broadcast**  
The complete data transmission always runs across all interfaces (advantage: error tolerance).
- **802.3ad IEEE 802.3ad Dynamic Link Aggregation**  
Network cards with the same performance data and settings are combined into groups. A switch with support for IEEE 802.3ad Dynamic Link Aggregation (Link Aggregation Control Protocol, LACP) is required.
- **balance-tlb**  
Depending on the load, outgoing data traffic is distributed across all network cards (this calculation depends on the speed of the interfaces). Incoming data traffic is taken over by any interface; in case of error, another network card takes over the MAC address of the interface that has failed (advantages: error tolerance and load balancing).

## Setting up replication

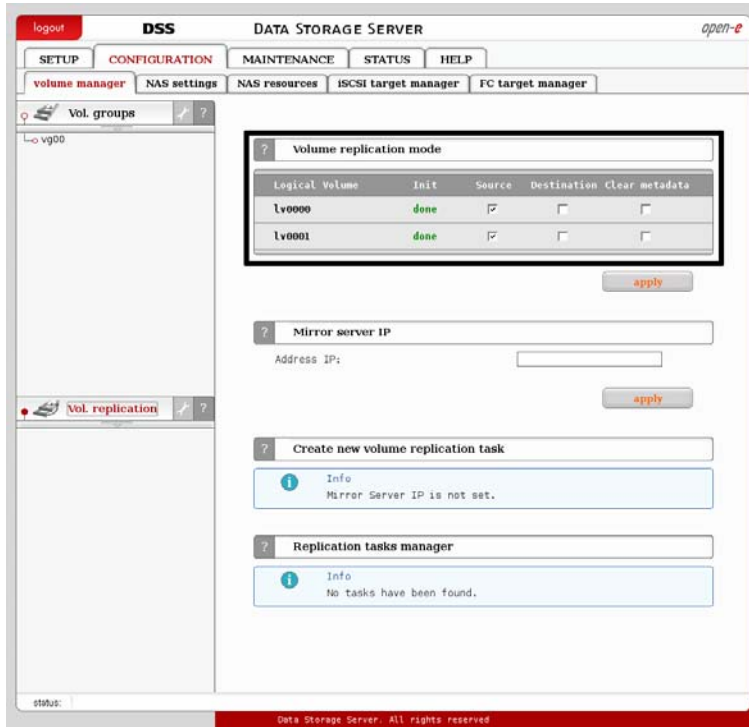
A frequently-used feature of the Open-E Data Storage Server is replication. With replication, you can always make a current 1:1 copy of a volume (volume replication) or of a share (data replication).

The higher-performance variant is volume replication; it functions synchronously and only with a second server (mirror) on which the replicas are stored.

1. When creating volumes (warning: for replication, the source and target volumes must be the same size), activate those that are participating in the replication by checking the **Use volume replication** checkbox (see also page 15).

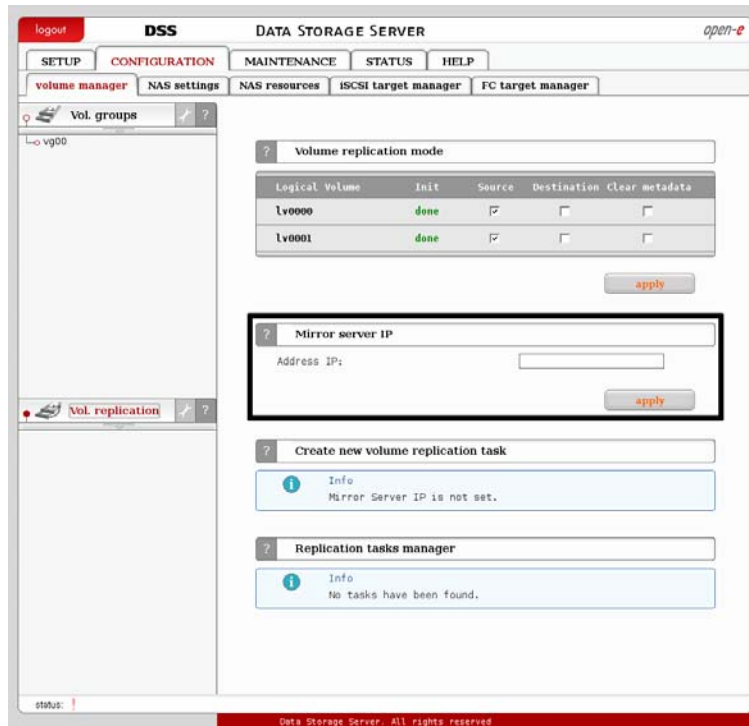


2. Define the source and target with the same size. Under **CONFIGURATION** and **volume manager** click on **Vol. replication** in the left menu column.
3. On the right, you will now see all volumes for which replication was activated under **Volume replication mode**.



Now, the source and target volumes should exist on both servers.

1. Under **CONFIGURATION/volume manager** and **Vol. replication**, click the checkboxes for source or target for all logical drives and confirm with **apply**.
2. Also specify the IP address of the mirror server and click **apply**.

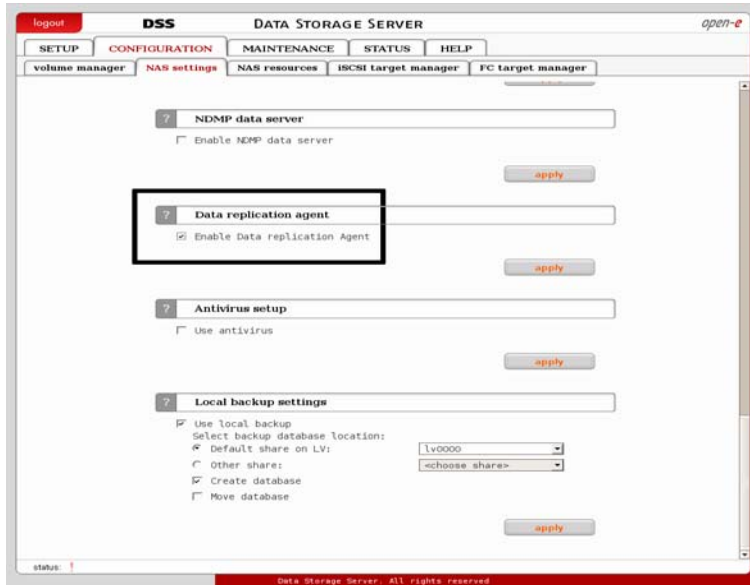


3. Create a new replication task with source and target volume and confirm with **create**.

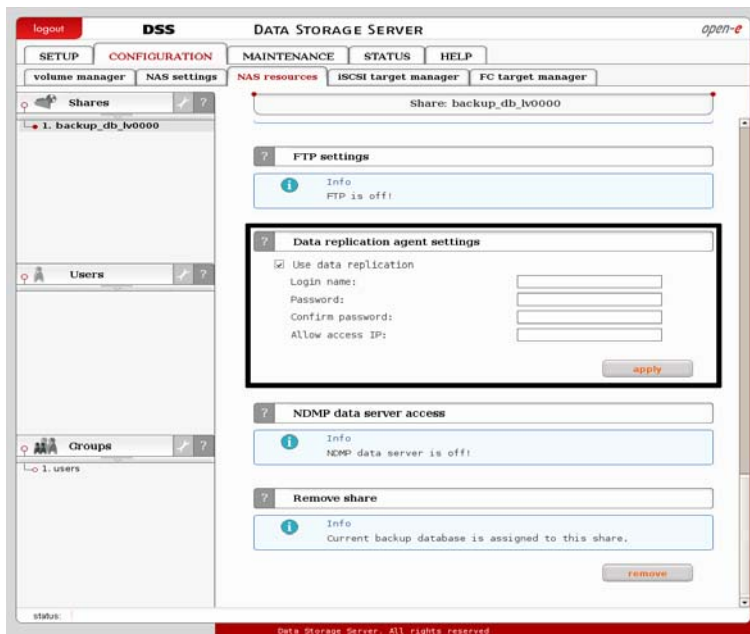
Under **Replication tasks manager**, you can start the volume replication task, stop it or delete replication tasks. Under **STATUS/Tasks** you can see all active tasks and their associated log files under **Volume Replication**.

For NAS, there is also asynchronous replication, also called data replication. You have to enable this first in your NAS settings.

1. Under **CONFIGURATION** and **NAS settings**, under **Data replication agent**, place a checkmark in the **Enable Data replication Agent** checkbox and click **apply**.



2. Next is the activation for individual NAS shares, which should work as the target for the replication. Under **CONFIGURATION** and **NAS resources**, select the share that should take over the replication.
3. Activate the **Use data replication** checkbox under the **Data replication agent settings** menu item.



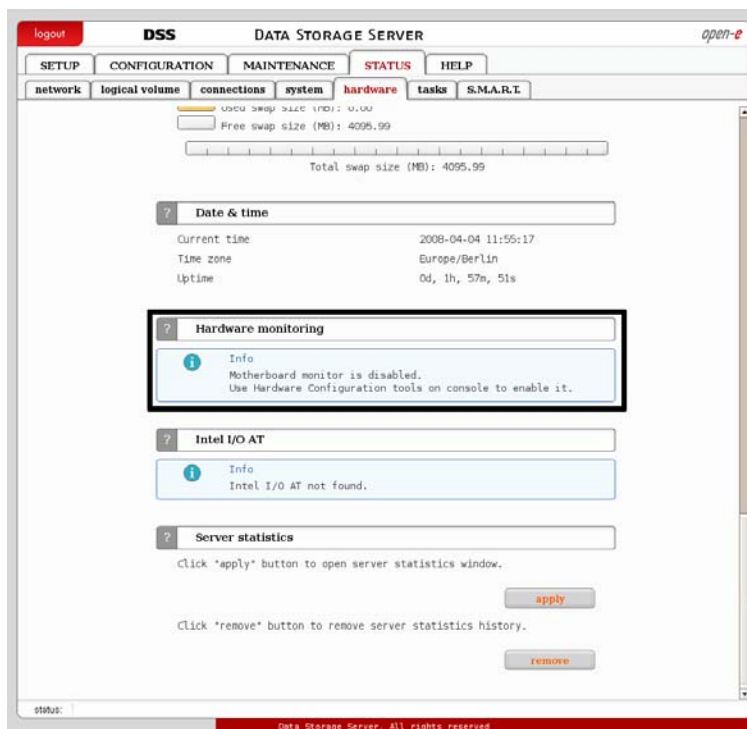


4. Optionally, you can also assign a user name and password and limit access to the share to one IP address.
5. Click **apply**.

## Using monitoring functions

Especially for the Intel® SSR212MC2 there are numerous monitoring possibilities under Open-E Data Storage Server: IPMI sensors, hard disks on the RAID controller as well as its battery backup unit.

Via the IPMI capabilities (Intelligent Platform Management Interface) of the built-in Vitesse VSC410 controller, administrators can monitor the installed server hardware.

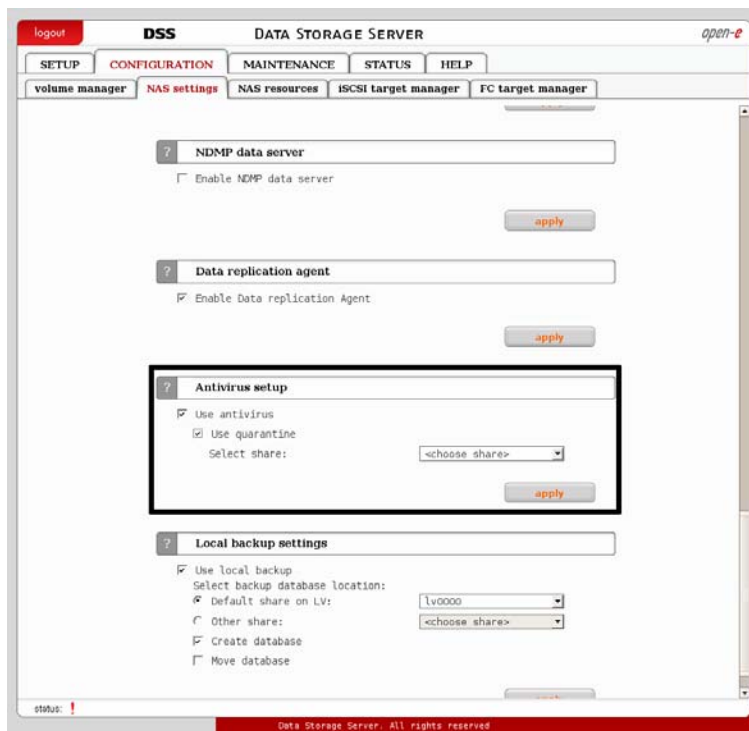


In the Intel® SSR212MC2R with integrated hardware RAID controller, you can also display status information about the hard disks and monitor the backup battery unit (status query, capacity info, settings, design info).



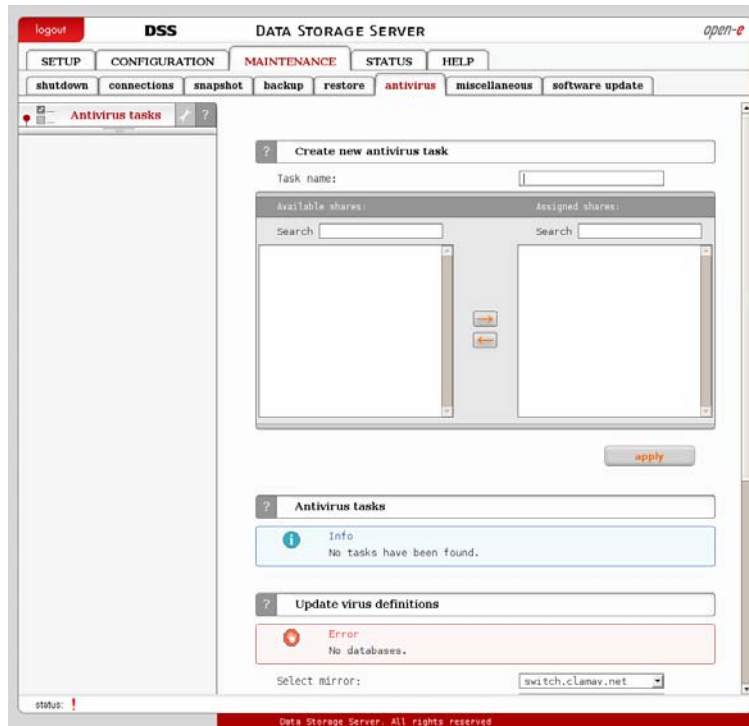
## Setting up antivirus

In order to be able to search NAS shares for viruses, Open-E Data Storage Server has integrated the ClamAV virus scanner. You can enable it via **CONFIGURATION** and **NAS settings**. To do this, under **Antivirus setup**, check the **Use antivirus** checkbox, select a NAS share, and click **apply**. You should also select the **Use quarantine** option. For this, you must define an individual share in advance.



Now you have to create a task that uses the antivirus check for the share. You can set this under **MAINTENANCE** and **antivirus**.

1. Assign a task name and select the share that should be checked.
2. Under **Antivirus tasks**, the defined tasks are displayed and you can start and end them.
3. When you select the new task, you can start it weekly or specify an interval at which the scan procedure restarts at specified times. Tip: when selecting a time for the task make sure that it is not within your core working hours.



Important: update the antivirus database under the menu item with the same name and set the update interval to **Now, then hourly**.

## Installing system updates

The developers of Open-E DSS are constantly improving the operating system. Regular customers can also profit from the easy update possibilities via Web interface; these are found under **MAINTENANCE** and **software update**.

Under Check update you can check whether there is already a new version for your system and download this. Alternatively, you can also load an ISO image from the Open-E FTP server. To install updates, proceed as follows:

1. Get the new version from the Web or FTP server.
2. Click **Search** and select the update image.
3. Click **Upload** in order to load the system software onto the module
4. Under **Action**, click the green checkmark to install the update
5. Activate the **Copy existing configuration** checkbox and click restart in order to take over all settings on the new system.

**Tip:** if you experience problems with an update, you can fix this quickly. Use system restore and click **Reboot** in order to start with the previous version.





## Using console tools

Open-E Data Storage Server can be operated completely via the Web interface. However, a few special functions are accessible only via the console. Regardless of whether you are directly on the server or in an SSH session, Open-E DSS always displays the version, release date, licensed storage capacity, IP addresses and HTTPS settings.

Console overview	
CTRL + ALT + n	Enter static IP address and subnet mask; DHCP server is switched off
CTRL + ALT + p	Sets server back to factory settings
CTRL + ALT + i	Sets server back to default network settings
CTRL + ALT + t	Starts console tools
CTRL + ALT + x	Starts extended tools
CTRL + ALT + w	Tools for hardware configuration
CTRL + ALT + r	Starts RAID tools CLI
CTRL + ALT + f	Starts Fibre Channel tools CLI
CTRL + ALT + h	Displays hardware and driver information
F1	Displays help
F2	Displays all network interfaces
F5	Refresh
CTRL + ALT + k	Restart/shutdown menu
CTRL + ALT + s	Switch off the system

If you hold the **ESC** key down after the Power On Self Test of the storage server, you will see the expanded boot menu. There, you can select from among the following options:

Boot options (hold ESC or TAB down after POST)	
Single	Support for one CPU
SMP	Support for several CPUs
Single 64 bit	Support for one CPU 64-bit mode
SMP 64 bit	Support for several CPUs 64-bit mode
x86	Compatibility mode
Single (testing)	Newest test kernel for a CPU
SMP (testing)	Newest test kernel for several CPUs
Memtest	Carries out RAM test
RESCUE_MODE	Deactivates storage drivers for error diagnosis



## Troubleshooting-FAQs

### I'm interested in Open-E DSS. Is there a test version?

Yes, there is. At [www.open-e.com/demo-cd](http://www.open-e.com/demo-cd) you can download a completely-functional 30-day version as an ISO file, burn it on CD and try out the software. The special thing about this: if you purchase a DSS module, the settings you have made can be taken over easily.

### How can I change the DNS settings?

On the console, press Ctrl + Alt + N and select DNS settings. Enter the address of the DNS server. With several servers, separate the IP addresses with a hyphen.



### I'm operating an Intel SSR212MC2R and Open-E DSS, yet I don't see the expanded monitoring possibilities.

Change to the console and press Ctrl + Alt + W. Select **Hardware options** and then **Intel SSR212MC2**. After that, under **STATUS/hardware**, the monitoring should be displayed.

### I have a problem with the storage server. How can I use the support?

Under **STATUS** and **hardware**, you will find the **Logs** menu item. Click **Download** and save the file locally on your computer. Send a support query to [support@open-e.com](mailto:support@open-e.com) with the log as attachment.



## Application Examples

A few practical application examples show how varied the possible applications of Open-E Data Storage Server are on an Intel® storage server such as the SSR212MC2 and how companies can profit from the deployment of the solution described here.

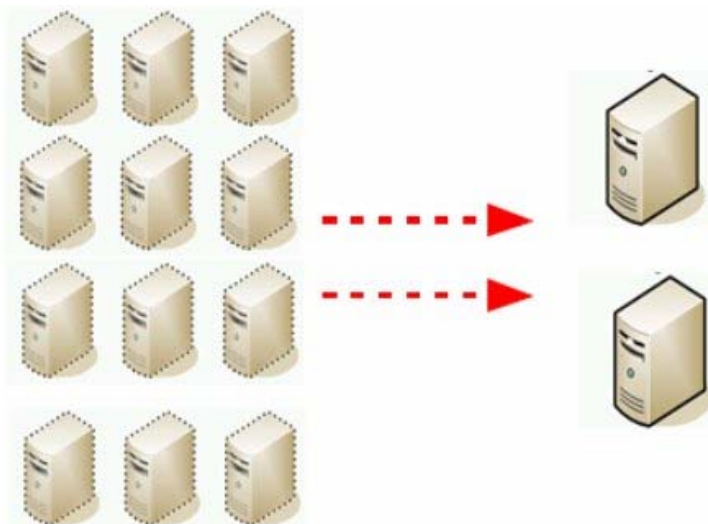
### Server consolidation with virtualization

Open-E DSS and Intel® SSR212MC2 are extremely well-suited for IT infrastructures with virtualization. This way, users can set up test environments, operate legacy systems, implement disaster recovery concepts or use server consolidation. In practice, concrete implementations generally run with VMware ESX-Server, Xen or Virtual Iron. The storage server works here as a fast iSCSI target.

Server virtualization with XenServer based on Intel® VT is very well-suited for server consolidation projects. The overarching goal is to virtualize several existing servers and to combine them into a few physical computers.

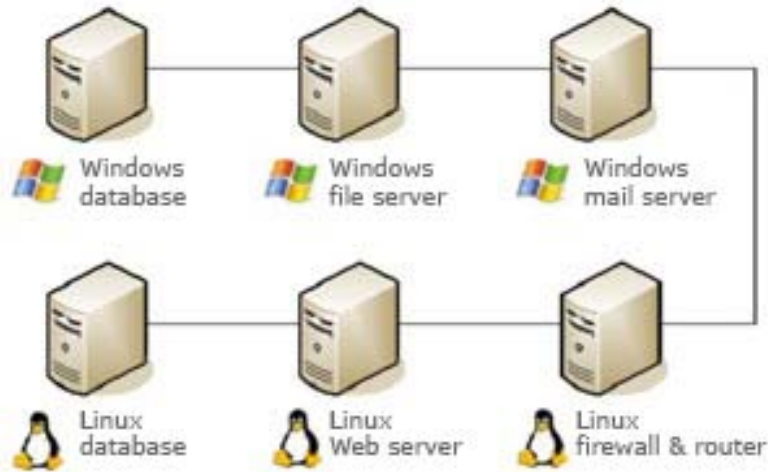
Virtualization ratios in a ratio of 20:1 (old computers to new computers) are not a rarity here. Purely technically, depending on their hardware capacity, Xen-Servers can also cope with significantly more virtual machines. However, this also depends heavily on the number of users and the applications.

On the one hand, server consolidation reduces the number of physical servers; on the other hand, it increases the demands placed on the hardware up to a sensible value. Positive effects arise due to cost savings for hardware and operating costs (electricity, cooling) as well as through reduced cabling, lower administration effort and increased flexibility.

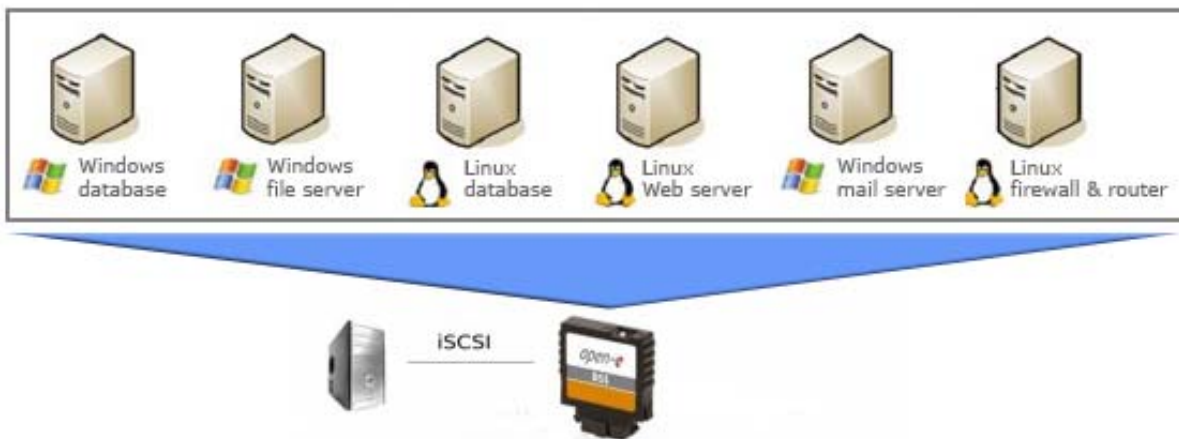




**Server consolidation with virtualization**



**Before: Unconsolidated server landscape**



**After: Servers consolidated thanks to virtualization**



Important is advance planning, in which especially load data is measured and evaluated over a longer time period in order to determine sensible virtualization candidates on the one hand, and, on the other hand, to achieve a sensible combination of virtual systems per computer. In ongoing or test operation, XenServer supports you with monitoring data during monitoring and further optimization of the virtual server landscape.

A possible hardware configuration for the operation of 10 virtual servers on Intel® SSR212MC2 looks like this:

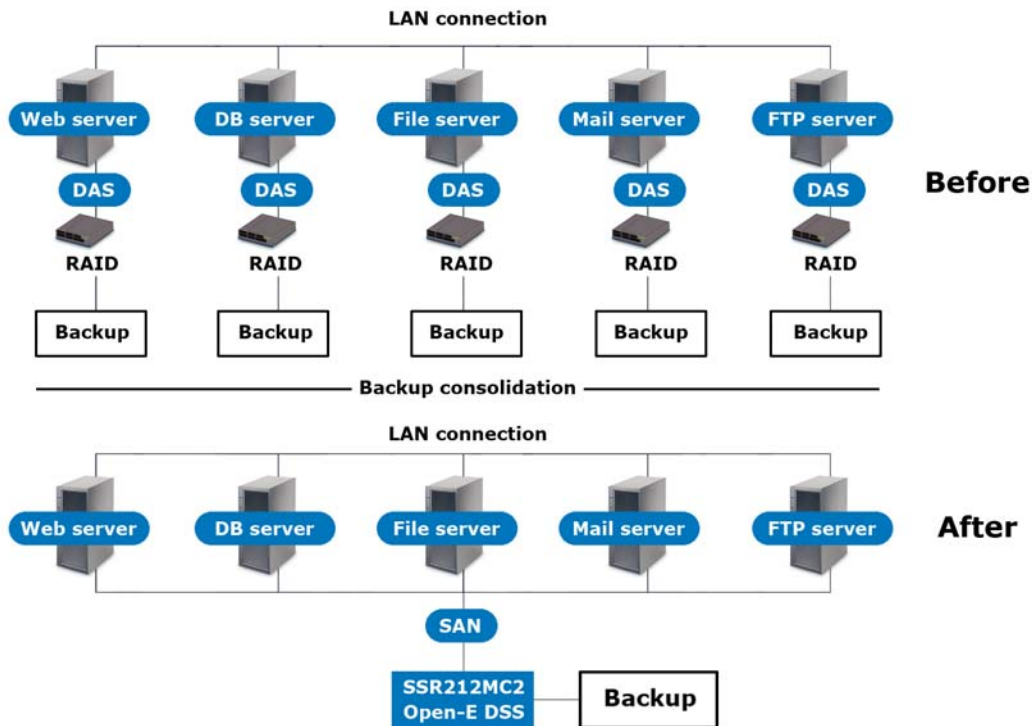
10 virtual servers with VMware		
Intel® SSR212MC2R	CPU	2x Intel Xeon 5335 2.0 GHz
Open-E iSCSI or Open-E DSS	RAM	8 Gbyte
	Hard disks	8x 200 Gbyte SAS
	NIC	2x Gigabit onboard + Intel Pro 1000/PT Quart Port with iSCSI boot
	RAID	HW-RAID 5

## Accelerating backup/restore

According to a survey conducted by the market research institute Smart Research about the most urgent storage tasks for 2007, the reduction of backup times is at the top of IT departments' to-do lists.

Intel storage servers and Open-E DSS are very well-suited for this. Instead of distributed backups that only use a fraction of the capacity of the connected systems, you can centralize your data backups with the solution presented. You thus utilize the capacity of the storage systems better and achieve quicker and more reliable backups. And the capacity utilization rate is convincing in practice: for reference projects, the capacity utilization of the storage systems used climbed from 30% for a DAS to up to 85% after centralization on the SAN.

Via the optional expansion possibilities (see page 14), you can adapt the SSR212MC2 optimally to your infrastructure. A few specialized functions of the Open-E Data Storage Server also support you. For example, snapshots permit high-performance backups without downtimes for your applications.



### Storage consolidation: conversion from DAS to SAN

Shorter restore times are more than a pleasant side-effect of simplified backups. The study cited above also names the disregarding of emergency plans as a reason why many medium-sized companies can react only slowly in case of an actual server failure. More than 29% need between four and twelve hours until all data and storage systems are restored; for 19.6% this can take up to 24 hours. Depending on the industry, a system failure of just a few hours can result in enormous costs.

## Shared storage on the heterogeneous network

The classic deployment purpose for centralized storage is the common use of resources, such as Office documents or address data, by several people or applications. In most companies, heterogeneous networks are on the agenda to allow client access from various operating systems to the common storage.

This is the classic case for a NAS system, which you can set up quickly with Open-E DSS (or Open-E NAS-R3) and Intel® SSR212MC2 (see also page 15). A few hardware configuration examples for various user groups show the flexibility of the storage platform:



Shared Storage 20 users		
Intel® SSR212MC2	CPU	Intel Xeon 5130 2.0 GHz
Open-E NAS or Open-E DSS	RAM	1 Gbyte
	Hard disks	6x 320 Gbyte SATA
	NIC	2x Gigabit onboard
	RAID	SW-RAID 5
Shared Storage 50 users		
Intel® SSR212MC2	CPU	2x Intel Xeon 5130 2.0 GHz
Open-E NAS or Open-E DSS	RAM	2 Gbyte
	Hard disks	8x 200 Gbyte SATA
	NIC	2x Gigabit onboard
	RAID	SW-RAID 5
Shared Storage 100 users		
Intel® SSR212MC2	CPU	2x Intel Xeon 5130 2.0 GHz
Open-E NAS or Open-E DSS	RAM	4 Gbyte
	Hard disks	10x 320 Gbyte SATA
	NIC	2x Gigabit onboard + Intel Pro 1000/PT Dual Port
	RAID	HW-RAID 5



The advantages:

- Streamlining of IT processes with central data storage
- Easy realization of version control



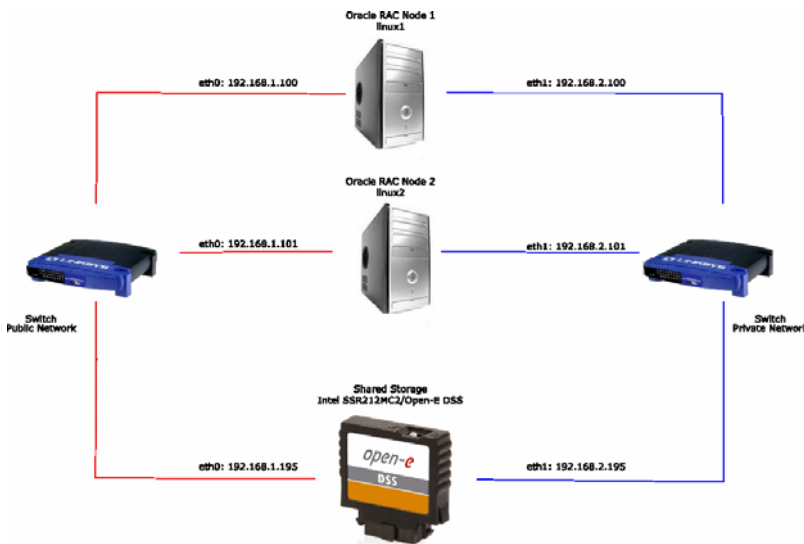
- Teamwork on jointly-used documents possible
- Better utilization of the storage resources
- Seamless ADS integration

## Storage for databases

Storage servers with Open-E DSS are also very well-suited for the operation of databases. Here, iSCSI or FC systems are usually used; for a few application areas, a NAS system is sufficient. If the concern is the provision of database storage, a SAN is the first choice due to its better performance. Especially if the requirement is to cope with high I/O loads, you can reach the limits quickly with a NAS system.

However, SQL-based databases can use a NAS system as storage. Thus, it would be conceivable that in small workgroups (approx. 20 employees) a NAS system could be used for joint Office files and is also used as storage for a MySQL database. Practical: via snapshots, for example, you can create easy backups of database files.

Anyone who is interested in operating an Oracle database, possibly also in a cluster, has a perfect introductory possibility for running initial tests with Open-E DSS and Intel® SSR212MC2. Here, two Linux computers are sufficient as cluster nodes; these are connected to the storage server via iSCSI.



Structure of an Oracle mini-cluster with Open-E Data Storage Server





## Video streaming via IP cameras

The Intel® SSR212MC2 and Open-E DSS combination is especially well-suited for applications with high data occurrence and high demands for data throughput. The reason: the built-in Intel® I/OAT and the optimal and certified support of this technology by Open-E DSS. In the area of video streaming, entirely new possibilities are opening up for customers. Thus,

for example, monitoring cameras can be combined with a central storage, to which the data is streamed via a fast network connection. A second area of application is medical technology, where images and test results create large quantities of data; live surgery images make especially high requirements of the storage servers used.



The cost-effective and also fast connection occurs via iSCSI. Thus, Bosch Sicherheitssysteme expanded its video-over-IP encoder to include iSCSI support. The VIP X1600 model, for example, uses MPEG-4 compression for the transmission of live videos with 30 images per second (for NTSC; 25 images per second for PAL) and a resolution of 2CIF. The dual streaming function offers two parallel video streams, so that there are a total of eight streams per module or 32 streams per device. This enables two different quality levels for display and recording and, therefore, also allows for storage space and bandwidth to be used sparingly, if desired. An iSCSI storage array can be connected directly to the VIP X1600. This guarantees reliable recording and storage with "local" use or use in another network area. Alternatively, for the storage of digital video streams, a central connection of the iSCSI device to the network is possible. Thanks to the iSCSI storage, the VIP X1600 can function as a normal DVR, however, with a much higher capacity.

## Exchange and sharepoint operation

Meanwhile, the operation of Microsoft Exchange is business-critical in most companies. Employees rely on the contact database, e-mails and schedule management. Furthermore, legal regulations such as the Principles of Data Access and Verifiability of Digital Documents (GDPdU) also apply to business letters and e-mails. In order to operate Exchange, either local storage or a connection via iSCSI and Fibre Channel is required. Together with the Windows



Storage Server, Exchange works with NAS; however, Microsoft does not recommend this to its clients. With the Intel® SSR212MC2 and Open-E DSS, you can define an iSCSI target for Exchange and thus achieve the required availability, and, with easy backup mechanisms, adhere to legal regulations. An Exchange sample configuration looks like this:

Exchange database 50 users		
Intel® SSR212MC2R	CPU	Intel Xeon 5320 1.86 GHz
Open-E iSCSI or Open-E DSS	RAM	2 Gbyte
	Hard disks	8x 200 Gbyte SAS
	NIC	2x Gigabit onboard
	RAID	HW-RAID 5

Microsoft Sharepoint uses MS SQL Server as database. This means that the same limitations apply as for "normal" operation of SQL Server. Microsoft recommends operation together with a SAN. For this case, a connection via iSCSI is also recommended; the Intel storage platform and Open-E Data Storage Server are well-suited for this.



## Additional information

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### Intel® Storage Systems

<http://www.intel.com/products/server/storage>

### Intel® Multi-Core Technology

<http://www.intel.com/multi-core>

### Intel® I/O Acceleration Technology

<http://www.intel.com/go/ioat>

### Information about Open-E

<http://www.open-e.com>

### Products from Open-E

<http://www.open-e.com/products>

### Open-E Manuals, Quick Start Guides

[http://www.open-e.com/data\\_storage\\_solution/server/service\\_and\\_support.php](http://www.open-e.com/data_storage_solution/server/service_and_support.php)

### Open-E Forum

<http://forum.open-e.com>

### Open-E Partners

<http://www.open-e.com/partner>