



with



## *iSCSI SAN for Education*

Shared storage, Server & desktop virtualization, Replication, Back-up, Recovery

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## Overview

Computer availability increasing is unavoidable for educational institutions that are serious about staying relevant in the world that is rapidly evolving into a paper-less society. Text books, as any other form of traditional print media, are becoming digitised, resulting in a huge amount of data that needs to be securely stored and backed up. Many schools, colleges and universities have already computerised their classrooms or are in the process now, but still IT's effectiveness hasn't been tapped to its current potential to leverage new technologies such as EcoVault SAN (Storage Area Networks), server & desktop virtualization, advances in back-up best practices and off-site data replication.

In many cases, IT usage is limited to simple training software installed in computer classrooms, which limits IT administrators from being able to provision new services for students and teachers. Two main reasons for the lack of IT effectiveness in educational establishments are a) limited educational budgets, and b) limited knowledge and exposure to the rapidly changing IT products available to educational institutions.

At the same time educational institutions are coming under pressure from Government and EU regulations to procure and manage their IT estates from a more sustainable and carbon efficient standing. The use of energy efficient IT no longer implies a compromise on the performance of the device. Instead the combination of the latest technologies available and the drive for low energy consumption go hand in hand, of which EcoVault SAN solutions are a prime example.

The call of the times both demands and allows Administrators to use IT in education more effectively. This white paper provides an overview of how the EcoVault SAN solution can help overcome limited IT budgets and gain weight from an environmental perspective, being an effective, inexpensive, scalable and efficient solution for education environments. This paper will also give a brief description of the initial steps in building your EcoVault SAN based on the industry standard Windows operating system.

### The IT Challenge for Educational Institutions

First we will define several tasks that will inevitably present themselves to IT System Administrators and technical advisors. Networks must provide connectivity across campuses with high quality service levels, data security must be guaranteed to protect the privacy of students and both applications and data must be accessible and available when needed. When these elements are in place, many new possibilities present themselves to IT departments to serve students, teachers and staff.

When desktops and servers are connected to a network, students and teachers have access to various resources such as online lectures, student assignments, projects, test, online libraries and much more. Professors can give online video tutoring and lectures, webinars, and mark assignments or tests online. This is a pleasant bonus to the core educational process, although providing the backend infrastructure to make this happen is critical to developing a technology proficient graduate ready for today's world of work, whilst improving the entire learning process and enhancing the prestige of your educational institution.

One of the key corner stones that makes IT easier to use and manage, allowing the full range of benefits from server and desktop virtualization to extending your network into a disaster recovery resource is an EcoVault SAN (Storage Area Network) solution. The goal is that EcoVault can manage all your data storage as a single pool, one resource that can be divided up as needed and allocated to individual applications and users whilst being managed and backed up as a single device.

Implementing a SAN, requires some upfront planning to avoid issues with performance and scalability as the IT infrastructure and/or storage performance demand increases. You need fast (1 GigE) and redundant Ethernet connections from servers to the EcoVault SAN, along with a back-up system that can keep up with the higher speeds available when backing up. Any single point of failure with the SAN, switches or server NICs can cause downtime and even data loss. So redundancy is a key element to implementing a SAN.

High availability, reliable back-ups and no downtime - all of these items can be guaranteed by the EcoVault 200 Series solution with StarWind iSCSI SAN software. Using VeryPC's EcoVault SAN with StarWind embedded software enables best practices for effective storage, back-ups, replication and server virtualization without incurring high costs.

A SAN is centralised and manageable network storage. EcoVault SAN architecture provides ways to perform

storage tasks easier and with more reliability. You can create shared storage for servers and manage the SAN remotely. Using the iSCSI protocol the EcoVault SAN solution is the most economical and practical solution for schools and colleges with limited IT budgets that want to take control of the growing costs and complexities associated with managing storage, back-ups and virtual server and desktops.

A major benefit of the EcoVault solution is the compatibility with any type of hypervisor. This is a significant point since many educational institutions receive significant discounts from Microsoft, allowing Hyper-V to be implemented at an extremely low acquisition cost. The StarWind embedded software on the EcoVault solutions is qualified for use with Microsoft Hyper-V, VMWare and XenServer.



### What is EcoVault?

EcoVault 200 series products are a complete Storage Area Network solution from VeryPC bundled with StarWind iSCSI SAN software. EcoVault is a pair of High Availability shared storage boxes that can be provisioned to servers over a dedicated network. The term SAN is commonly used to refer to dedicated storage servers that use either the Fibre Channel (FC) or the iSCSI protocol. By carrying SCSI commands over IP networks, iSCSI is used to facilitate data transfers over intranets and to manage storage over long distances. EcoVault takes advantage of iSCSI to simplify the implementation and management of the solution. The advantage of EcoVault using iSCSI over FC storage solutions is that no expensive switches or host cards (HBAs) are required. Likewise the iSCSI design of the EcoVault solution does not force you to put your SAN on a completely separate Fibre Channel network.

EcoVault SAN solutions typically come with options for single or dual controllers for redundancy, and can allocate discs based on various RAID levels as required by your application or virtualization servers. In essence, application servers don't behave any differently when connected to an EcoVault solution, other than you may actually see an increase in storage performance with overall server management taking less time.

With the iSCSI protocol, it is entirely possible to connect EcoVault into your existing corporate IP network, also known as your LAN. However, your LAN should not be designated for your EcoVault even though it is possible to use it for that purpose. This design could flood the corporate LAN with storage traffic, which may slow everything down. So even with EcoVault storage, you should use the separate network interface cards (NIC) ports on the EcoVault, and separate (and redundant) IP switches to connect to the EcoVault. Using multi-pathing to do so will eliminate a single point of failure on the SAN fabric. This will ensure you gain a secure, segmented network for storage traffic with no adverse effects on your LAN or existing network traffic.

### ***What does EcoVault provide that you can't get from Direct Attached Storage (DAS)?***

Why use EcoVault in the first place? You may think direct attached discs are working just fine, but consider that an EcoVault solution provides the following benefits not just for primary storage, but also for back-ups, recovery, off-site replication and allowing advanced functionality in virtual server and desktop environments.

EcoVault allows you to use advanced features of virtual machines, migrate VMs between physical host servers without any downtime, easily manage hardware resources and power down a physical server for repair or maintenance, all without impacting applications. Using features such as Vmotion, Live Migrate or XenMotion (depending on your vendor choice) provides VMs with a fail-safe shared storage environment without purchasing additional costly hardware. Moreover, you can implement high availability clustering at the operating system (OS) level and use features such as DRS to enable auto load balancing between EcoVault server nodes. The core parking facility on the Windows Storage Server operating system ensures processor cores are fully utilised at peak loads or parked on standby when not required, reducing the energy demands of the SAN.

### ***Advanced Data Protection - Replication, Snapshots & Thin Provisioning***

Replicating data off-site over Ethernet using an iSCSI EcoVault provides a cost effective solution to Disaster Recovery, eliminating the need to purchase high cost SAN hardware and reduces the overhead of host based replication. The EcoVault 200 Series with embedded StarWind iSCSI software provides the ability of synchronous and asynchronous mirroring. Synchronous mirroring in the High Availability mode turns the EcoVault solution into a fully redundant SAN architecture.

Thin Provisioning is a SAN feature that essentially deceives the operating system into thinking it has a larger disk partition available than what is on the actual physical disk. This allows you to purchase an EcoVault solution with as many physical disks as are required in the near term, while eliminating the need to make any changes to the application server when adding more disks to the EcoVault.

The snapshotting feature on the EcoVault solution provides a means for fast back-up and restoration of data. Snapshots take up only enough space to hold block level changes, hence the amount of disk space snapshots take is minimal compared to differential back-ups. In addition, replicating data off site from a snapshot reduces the impact on primary data so that applications don't suffer I/O lags during production hours. Cloning full volumes can be used to create a full back-up on disks, or to copy an entire volume for testing or development without affecting the primary data.

### ***Why EcoVault iSCSI Storage?***

The section above hints at why using iSCSI protocol for storage is advantageous.

When it comes to storage there are several choices. You can select from NAS (Network Attached Storage), DAS (direct Attached Storage) or implement an FC SAN (fibre Channel).

EcoVault is based on the iSCSI protocol, which means the disk drives in each EcoVault node are presented over an IP network using the SCSI command set. Don't confuse this with traditional SCSI disks; in fact the iSCSI storage provided in EcoVault solutions is typically implemented with a Configure To Order (CTO) choice of affordable Serial Advanced Technology Attachment (SATA) or Serial Attached SCSI (SAS) disks. iSCSI presents block based storage just as you get with your internal disk drives, whereas a NAS is just a plain file server, which presents storage as file shares. A common scenario is to use a portion of your EcoVault as back-end disks for file servers

(NAS), consolidating both application data and file shares into one appliance.

Another advantage of using an iSCSI storage appliance such as EcoVault lies in the iSCSI security, which allows IT Administrators to specify which client machines (initiators) are able to connect to the EcoVault server nodes (iSCSI target). The Challenge Handshake Authentication Protocol (CHAP) feature of the StarWind iSCSI software is used to provide authentication between application servers and each of the EcoVault storage nodes. Because CHAP identifiers are changed frequently and because authentication can be requested by the EcoVault array at any time, CHAP provides a high level of security, even more so than Password Authentication Procedures (PAP).

The EcoVault solution, like all iSCSI storage is Ethernet-based, so IT Administrators only require basic IP networking knowledge, as opposed to more specialised FC networking skills. There is a common misconception that FC offers better performance than iSCSI, but with correct sizing to determine the speed and number of disks required to achieve the necessary IOPs (I/O's per second) for optimal application performance, iSCSI has proven to be more than up to the job of even the most demanding applications. Additionally FC storage is significantly more expensive than iSCSI, requiring proprietary FC HBAs (Host Bus Adapters) on client machines as well as more expensive FC network switches. Managing and maintaining an FC SAN also requires Administrators to learn new skills in FC networking. While the price is significantly higher for FC solutions, the performance does not justify the increased cost. Ultimately, while Fibre Channel bandwidth is indeed higher (that is until everyone has 10GigE implementation), the most common bottleneck is actually the speed of the hard disks and not the network connection.

Therefore EcoVault storage solutions allow you to use standard IP switches and application servers can use a simple software called an "Initiator" instead of an expensive FC HBA card. For instance, the Microsoft iSCSI Initiator is already included in the Windows Storage Server 2008 R2 for Embedded Systems which comes as part of the EcoVault 200 series solution.

For organizations that have already invested in FC as their primary storage and require lower cost Tier 2 storage, using an EcoVault solution for the lower cost tiers will provide significant cost savings over FC. It is also a growing trend within the industry to implement iSCSI storage in a mixed environment, where existing FC storage may be legacy but still under warranty or the performance of FC is required for extremely I/O intensive applications, such as

high transactional databases with many hits per second. In any mixed storage environment, iSCSI EcoVault storage can be an ideal choice for many applications from Exchange, SQL Server to VMware or Hyper-V.

In fact, iSCSI storage is already in use by many companies from SMBs to Fortune 500 companies.

The simplicity of using an EcoVault SAN solution with Windows Storage 2008 R2 for embedded systems to provide iSCSI storage allows you to use the familiar Microsoft Windows operating system as the SAN controller and have a fully functional iSCSI SAN with an easy to use and familiar user interface. Any IT Administrator familiar with Windows should be able to install and configure the EcoVault SAN solution in less than 30 minutes. Microsoft is one of several companies that provide iSCSI storage software for Windows; another is the featured StarWind iSCSI SAN product which comes bundled with all EcoVault 200 Series solutions.

### **What can you do with EcoVault featuring StarWind iSCSI SAN?**

- Use all the features of server and desktop virtualization such as Vmotion and HA (VMware) or LiveMigrate (Hyper-V).
- Manage unlimited Terabytes of disk space.
- Use Thin Provisioning to save disk space and reduce storage providing times.
- Replicate data off-site or to a local EcoVault node
- Perform point in time snapshots for fast disk-to-disk back-ups and restores.
- Clone entire volumes for testing or back-up
- Turn direct attached storage into a SAN.
- Increase storage security with the iSCSI standard.

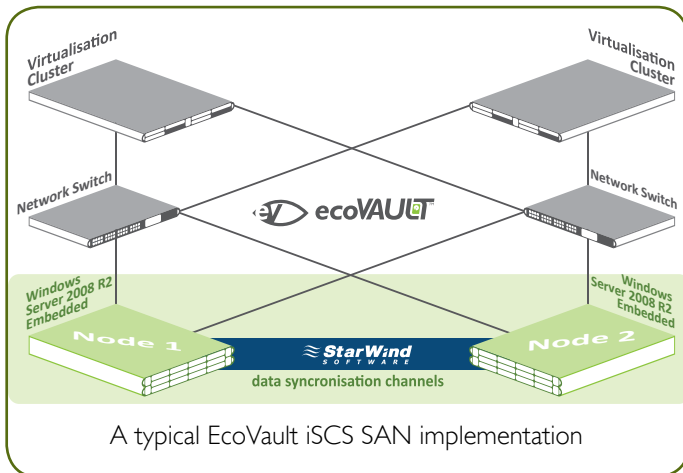
### **What are the energy efficiencies of EcoVault iSCSI SAN solutions?**

The Eco Power Management used in the production of the EcoVault means each storage node has been engineered to provide the following hardware efficiencies to reduce the energy consumption of the solution and therefore the Total Cost of Ownership:

- 90% increase in GB/Watt performance
- Thermostatic cooling
- High conductivity heat sinks
- 80%+ Gold performance Power Supply Units
- VeryPC energy efficient spin-up spin-down technology

for increased disk efficiency.

- Windows Storage Server 2008 R2 Core Parking feature to fully manage the utilisation of the processing cores to provide dynamic energy savings depending upon the processing resource needed at a point in time.



- **Software:** StarWind iSCSI SAN software is pre-loaded onto an internal SSD.
- **Disks:** Sizing disks involves selecting the correct speed drives and the right number of drives to achieve the required IOPs for your application. EcoVault provides a choice of disk speeds and sizes for both SAS and SATA, and option to have from 12 to 36 disks per node.
- **IP Switches:** EcoVault works over a standard IP network is recommended to be connected via a dedicated 1GigE switch, and a second switch is recommended if connecting mission critical applications.

To make sure that your IP network is utilised correctly, you should use a dedicated NIC port on your application servers to connect to dedicated IP switches, which are only used for iSCSI traffic. This will ensure that you don't overwhelm your LAN. Ensuring the use of a 1GigE network for all SAN traffic will ensure a good level of storage performance. If additional performance is required, using a 10GigE dedicated IP network for SAN traffic will assure you achieve higher performance at a fraction of the total cost of FC storage and FC switches.

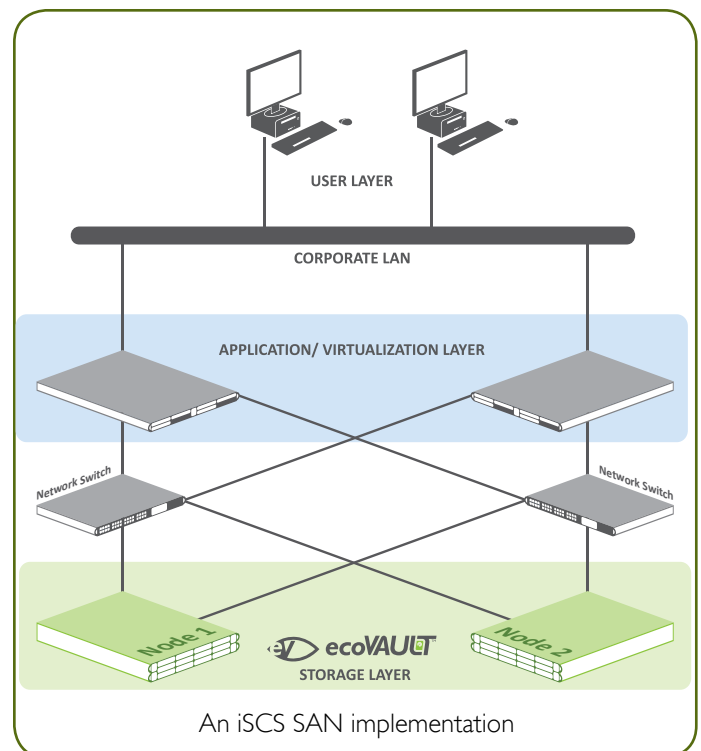
### EcoVault: A complete SAN solution

EcoVault 200 series provides a complete SAN solution comprising of 2 high availability nodes, Windows Storage Server 2008 R2 for embedded systems and StarWind iSCSI SAN software allowing for ease of implementation and system management. Utilising VeryPC's award winning EPM™ technology enables EcoVault solutions to deliver low power consumption, reduced noise signature and a lower Total Cost of Ownership (TCO).

Here's a list of the basic ingredients in an EcoVault, which can be Configured to Order to suit your requirements:

- **AMD Opteron servers:** a 64-bit platform with redundant Gold rated power supplies suitable for critical applications and 32GB enterprise class ECC Registered RAM in each node.
- **Windows Operating System:** Windows Storage Server 2008 R2 standard edition for embedded systems incorporating Microsoft iSCSI initiator for client connections and core parking feature for manageable utilisation of processing capabilities.
- **NICs:** 4 NIC ports on each EcoVault node for applications with high I/O requirements. The multiple NICs allow dedication for storage traffic to eliminate a single point of failure at the NIC level.

The addition of 4 NIC ports on each EcoVault node allows for greater data throughput and is suitable for large I/O environments.



## Summary

As you can see, the process of creating an iSCSI based SAN for your educational environment is as simple as provisioning an EcoVault SAN system and perhaps an Ethernet switch once you have done some basic network planning and defined your goals. With EcoVault you have the ability to Configure to Order an implement a fully functional, high availability iSCSI storage area network that can be managed using a simple Windows user interface. IT administrators gain obvious advantages when using an EcoVault SAN and, at the same time, keep within the limits of a restrictive budget.

This guide is meant as an introduction to the EcoVault solution featuring StarWind iSCSI SAN software. To learn more about the products available, including the Configure to Order options or to request a product demonstration appropriate to your specific environment, please contact VeryPC on (+44) 114 321 8609 or [info@very-pc.co.uk](mailto:info@very-pc.co.uk).

## About VeryPC

VeryPC is an innovative and industry leading manufacturer of high performance, energy efficient hardware platforms. Combining the latest industry standard, enterprise-class components with VeryPC's EcoPower Management (EPM™), VeryPC's EcoVault, Odeum server and storage solutions optimise energy efficiency with performance to significantly reduce Total Cost of Ownership, whilst providing a compatible, flexible and scalable platform for you back-end processes.

## About StarWind Software

StarWind software is a global leader in storage management and SAN software for small and mid-sized organisations. StarWind's flagship product is SAN software that turns Windows Server into a fault-tolerant, fail-safe iSCSI SAN. StarWind iSCSI SAN is qualified for use with VMware, Hyper-V, and XenServer. Advanced enterprise-class features in StarWind include Automated Storage Node Failover and Failback, Replication across a WAN, CDP and Snapshots, Thin Provisioning and Virtual Tape management.