QSAN Official Document

XVault (Virtualization Integrated Data Protection)

White Paper

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ANNOUNCEMENT

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Announcement
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PREFACE

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- Via the Web: https://www.qsan.com/technical_support
- Via Telephone: +886-2-77206355
- (Service hours: 09:30 - 18:00, Monday - Friday, UTC+8)
- Via Skype Chat, Teams / Skype ID: qsan.support
- (Service hours: 09:30 - 02:00, Monday - Friday, UTC+8, Summer time: 09:30 - 01:00)
- Via Email: support@qsan.com

Information, Tip, and Caution

This document uses the following symbols to draw attention to important safety and operational information.



INFORMATION

INFORMATION provides useful knowledge, definition, or terminology for reference.



TIP

TIP provides helpful suggestions for performing tasks more effectively.

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CAUTION

CAUTION indicates that failure to take a specified action could result in damage to the system.

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1. INTRODUCTION

XVault is a virtualization integrated data protection solution, offered as a native application within the XInsight management platform. It uses QSAN iSCSI storage as a backup repository, supporting agentless backup and flexible restoration of VMs (Virtual Machines) running on VMware vCenter-managed infrastructure.

Traditional VM backup solutions require the installation and maintenance of agent software on each guest operating system, leading to ongoing operational overhead and compatibility challenges. XVault completely eliminates this requirement by leveraging VADP (VMware's vStorage APIs for Data Protection) and VDDK (Virtual Disk Development Kit). It uses the same industry-standard interface as leading enterprise backup vendors.

XVault is designed to act as the sole bridge between the VMware vCenter inventory and the QSAN iSCSI LUN storage pool. All backup data flows through the XVault engine hosted within XInsight, providing a centralized, auditable, and manageable data protection pipeline.

XVault is particularly effective in the following environments:

- VMware vCenter management infrastructure requires agentless backups to reduce VM overhead.
- Storage environments using QSAN enterprise-class iSCSI arrays for centralized backup storage management.
- Organizations requiring resilient recovery options, covering scenarios ranging from accidental deletion recovery to full disaster recovery.
- IT teams seeking an integrated backup solution fully managed through the XInsight single-panel management interface.



INFORMATION

XVault requires a valid XInsight subscription license to activate. The backup repository will be configured as a dedicated QSAN iSCSI LUN. VMware Tools must be installed on the guest VMs to enable application-consistent snapshots and guest operating system verification operations.

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2. THEORY OF OPERATION

2.1. Architecture Overview

XVault's architecture is designed to build an integration bridge between the VMware ecosystem and the QSAN storage infrastructure. This solution runs entirely through XInsight extensions, communicates with VMware vCenter via standard APIs, and directs backup data to QSAN iSCSI LUN storage pools.

2.1.1. Cross-Platform Integration Bridge

The XVault architecture is based on the following fundamental design features.

1. **Agentless Architecture**: Application operates entirely through XInsight. No agent software needs to be installed inside the VMs, reducing VM resource overhead and eliminating agent lifecycle management.
2. **Ecosystem Bridge**: Serves as the sole communication bridge connecting VMware vCenter resources and QSAN iSCSI LUN storage pools. All backup and recovery operations are centralized through a single management path.
3. **Data Flow Direction**: Local storage / 3rd-party storage -> XVault engine -> QSAN storage pool. Provides a clear and auditable chain of custody for all backup data.

2.1.2. Standards Compliance

XVault is built on mature VMware and industry standards to ensure interoperability, reliability, and long-term support.

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Table 2-1 Standards Compliance

STANDARD	DESCRIPTION	BENEFIT
VMware VDDK	Virtual Disk Development Kit features stable data transport and compatibility layer.	Ensure stable data transfer across VMware versions.
VADP	vStorage APIs for Data Protection features a native agentless backup protocol.	Agentless backup can be achieved without VM-level agents.
Application-Consistent	VSS / VMware Tools are quiescing before creating a snapshot.	Ensure application data integrity during backup.
Crash-Consistent	Take raw snapshots without guest quiescing.	Provide faster backup speeds for stateless or non-critical workloads.
Task Management API	A centralized REST-based API enables task lifecycle control.	A unified control plane is responsible for all backup operations.

2.2. Backup Mechanism

XVault supports two complementary backup strategies designed to balance storage efficiency and recovery speed. Furthermore, it supports multi-source concurrent backups in high-throughput environments.

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Table 2-2 Backup Types

TYPE	DESCRIPTION	RECOMMENDED FREQUENCY
Full Backup	A baseline recovery point is established by capturing a complete image of all virtual disks. This serves as the anchor point for all subsequent incremental backups.	Weekly or Initial setup
Incremental Backup	Only data blocks that have changed since the last backup are transferred (using Change Block Tracking). This significantly reduces backup window duration and storage consumption.	Daily
Multi-Source Support	It supports concurrent backup of multiple virtual disks (multi-disk) and multiple network interfaces (multi-NIC) to achieve parallel data transmission streams.	Per task configuration

2.3. Repository Architecture

The XVault backup repository is hosted on QSAN iSCSI storage and launched as a dedicated subscription storage resource. The repository is designed with performance, security, and operational reliability in mind.

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Table 2-3 Repository Architecture

COMPONENT	FEATURE	DESCRIPTION
QSAN iSCSI Disk	Subscription Storage	Repository storage is provisioned as a dedicated iSCSI LUN activated via a QSAN subscription model. This ensures enterprise-class I/O performance and storage pool isolation.
CHAP Authentication	One-way	Supports one-way CHAP authentication to ensure iSCSI session security. Prevents unauthorized access to backup storage targets.
MPIO & Auto-Mount	Path Redundancy	Supports MPIO (MultiPath I/O) for path redundancy and load balancing. Implements automated iSCSI login / logout sequences to ensure a clean mount cycle.

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3. DEPLOYMENT AND OPERATIONS

3.1. Prerequisites

This system has explicit limitations on the number of tasks and execution capabilities. Each system supports a maximum of 8 tasks. In terms of execution, a maximum of 2 session paths are allowed to run concurrently to maintain overall system performance and stability.

Table 3-1 XVault Parameters

ITEM	VALUE
Maximum number of backup tasks	8
Maximum number of backup targets	8
Maximum number of VM per task	8
Maximum number of backup retention	5 copies for recovery

3.1.1. System Requirements

The following are the system requirements for running XVault.

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Table 3-2 System Requirements

COMPONENT	REQUIREMENT	NOTES
VMware Tools	It must be installed on the Guest OS.	Required for application-consistent snapshots and quiesced backup operations.
Datastore Space	There is sufficient available space for storing source data.	This step is required to create a VMware snapshot during backup execution.
Network Connectivity	XInsight can be accessed from vCenter.	XVault communicates with VMs through the vCenter API, without needing to directly access the VM network.
XVault License	Require a valid XVault subscription license.	Activates the XVault module within XInsight.
QSAN iSCSI Storage	Require QSAN iSCSI array with available LUN capacity.	It serves as a dedicated backup repository. Its minimum size should be greater than the total footprint of the protected VMs.

3.1.2. VMware Compatibility

XVault fully supports the following versions.

- vCenter Server 7.0, 8.0, 9.0 series
- ESXi 7.0, 8.0, 9.0 series

For the latest compatibility matrix, please refer to the QSAN XInsight release notes.

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3.2. Restore Strategies and Recovery Pathways

XVault offers flexible restoration options to handle a variety of recovery scenarios, from simple accidental deletion recovery to complete disaster recovery through hardware reconfiguration.

3.2.1. Restore Paths

It can restore to different vCenter, data center, or data storage locations. It supports custom VM names and hardware reconfiguration, including the number of CPU cores and memory size. It is ideal for disaster recovery testing, migration, and capacity reconfiguration.

3.2.2. Advanced Restore Logic

When restoring a VM to a new location (e.g., path B), XVault performs a three-stage identity and network reset process to prevent IP address conflicts and ensure seamless integration of the restored VM into the target network.

1. **Read Metadata**: Parses the meta.json file embedded in the backup to retrieve the original VM configuration parameters (CPU, memory, disk layout, NIC configuration).
2. **Clear Original MAC Address**: Executes the **create_new** process to delete the original MAC address record. This prevents duplicate MAC addresses and ARP conflicts on the target network.
3. **vCenter MAC Address Assignment**: vCenter automatically assigns a new MAC address to the restored VM. This ensures the uniqueness of the network identity and avoids IP address conflicts.

3.3. Task Management and Lifecycle

XVault implements a comprehensive task management system for managing the entire lifecycle of backup and restore jobs. All tasks are accessible through a centralized XInsight management interface.

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3.3.1. Task Operations

Create (C)

Define a backup or restore task, including the VM target list, backup type, transfer preferences, retention policies, and notification settings.

Read (R)

View task status, execution history, number of VM s, completion percentage, last run time, and next scheduled run time.

Update (U)

Modify task configurations, including scheduling, VM selection, and retention settings.

Delete (D)

Delete only the task definition, or delete the task and all associated backup data from the repository.

3.3.2. Scheduling System

XVault supports on-demand backups (which can be manually triggered) and interval-based automatic backup plans. Supported plan types include hourly, daily, weekly, and monthly.

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INFORMATION

When deleting a task with associated backup data in the repository, XVault offers two deletion modes:

- **Delete only the task definition**: The backup data remains in the repository.
- **Delete the task and data**: The task definition and all associated backup files will be permanently deleted.

3.4. Operations

Video Tutorial

This is a tutorial example to configure a Metro Volume. See

- How to Back Up VMware VMs using XVault
- How to Restore VMware VMs using XVault

3.5. Best Practices

When enterprises evaluate VM backup solutions, XVault demonstrates significant advantages across three key dimensions: total cost of ownership, resilient architecture, and deployment speed. This chapter focuses on explaining how XVault's design philosophy translates into measurable operational and financial benefits for QSAN-based infrastructure.

Total Cost of Ownership

XVault is built to provide enterprise-grade VM protection at a significantly lower cost than traditional standalone backup solutions. Many third-party VM backup solutions require enterprises to configure dedicated Windows Server execution instances to host the backup software. Operating system licensing fees must be paid before any backup subscription can be applied. Backup pricing is calculated per VM, CPU socket, or number of units, meaning the total cost grows linearly with the infrastructure.

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XVault completely eliminates these cost tiers:

- ▪ No dedicated Windows server infrastructure is required. XVault can operate on QSAN hardware as a module of the XInsight management platform.
- No licensing is required per VM or CPU. A single XVault subscription overrides the entire VMware vCenter inventory managed through XInsight.
- All operational overhead is centralized in a single XInsight interface, eliminating the management burden of managing standalone backup servers, their operating system lifecycles, and their dependencies.

This resulted in a predictable, infrastructure-scale pricing model where prices remain constant as VM inventory grows—leading to significant savings in total cost of ownership over multi-year deployment cycles.

Table 3-3 Total Cost of Ownership Comparison

COST FACTOR	CONVENTIONAL SOLUTION	XVAULT
Server Infrastructure	Dedicated Windows Server required	None, runs within XInsight on QSAN storage
OS Licensing	Windows Server license required	Not applicable
Backup Licensing	Per VM / per CPU socket / per quantity	Annual subscription
Administrative Overhead	Separate backup server management	Unified within XInsight management interface

Enhancing Recovery Resilience with Post-Task Snapshots

XInsight introduces an architectural enhancement that significantly improves recovery resilience in the face of database-level failures. In traditional backup architectures, the backup database LUN is both the target of active writes and the sole source of recovery. If the database disk extents encounter block-level integrity issues, whether due to storage hardware failure, file system corruption, or unexpected power outages, recovery operations may be affected at the most critical moment.

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XInsight addresses this architectural limitation by automatically triggering a QSAN storage snapshot of the database LUN after each successful XVault backup task. This post-task snapshot mechanism provides:

- An immutable, point-in-time recovery anchor, independent of the database's primary data path.
- Recovery of VM backup data even if the database LUN's primary file system is corrupted or unavailable.
- No additional administrator intervention required – snapshot creation is fully integrated into the task completion workflow.

This architecture ensures that each successful backup task generates two independent recovery paths: the active repository backup set and the repository LUN snapshot. Together, they provide a defense-in-depth recovery capability that a single-path backup architecture cannot match.

Rapid Deployment and Disaster Recovery Preparation

In disaster recovery scenarios, the time required to restore and execute backup infrastructure directly determines the RTO (Recovery Time Objective) of the entire protected environment.

XVault takes only 5 minutes from a clean installation of XInsight to full operational status. The deployment process requires no external software installation, no Windows Server configuration, and no agent deployment to guest VMs. All configuration steps can be completed within the XInsight web management interface.

Traditional backup solutions deployed on Windows Server infrastructure typically require:

- Windows Server operating system installation, initial configuration, and security patching
- Backup application installation and license activation
- Post-installation prerequisite verification (Visual C++ Redistributable Kit, .NET runtime, native database execution instance)
- Firewall rule configuration and backup service port configuration
- Installing and registering agents (if applicable) on each protected VM

Under optimal conditions, the cumulative deployment time for such solutions typically exceeds one hour. In real-world disaster recovery scenarios, steps including network configuration, storage reconnection, and sequential installation must be completed under stress, so the actual deployment time is usually longer.

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For organizations using XInsight-managed storage as their primary infrastructure, the total installation and configuration time for XInsight and XVault remains under 5 minutes, providing a complete and immediately production-ready backup platform. This deployment speed advantage is particularly significant during the recovery of Windows Server infrastructure that requires rebuilding managed backup applications.

Table 3-4 Deployment Comparison

DEPLOYMENT FACTOR	CONVENTIONAL SOLUTION	XVAULT
Time to Operational	> 1 hour (optimal conditions)	< 5 minutes
OS Provisioning Required	Yes, Windows Server	Any
External Prerequisites	Yes, runtimes, databases, and agents	None
Backup Server Recovery	Must rebuild before restoring VMs	Embedded in a storage device, operate independently

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4. CONCLUSION

XVault is QSAN's comprehensive solution for the growing enterprise-level agentless VM data protection needs. Through deep integration with VMware's native VADP / VDDK infrastructure via the XInsight platform, XVault provides a powerful, easy-to-use, cost-effective, and highly reliable solution.

The combination of agentless architecture, CBT-based intelligent incremental backup, flexible multipath restore logic, enterprise-grade repository security, and native storage tier snapshot recovery capabilities creates a data protection platform that IT teams can trust for mission-critical workloads. Compared to multi-vendor, multi-server backup solutions, the single management interface in XInsight reduces operational complexity and total cost of ownership.

QSAN XInsight plus XVault provides the following pillars for enterprise data protection:

- **High Integration**: Single-interface management in XInsight eliminates the complexity of operating separate backup servers, thereby reducing operating costs and training requirements.
- **Cost-Effectiveness**: A fixed annual subscription fee, not charged per VM or CPU, delivers predictable, infrastructure-scale total cost of ownership advantages.
- **High Reliability**: Built on VMware VDDK standards, it features post-mission snapshot recovery capabilities, ensuring that each backup creates two independent recovery paths on QSAN enterprise-class hardware.
- **Rapid Recovery**: Deployment time of less than 5 minutes ensures that the backup infrastructure can be restored and run before any VM recovery process begins, thereby minimizing the RTO (Recovery Time Objective) in disaster scenarios.

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5. APPENDIX

5.1. Apply To

- QSM firmware 4.2.2 and later
- XEVO firmware 3.2.2 and later
- XInsight 1.6.1 and later
- XVault subscription license required
- VMware vCenter 7.0 and later

5.2. Reference

Product Page

- XVault

Data Sheet

- XInsight Data Sheet

Document

- XInsight Software Manual
- VADP (VMware vStorage APIs for Data Protection) Developer's Guide
- VDDK (VMware Virtual Disk Development Kit) Programming Guide

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