

NetBackup Flex Scale- Secure by Default

Providing the building blocks for
ransomware protection.

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Executive Summary

With ransomware attacks occurring at an alarming rate and demands becoming outrageous, it's no surprise that securing data is top of mind for all companies. When the first known ransomware attack happened back in 1989 the demands were minimal, and if you paid, your data was restored. Nowadays, the demands are increasingly excessive and there is no guarantee you'll get your data back intact. According to [Cybersecurity Ventures](#), by 2031, a business will fall victim to a ransomware attack every two seconds and those attacks will cost its victims more than US\$265 billion annually, making ransomware the fastest-growing type of cybercrime. Your last line of defense is being able to quickly restore your data from prior to the attack. This requirement makes protecting your backup data and ensuring your backup infrastructure is highly secure even more critical. Together, doing both provides an easy and reliable way to recover your data quickly.

People often believe that storing backups on immutable write once, read many (WORM) storage is all that's needed, but that's only part of the solution. There is no silver bullet for protecting your data. Instead, there are several factors involved in protecting your backup infrastructure and data in addition to storing it on immutable WORM storage. These include encryption, firewalls, access controls, security scanning, and intrusion detection and protection to name a few, but these can be extremely challenging to set up and even harder to maintain. The easiest way to get the most secure backup infrastructure is with Veritas appliances, including NetBackup™ Flex Scale, which delivers security by default with an architecture that provides enterprise scalability with both immutability and indelibility. In addition to NetBackup's ransomware anomaly detection, NetBackup Flex Scale adds infrastructure security protection through:

- System hardening and a Zero Trust architecture
- Immutable and indelible storage with an integrated secure compliance timer
- Container isolation and network segregation

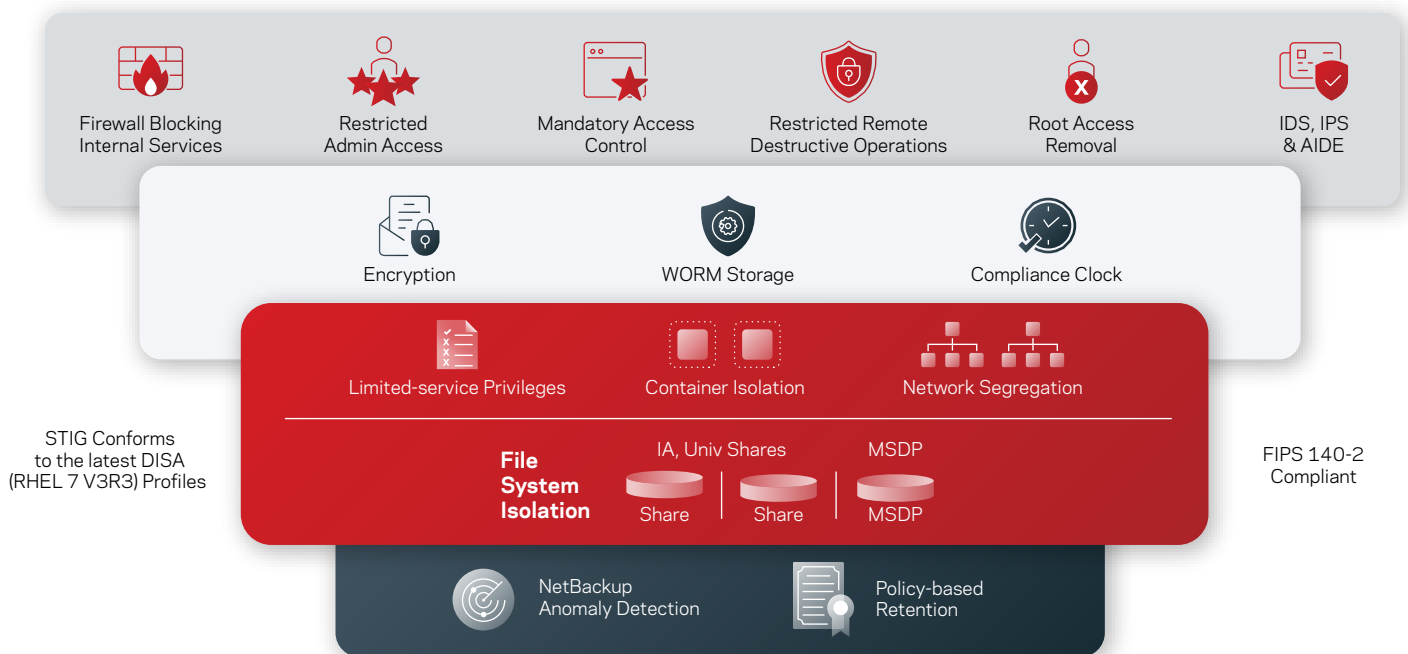


Figure 1. NetBackup Flex Scale's Zero Trust model providing multiple layers of protection from ransomware attacks.

Secure By Default

The NetBackup Flex Scale architecture was built with security as its primary objective and uses containers to provide service isolation, a hardened OS, and a Zero Trust security model. There are many layers required to provide a Zero Trust architecture, including access controls that limit or remove root access to users and services, secure communication including management controls, and enhanced data infrastructure security. Let's get into each of these in more detail.

Container Isolation

One of the key design choices needed to build the most secure immutable architecture for protecting backup data from a ransomware attack is containerizing the software. This approach is inherently more secure due to the isolated nature of container resource allocation and namespaces and their logically separated configurations. Starting a container-based service is subject to security constraints and checks: Rather than being read and executed from a node's operating system files, a container's contents are bundled together in binary form and a checksum comparison is carried out before execution to ensure program contents are in fact immutable. In NetBackup Flex Scale, all NetBackup services run in different containers. This design provides many layers of additional security, including:

- **Separation of backup images from NetBackup services**—Removes the NetBackup admin's ability to delete images stored in WORM storage (see the lockdown section for details on when deletion is possible).
- **Namespace isolation**—Ensures processes only have access to their own discrete set of resources.
- **Limited-service privileges per container**—Defines which system calls a container can run and grants control on what runs inside the container, eliminating the need for elevated system privileges.
- **Network segregation between containers**—Provides external connectivity to and from the containers as well as controlling network access between containers, ensuring containers can't affect other containers if compromised.
- **Blocking host network sharing with containers**—Ensures that anyone able to access the host network won't be able to see communications between services.
- **Preventing access to container file systems**—Keeps host-level services like the web UI from accessing container file systems.
- **Dedicated file systems mounted with security context for exclusive access to each container**—Blocks container file system sharing, allowing each file system to only be visible from and accessible to one specific container.
- **Isolation of container file systems to necessary services**—Limits other services within a container from seeing and accessing container file systems they are not specifically assigned. For example, there is a secure dedupe (MSDP) data store that eliminates users and NetBackup processes from accessing the MSDP data store where the backup images lie. It works by the dedupe filesystem only being visible to the dedupe (MSDP) service, but it is hidden from file system services such as CIFS and NFS that are used for Instant Access and Universal Shares even though they run from the same container (see Figure 2).

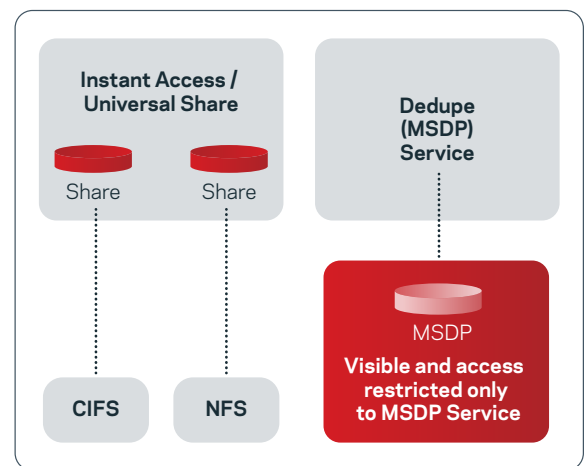


Figure 2. An overview of container file system isolation in NetBackup Flex Scale.

Hardened Operating System (OS)

NetBackup Flex Scale includes a customized version of Linux OS called VxOS that removes all unnecessary services and software packages to eliminate the ones that could potentially result in vulnerabilities. The VxOS kernel provides namespaces, control groups, and secure computing mode to control processes and resources at the operating system (OS) level. NetBackup Flex Scale uses these features to control access and manage resources.

The OS and platform software meet stringent security standards and are Federal Information Processing Standard (FIPS) 140-2-compliant. NetBackup Flex Scale also uses the security framework within Linux, SELinux, to create and enable proprietary security policies that conform with STIG guidelines (DISA RHEL7 profile) to further harden the OS from malicious attacks. For example, it removes admin access to superuser and includes an internal software firewall that blocks external access to internal services.

Mandatory Access Control

The standard Linux security model allows the superuser “root” to bypass all security checks, including the possibility of using the setuid bit to allow users to run an executable file with the permissions of the executable file owner. Doing so could cause serious security issues on systems. Instead, NetBackup Flex Scale explicitly denies access by default to all resources and tightly limits data access to only those programs and activities specifically needing access, regardless of their system privileges.

It works by using SELinux labels that view each object on the system—every file, directory, socket file, symlink, shared memory, semaphore, or FIFO file—and every subject—running process or Linux user entity—with an SELinux label. It uses these labels to specifically assign access permissions for individual resources to each service.

Intrusion Detection and Protection

NetBackup Flex Scale helps protect the system from an attack, misuse, or compromise with its built-in intrusion detection system (IDS), including an advanced intrusion detection environment (AIDE) and an intrusion protection system (IPS).

In essence, the IDS sandboxes applications, restricting each to access only to processes and resources specifically assigned to them. As part of STIG rules, it also has AIDE, which keeps track of file systems and generates alerts if any new software is deployed or if any changes are made to the file system containing the OS. This feature provides enhanced visibility into important user or system actions to ensure a valid and complete audit trail that addresses compliance regulations like PCI as a compensating control.

The IPS analyzes system and network activity and logs any unauthorized access attempts.

Security Technical Implementation Guide

Security Technical Implementation Guides (STIGs) are a cybersecurity methodology for standardizing security protocols within networks, servers, computers, and logical designs to enhance overall security. NetBackup Flex Scale uses the STIG template to meet security requirements per the Defense Information Systems Agency (DISA) profile.

Some examples NetBackup Flex Scale implemented for OS hardening with the DISA STIG include:

- Auditing enabled for low-level operations such as OS commands and system calls
- SSH root login disabled
- Interactive/login session idle timeout
- Forced password changes during initial configuration, ensuring the default password does not remain active on the system
- Logging of incorrect login attempts
- Customizable password policies—The ability to set your own password policy, including the option to use STIGs for validation. For example, the admin can set the password complexity, age, password lockout, and login-retry enforcement policy with or without STIG being enabled.

Continuous Security Scanning

As part of product development, each element of the appliance, including its Linux OS, drivers, appliance software, patches, and the core NetBackup application is continuously tested for vulnerabilities using industry-standard advanced security products such as Tenable, Qualys, Black Duck, and OpenSCAP. External penetration, or PEN, testing is also regularly performed.

Write Once, Read Many (WORM) Storage

NetBackup Flex Scale includes WORM storage that provides immutable and indelible data protection, ensuring data cannot be changed for a determined length of time to protect data against cybercriminal intrusion and internal threats. Any data saved on WORM storage is protected with the following security measures:

- **Immutability**—Ensures the backup image is read-only and cannot be modified, corrupted, or encrypted after backup.
- **Indelibility**—Protects the backup image from being deleted before it expires. The data is protected from malicious deletion.

WORM storage also works with Instant Access and Universal Shares.

Lockdown Mode

Immutability support for backup images requires locking down the appliance and disallowing any operations that could lead to data destruction. Lockdown mode is a core component of NetBackup Flex Scale's immutable architecture, and it means that in addition to being able to provision WORM-based storage, the appliances hosting this storage in their distributed cluster move into a heightened security level to protect both data and storage infrastructure. When the appliance is placed in lockdown mode:

- Administrators are prevented from making any changes to the OS and the internal components.
- All the external endpoints are secured from unauthorized access, protecting your cluster data from internal and external threats.
- Access to all services is protected and authenticated.
- Your data is protected from being encrypted, modified, and deleted using WORM properties.
- Built-in remote access interfaces—HP ILO and Dell iDRAC—are restricted to non-disruptive operations.

NetBackup Flex Scale supports three different lockdown modes, each providing a different level of granularity for WORM and retention: Normal Mode, Enterprise Mode, and Compliance Mode (see Figure 3). Normal Mode disables WORM and retention capabilities. To configure WORM storage and retention capabilities a user with the appliance admin role must enable either Enterprise or Compliance lockdown mode for the cluster either during initial config or after. The differences are:

- **Enterprise Mode** images stored in a WORM-enabled storage unit can be deleted prior to expiration; however, it involves a two-step, two-persona action.
 1. Users with the **appliance admin role** can remove the retention lock on an image-by-image basis using the MSDP restricted shell, then
 2. Users with the **backup admin role** can expire the unlocked images.
- In **Compliance Mode**, images stored in the WORM-enabled storage unit can't be deleted early.

Properties	Standard Protection			Immutable Protection	
	<input checked="" type="radio"/> Normal	<input type="radio"/> Enterprise*	<input type="radio"/> Compliance*		
Immutable data support with retention locking	X	✓	✓		
Deletion of immutable data before expiry by the Backup Administrator	✓	X	X		
Backup image retention lock deletion	—	✓	X		
Access to Remote Management Platform	✓	X	X		
Appliance Administrator access to node operating system	✓	X	X		
Appliance immutability mode upgrade	✓	✓	—		
Appliance immutability mode downgrade	—	X	X		
Retention lock extension	—	✓	✓		

Figure 3. An overview of the three lockdown modes in NetBackup Flex Scale.

Once a cluster has entered lockdown mode, it cannot be exited as long as data is stored with an active retention period, nor can the lockdown mode be changed from Compliance lockdown mode to the less-restrictive Enterprise version.

However, users with the appliance admin role can increase the mode; supported changes include:

- Normal Mode to Enterprise Mode
- Normal Mode to Compliance Mode
- Enterprise Mode to Compliance Mode

Other security enhancements for a cluster when it is set to either Enterprise or Compliance mode include:

- Lockdown modes are retained during upgrades
- The cluster nodes are prevented from being factory reset
- Newly added or replacement nodes are automatically placed in the existing lockdown mode of the cluster

Figure 4 shows the WORM storage configuration in NetBackup Flex Scale.

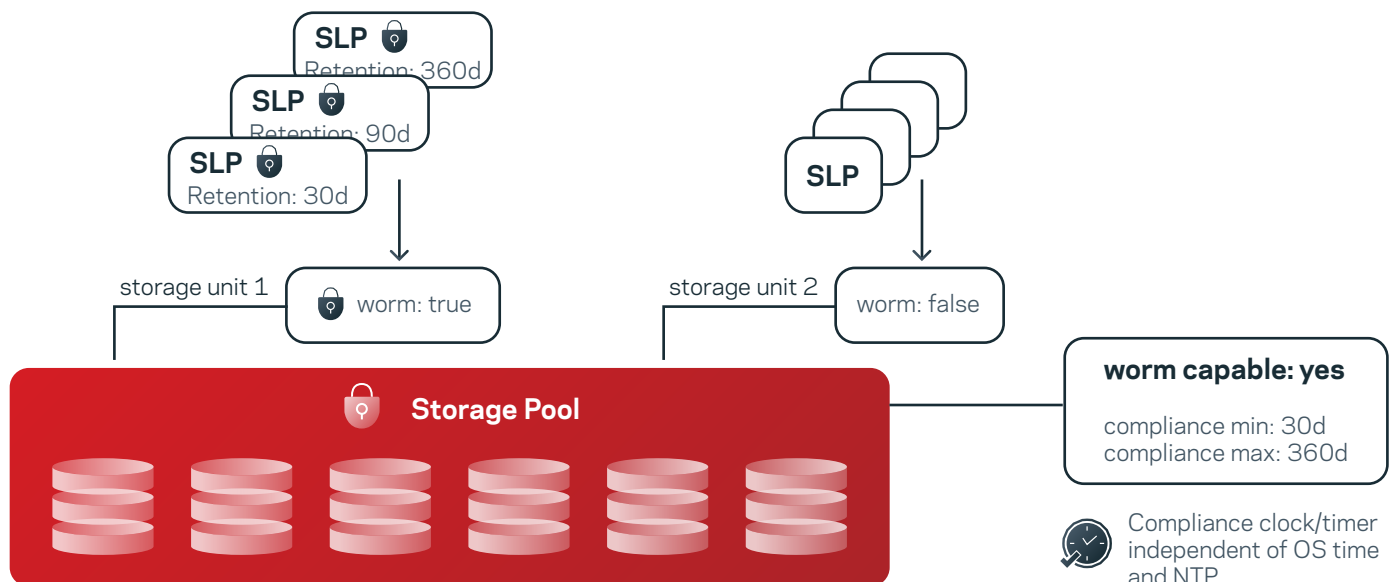


Figure 4. The WORM storage configuration in NetBackup Flex Scale.

1. The disks inside the nodes are automatically configured in a single storage pool that can be configured to be WORM-capable by selecting a lockdown mode. If lockdown is selected, the admin sets a compliance minimum and maximum duration for data retention of between 1 hour and 60 years. The appliance admin can change this setting at any time, but it will only affect future backup images. Any changes to compliance mode or duration will generate an event and be logged.
2. The storage pool is automatically presented to NetBackup with a single storage unit. After the admin enables Enterprise or Compliance lockdown mode, this default storage unit is automatically enabled for WORM. If desired, the backup admin can configure additional storage unit(s); typically, admins add a storage unit with WORM set to false in addition to the default one that has WORM set to true.
3. Then when you create backup policies or storage lifecycle policies (SLPs), you can select to have the data written to the appropriate storage unit. If you don't want to set a retention period on a particular backup policy, you send it to the storage unit with WORM set to false. If you want the data to be retained for a set retention period, then you configure the policy to write to the storage unit with WORM set to true. Each policy/SLP can have a different retention period, but it must fall within the compliance minimum and maximum range set at the storage pool layer.

Most important, there is a cluster-based immutable compliance clock/timer that is independent of OS time and the Network Time Protocol (NTP) and can't be tampered with by the appliance or the NetBackup admin. This compliance clock is used to determine whether a retention period on backup data has actually expired or not, thus ensuring the data written to WORM storage is retained for the proper duration and isn't affected if an attacker or ransomware tries to modify the system or NTP time. The compliance clock/timer is implemented at the cluster level and instantiated by the filesystem layer.

NetBackup provides backup image management with a visual representation of the immutable lock and image deletion after the WORM retention period.

Zero Trust

The Zero Trust architecture model means that NetBackup Flex Scale is designed to inherently trust no person, service, or process. This model ensures there is no implicit trust granted to users or resources. By default, NetBackup Flex Scale assigns the least privileges possible, thereby minimizing the impact of a breach. For example, if a malicious user were able to gain access to the system using admin credentials, because of the Zero Trust architectural design implemented in NetBackup Flex Scale, they can only see the infrastructure details but not cause any harm such as encrypting or deleting data, wiping a system, or changing a config. There are many design elements that are included in the Zero Trust design. In addition to the inherent network segregation between applications—NetBackup and appliance software—plus the container isolation and hardened OS attributes previously mentioned, NetBackup Flex Scale also includes the following enhancements to align with the Zero Trust security model.

Root Access Removal

Root access is removed, ensuring no one has superuser rights. Also, appliance services are run as non-root.

Restricted Admin Access

Restricted admin access limits what access administrators have, including removing admin access to the OS/root and preventing them access to make system changes such as deleting volumes. Any access to superuser-level appliance commands requires dual authentication and participation from the system admin and Veritas support, thus ensuring system-level activities are closely supervised. This process works by having the admin user generate a one-time password that Veritas support uses with other details to generate a support key. They can then use this support key together with their secret key to elevate to root and unlock the appliance. If the session is not locked manually, it will automatically lock after 12 hours and all current users will be removed from the root shell.

Restricted Access to Remote Management Platform

Access to the remote management platform—HPE iLO and Dell iDRAC—is restricted when either Enterprise or Compliance lockdown mode is selected. This feature prevents anyone from remotely changing the boot device and gaining access to the underlying OS and data. In addition, destructive operations such as wiping and repartitioning of disks are restricted for remote management interfaces/ Intelligent Platform Management Interface (IPMI).

Appliance Software Lockdown

All appliance software is signed and installed at the factory; any new additions must contain Veritas signatures.

Internal Firewall

NetBackup Flex Scale includes an internal firewall that only exposes backup and management ports required by NetBackup admins. All other internal services are blocked.

Encryption

NetBackup Flex Scale includes both in-flight and at-rest encryption. Management access—web UI, SSH shell, and REST APIs—is encrypted using TLS 1.2 and 2048 bit+. The backups are stored on disk using AES 256-bit encryption.

External Certificate Authorization

NetBackup Flex Scale provides the flexibility to use either internal certificates or certificates from an external certificate authority (ECA). The ECA can be uploaded and validated using the NetBackup Flex Scale web UI. Once you deploy the external certificate, all NetBackup Flex Scale components will use them, including the NetBackup services, management gateway, and web services. One certificate is deployed for all the components.

Customizable Login Banner

If STIG is disabled, you can create a customized text banner that appears before a user signs in to the NetBackup Flex Scale web UI, system console, or NetBackup UI. The typical use cases for login banners are legal notices, warning messages, and company policy information. The security banner can provide legal protection if an unauthorized user violates any access restrictions, such as Terms of Use, and accesses the system anyway. If STIG is enabled, then it sets its own login banner, which can't be modified.

Compliance

NetBackup Flex Scale's immutability solution has been assessed by the [Cohasset Immutability assessment](#) (in Compliance mode) and found to be compliant by third parties such as:

- Securities and Exchange Commission (SEC) in 17 CFR § 240.17a-4(f)
- Financial Industry Regulatory Authority (FINRA) Rule 4511(c)
- Commodity Futures Trading Commission (CFTC) in regulation 17 CFR § 1.31(c)-(d)

Summary

NetBackup provides anomaly detection, policy-based image retention, and KMS encryption. Using NetBackup Flex Scale as the deployment option adds the additional layers of infrastructure immutability and indelibility that is needed to provide ransomware protection. With integrated container isolation, a security-hardened OS, and a Zero Trust security model, NetBackup Flex Scale is a proven platform that helps prevent data loss due to malware infiltration and ransomware attacks while allowing you to recover more efficiently.

To see some of these security features in action, watch this [video](#).

About Veritas

Veritas Technologies is a global leader in data protection and availability. Over 80,000 customers—including 87 percent of the Fortune Global 500—rely on us to abstract IT complexity and simplify data management. The Veritas Enterprise Data Services Platform automates the protection and orchestrates the recovery of data everywhere it lives, ensures 24/7 availability of business-critical applications, and provides enterprises with the insights they need to comply with evolving data regulations. With a reputation for reliability at scale and a deployment model to fit any need, Veritas Enterprise Data Services Platform supports more than 800 different data sources, over 100 different operating systems, more than 1,400 storage targets, and more than 60 different cloud platforms. Learn more at www.veritas.com. Follow us on Twitter at [@veritastechllc](https://twitter.com/veritastechllc).

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