

Technology GUIDE

We reshape data management across the entire data lifecycle, dismantling fragmented systems and outdated practices. Our revolutionary approach instills confidence with a holistic and unified technology, transforming behaviors and setting new industry standards.



What makes our **Technology Unique?**

▶ A powerful combination of hardware & software

AiRE is STORVIX's software stack built on a storage-optimized UNIX operating system with a 128-bit file system and software-defined data services. AiRE is carefully integrated with physical or virtual hardware to ensure optimum compatibility and get the most out of the hardware. Each physical or virtual AiRE deployment is called an AiRE instance.

AiRE is designed to optimize system performance, resiliency, and efficiency for different workloads within the same system over time. The next step to open up the full potential of this flexibility is to enhance it with cloud and AI technologies.

▶ Two-way cloud connection & AI create a self-driving storage array

One-way telemetry to the cloud, where CloudSight runs machine learning algorithms, enables reporting and the AI-driven identification of potential issues. A backlink from the cloud to AiRE makes centralized fleet management and a more proactive approach to support possible.

If customers opt into CoPILOT Connect, remote assistance is always active so the STORVIX SmartCARE support team can implement fixes and optimizations on behalf of customers without delay. With AutoPILOT, the AI can instantly do most of this on its own and alert SmartCARE if human intervention is required. Using the cloud and AI to enhance AiRE creates a self-driving storage array, much like a self-driving car.

▶ An intelligent unified data platform

Combining different classes of memory, multi-protocol support, and data management across data fabrics with next-gen cloud and AI technologies creates a complete solution that is unique on the market. We call this a next-generation unified data platform, AiRE IntelligentFiler, comprising the AiRE software, the hardware it runs on, and the associated cloud services.



Flexible hardware Technology

► Under the hood of AiRE's hardware

AiRE IntelligentFiler hardware contains a system processing unit (SPU) and disk packs. The SPU can be single or redundant, meaning it is either single or dual controller (controller a, controller b). Additional disk expansion units (DEUs) are provided upon requested. The DEUs can be installed instantly without downtime.

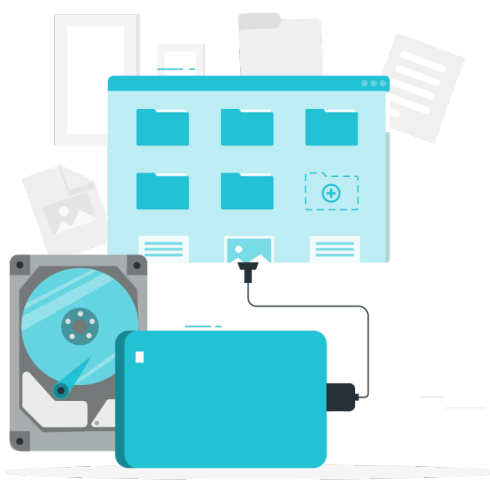
► Disk configurations for tiers 0_3

Standard hardware configurations include both hybrid-flash disk packs and all-flash disk packs tailored to data storage tiers ranging from 0 to 3. The hybrid-flash configurations can be either single or dual controllers with a combination of HDDs and SSDs. The all-flash configurations are always dual controller and use high-performance SSDs. The effective capacity of a single base unit without DEU can range from 32 TiB to 501 TiB, with an option to scale up as high as petabytes if needed.

► Long hardware lifecycle

All combinations of standard disks are possible in the disk pack. This flexible upgradability makes it easy to scale up performance and capacity or make the disk pack more cost-efficient. As a result, the hardware can be adapted over time to changing operational needs, workloads, and storage tiers.

This customization extends its lifecycle compared to other solutions that are replaced more frequently in their entirety.



AiRE's intelligent Data Management technology

► Pooled storage approach provides flexibility

Traditionally, data storage tuning parameters could only be set once for the entire system. If requirements changed, the whole system had to be wiped clean and set up from scratch, or a new array had to be purchased. AiRE changes this with a pooled storage approach built on its 128-bit file system with no physical limitations on space expansion.

This approach allows an unlimited number of datasets to be created within separate data pools in the same unit. Each of these datasets can have hundreds of different parameters. To make it easy to set these parameters optimally, AiRE uses a system of profiles and policies.

► Workload optimization with policies and profiles

Three common profiles are performance, resilience, and optimization. When running performance, lower latency and higher throughputs are prioritized for workloads like VMs. Resilience prioritizes redundant backups, external replication, and protection for mission-critical data. Optimization minimizes the system load and saves as much space as possible.

Pre-defined policies based on best practices are available for each profile and can be customized as needed. The policy sets all relevant parameters to match the profile. These parameters include I/O path management, cache behavior, and block size. AiRE supports variable data block sizes for volumes and filesystems, which makes it easier to adapt to a workload profile's performance or space usage requirements.



AiRE's powerful data storage Reduction Algorithms

► In-line deduplication

AiRE provides block-level in-line deduplication using cryptographically strong 256-bit checksums like SHA256. Deduplication is done synchronously using the available CPU power on the entire storage pool. AiRE also uses granular deduplication, thus allowing deduplication to be applied on a per-dataset basis.

► In-line compression

AiRE uses in-line compression while data is being written to disk instead of running compression afterward. The compression algorithms used vary from the more space-efficient like GZIP9 to the more high-performance like LZ4. This usage of both in-line deduplication and in-line compression speeds up operations while keeping capacity usage and the storage footprint to a minimum.

Intelligent data Protection

► Protection from silent data corruption with software raids

AiRE prevents a variety of silent methods of data corruption, including bit rot, phantom writes, DMA parity errors, and driver bugs. RAID-5 write holes are prevented by offering software raids through AiRE's RAID-Z and two or three-way MIRROR topologies. Software raids are also more cost-effective than proprietary hardware raid controllers.



► End-to-end data integrity with self-healing

With AiRE, each block is checksummed, and this checksum is kept in a pointer to that block, not in the data block itself. Data is checksummed all the way up the filesystem hierarchy up to the root node (the uberblock), which is also checksummed. When data is read, its checksum is calculated and compared to what it is supposed to be.

In case of mismatches, a self-healing mechanism is applied, repairing the blocks by considering the checksum result and other blocks that were written in the RAID-Z/ MIRROR configuration. This process of checksumming creates a self-healing file system with end-to-end data integrity.

► Data recovery and replication with snapshots

By using a copy-on-write transactional model, AiRE enables point-in-time, immutable snapshots to be taken. These allow the system to quickly revert to the state it was in when the snapshots were taken, providing fast recovery from malware attacks such as ransomware. This technique also allows the creation of instant clones without any additional space requirements.

Snapshots taken with AiRE can be incrementally replicated at the block level. Only block-level differences will be synchronized between different snapshots, making on/ off-site replication very efficient.

► Using Vault to protect your enterprise data

Customers can set up off-site replication and mirror to STORViX's GDPR-compliant data centers using the Vault cloud service. Data can be sent to and recovered from Vault securely in the cloud. Customers can also recover data by having the physical drives shipped to them. Our roadmap includes the capability to transfer files from other data streams to Vault as well.

All data sent to Vault is protected with SHA AES 256 encryption in transit and at rest. The data is secured with FIDO2 multi-factor authentication (MFA) on physical drives in our own geographically separated data centers in Sweden, Italy, and other EU countries. Customer data is processed in compliance with a strict zero-knowledge privacy policy and data processing agreement that goes beyond the statutory minimum.



AI technologies **Enhancing AiRE**

▶ AiRE's telemetry in the cloud?

AiRE sends telemetry to the cloud that is analyzed by our cloud processing engine, CloudSight, which presents the data in reports. Millions of data points are sent from AiRE to the cloud in real-time. These data points include performance, configurations, system health, workload types, and capacity utilization.

The data is run through advanced AI algorithms to identify signs of suboptimization, errors, or similar issues. This allows the AI to alert both the customer and the STORViX SmartCARE team of a potential issue so that corrective action can be taken proactively. CloudSight also uses the data to generate a variety of reports and prescriptive analytics.

Another use case for AiRE telemetry in CloudSight is to generate predictions of future capacity usage to support FlexiPay, which offers dynamic pricing for both physical and virtual AiRE instances.

▶ Centralized fleet management

In its simplest form, the telemetry from AiRE to the cloud is only a one-way cloud connection. Establishing a link back to AiRE instances from our cloud operations center, Merlin, makes it a two-way cloud connection. This enables centralized fleet management, allowing a software update or other command to be sent to as many AiRE instances as desired simultaneously.

▶ A more proactive approach to human support

The two-way cloud connection is also used to enable a more proactive approach to support. With CoPILOT Connect, remote assistance is always enabled. This allows the SmartCARE team to implement fixes, optimizations, and other corrective measures on behalf of customers faster and easier using the backlink.



► Self-driving support and optimization

AutoPILOT takes proactive support a step further with an AI that automatically performs optimizations, fixes, and other system administration tasks. It is able to do this with carefully trained machine learning algorithms analyzing AiRE's telemetry in real-time and executing commands over the backlink. If the AI is unable to solve a problem on its own, it can still identify the issue and flag it for human intervention.

The machine learning algorithms are trained on anonymized telemetry from other STORViX customers who opt into the program and rigorous test scenarios to recreate a variety of conditions for the AI to recognize and respond effectively to. This enables datasets to be continuously optimized and adapted to changing workloads over time with automated profile recognition and policy enforcement.

► SmartCARE plans

Upgrading from the standard SmartCARE plan to Advanced or Premium is required to enable most of STORViX's cloud and AI technology. Standard only provides one-way telemetry from AiRE to the cloud, while advanced unlocks the backlink from the cloud to AiRE. Premium creates a more self-driven and proactive experience with more powerful and extensive AI technology.

► For more insights

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