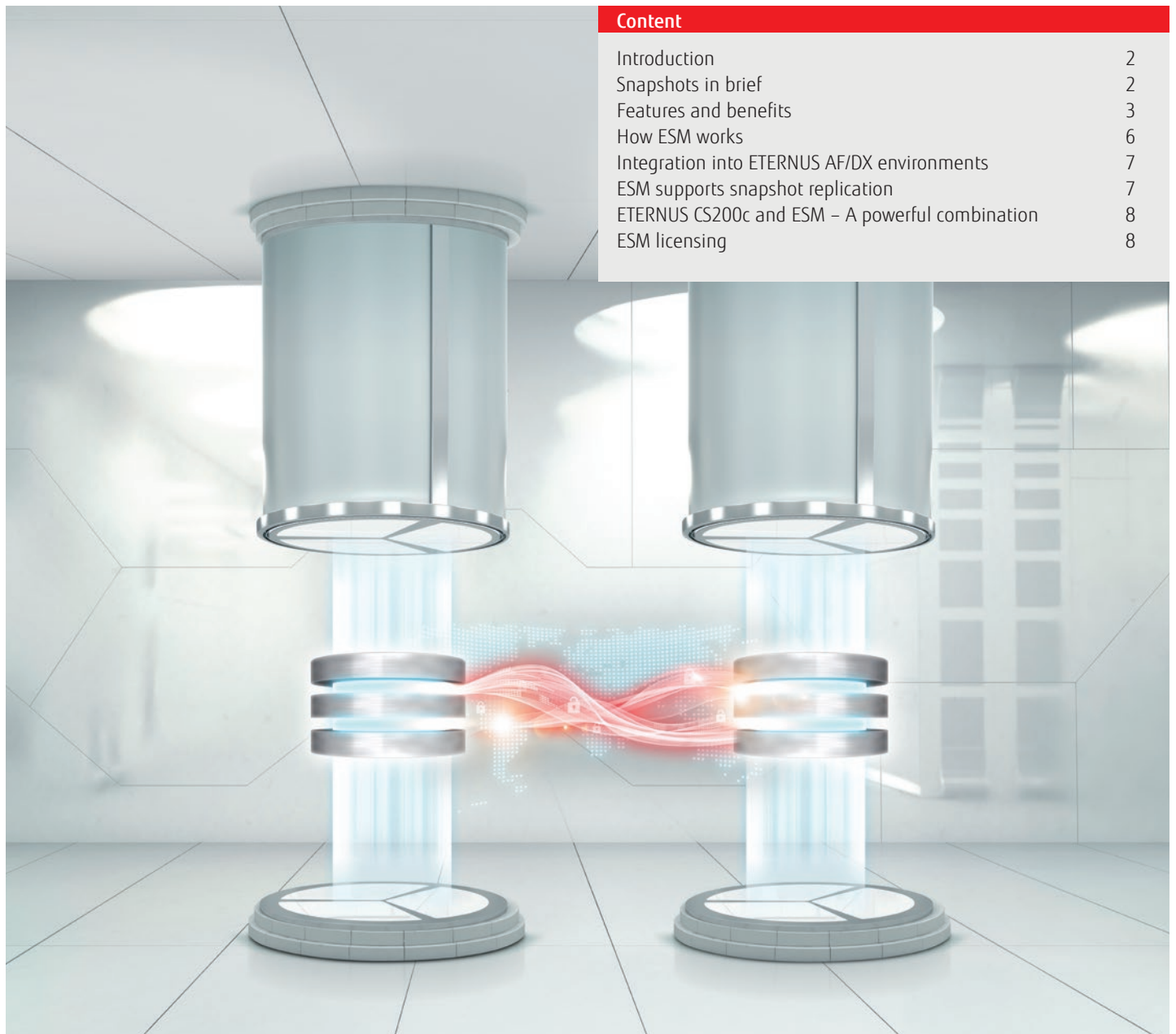


White Paper FUJITSU Storage ETERNUS Snapshot Manager (ESM)

Efficient Snapshot Management for Fujitsu Storage ETERNUS online storage systems.



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Introduction

Driven by rapid data growth and the increasing importance of data for business processes, companies are investing more and more in data availability and data protection. The ETERNUS SF storage management software of the FUJITSU Storage ETERNUS AF all-flash and ETERNUS DX hybrid series offers a powerful solution for this. ETERNUS SF complements the data management functions of the ETERNUS online storage arrays and provides flexible and efficient data management with functions for business continuity and disaster recovery, comprehensive automation and simple administration via web GUI. In addition, you can expand the snapshot functionality of ETERNUS SF with the ETERNUS Snapshot Manager (ESM). The ESM provides efficient snapshots and data replication for ETERNUS storage systems. The software features deep application and virtual machine integration without scripting. This white paper outlines the use of snapshots and describes the advantages of the ESM.

Snapshots in brief

The idea behind snapshot technology is quite simple: An image, for example of a volume, is created and saved. If you take such snapshots at defined times, you can return at a certain point in time if a rollback is required. This simple operation has become a powerful element in ensuring business continuity. Snapshots do not replace the backup, but they do complement it. They are ideal for restoring data that has been corrupted or inadvertently deleted, and a system can be quickly shifted back to a status existing earlier in the time frame.

All this makes snapshot technology a valuable component of modern data management. With snapshots you can ...

- ... create multiple recovery points to complement daily backups.
- ... access data much faster than with backups to tape.
- ... easily test new applications with real data.
- ... support key IT functions, such as remote replication, business continuity or regulatory requirements.

Snapshots help overcome five main challenges of backup and recovery:

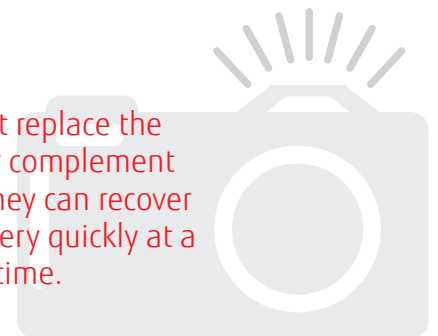
- Backup window is too short
- Too many point solutions
- Failed backup jobs may become a big threat for corporate data
- Data restore cannot be processed in time
- Reporting is missing or incomplete

In this context, two parameters make it easier for companies to implement the business continuity they need: **Recovery Point Objective (RPO)** and **Recovery Time Objective (RTO)**. RPO and RTO help evaluate the importance of data and applications to a company.

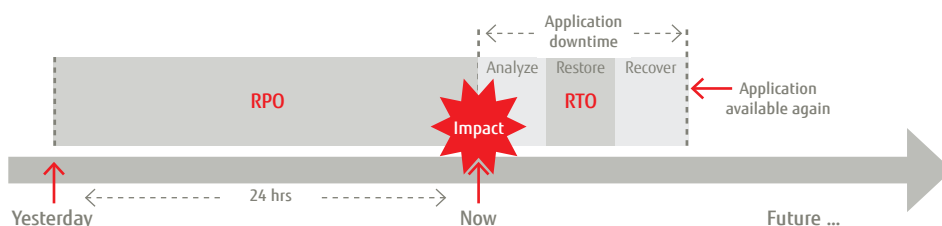
- RPO: The point in time you have to go back to in order to find the last valid and saved copy of lost data
- RTO: The amount of time needed to restore the last valid and saved copy of lost data

Snapshots have an RTO of seconds. They create multiple recovery points, decrease the amount of data loss after a disaster (RPO) and complement daily backups with a minimum impact on the production system. In addition, snapshots enable instant data access and minimize the time a system runs after a failure (RTO).

Snapshots do not replace the backup, but they complement the concept as they can recover a failed system very quickly at a specific point in time.

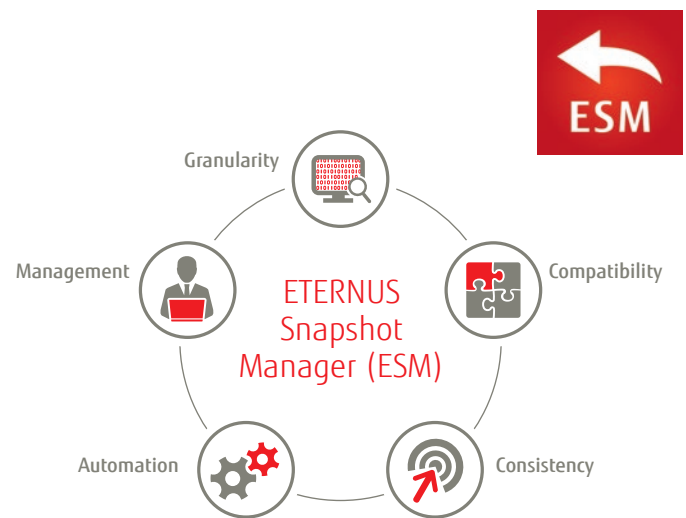


What RPO and RTO mean in practice



Features and benefits

Challenging SLAs with multiple RPOs and very fast RTOs can only be met by using the latest snapshot technology and capabilities. For this reason companies of all sizes today increasingly turn to array-based snapshot technologies. The ETERNUS Snapshot Manager (ESM) provides exactly that for ETERNUS AF all-flash and ETERNUS DX hybrid storage arrays. The software enables administrators to perform application-consistent hardware snapshots and to generate a detailed catalog of the recorded data. As a result, this leads to granular, rapid and coherent restoration of productive data and meta data from physical and virtual environments. In addition, ESM's central console offers numerous automation options for fast, streamlined and accurate snapshot management. The key features of ESM, which are outlined below, are: Compatibility, Consistency, Automation, Management and Granularity.



Compatibility



Snapshot support for the industry's broadest range of application and file systems

- Improves data availability and business productivity
- Eliminates multiple management and operational costs
- Reduces administration efforts and IT resources due to ease of use

Each database or application has its own backup characteristics which must be considered, and the snapshot management can be difficult and expensive. The administrator must perform many manual tasks and scripts to generate and recover application-consistent snapshots. Based on these facts, snapshot management can be very complex – and it can be more difficult to realize the full potential of snapshots.

ESM streamlines and simplifies snapshot management. It provides a complete view into snapshot data across applications, devices and operating systems, cutting administrative overhead and improving access, availability and IT efficiency. The software eliminates the chaos of multiple management tools and processes while reducing operational costs.

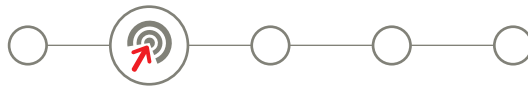
ESM quickly creates and retains application-aware snapshots of market-leading databases (Microsoft® Exchange®, SQL, SAP, Oracle etc.) and major operating systems (Windows, Linux, VMware, Solaris,...). Broader service level commitments can be met without the complexity of multiple tools. ESM also speeds up virtualization adaption and easily scales VM environments. Hundreds of virtual machines can be protected in minutes.

ESM is compatible with any other backup tool for additional data management and protection, such as creating secondary data copies from the snapshot data to disk or tape. Fujitsu Storage ETERNUS CS200c, combined with the ETERNUS Snapshot Manager Software, offers a very price-attractive solution for snapshot-based backup to disk that ensures business continuity and agility.



ESM covers most databases, applications and operating systems – as well as virtual environments. The software streamlines and simplifies snapshot management and is compatible with any backup tool.

Consistency



Coherent data handling for applications and creation of index and catalog of snapshot data

- Improves data availability and business productivity
- Increases protection for mission-critical data with low production impact
- Simplifies application protection and speeds up recovery processes to minimize business disruption

ESM extends the snapshot functionalities of ETERNUS AF all-flash and ETERNUS DX hybrid storage arrays. The software features array-based snapshot replication with agents that are available for a broad range of applications. ESM coordinates the snapshot operations across multiple ETERNUS AF, ETERNUS DX arrays and ETERNUS Storage Cluster through a single console.

When a scheduled protection job for defined applications is running, the agent quiesces the selected applications and automatically creates a set of persistent snapshots within the productive storage system. As soon as successful snapshot creation is confirmed, the productive system resumes full production operation. In this way, consistent data images can be created in minutes according to the scheduled RPOs.

A content-aware indexing of the snapshot enables the administrator to quickly find and recover individual files, volumes or whole VMs using intelligent search functions across a collection of indexed snapshots.

The application-awareness increases protection for mission-critical data with minimal impact on the running application and production systems. The feature improves data availability and business productivity with whole volume or granular and consistent recovery. The ESM simplifies application protection and speeds up the recovery process to minimize business disruption. Transparent failover in ETERNUS Storage Cluster configurations guarantees business continuity.

ESM provides content-aware indexing and cataloging.



Automation



Automated operation and management

- Improves RPOs and RTOs by allowing for more frequent copies and faster restores
- Frees up administration and IT resources thanks to ease of use
- Eliminates risk, improves business agility and increases efficiency

ESM simplifies, automates and standardizes all snapshot management tasks, including object, application and database recovery. The software eliminates scripting and manual mapping of file systems and applications. Existing script-based tools are replaced with an intuitive point-and-click interface, pull-down menu and wizards.

The software provides a complete view into snapshot data and replication copies across applications, devices and operating systems, cutting administrative overheads and improving access, availability and IT efficiency. The administrator can configure, create, retire, mount, dismount, monitor, mine, retain, revert and restore in the same way regardless of application and/or operating system platforms. The scheduling of snapshots is very easy and saves valuable administration time. The system views all scheduled jobs and provides several browse options.

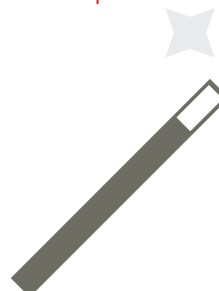
For example the administrator can browse the latest generated snapshot or look for information at a specified browse time. An integrated reporting function shows which and how much data of a specific server is stored. This enables the application specialists to run ESM without the support of specialized backup or storage experts, and the automated processes improve RPOs and RTOs by allowing for more frequent copies and faster restores.

In summary the automation feature frees up administration and IT resources, eliminates risk, increases efficiency and improves business agility.

Automated operation

Intuitive management

No scripting



Management



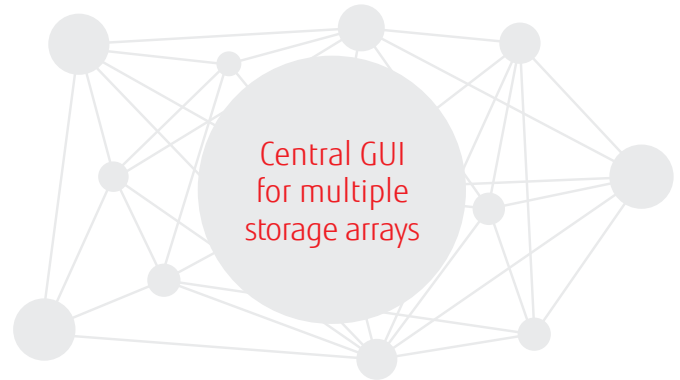
Single console with central GUI for multiple storage arrays

- Increases business efficiency and enhances productivity
- Lowers infrastructure and operational costs
- Reduces risks and eliminates multiple management points

The ESM console offers storage administrators unique and central snapshot management throughout the ETERNUS AF and ETERNUS DX series, from entry-level systems up to the high-end models.

Multiple management points belong to the past. From a single console, ESM manages hardware snapshots and catalogs the content for granular recovery for the whole environment. The snapshot management technology leverages the efficiency of hardware-based snapshots to speed recovery, eliminate scripting and lower infrastructure costs. The point-and-click and wizard-driven management

interface enables ease of use – and because only one console is used with ESM – multiple management points are eliminated. All of this pays off for IT organizations: The ESM guarantees lower operational costs, reduced risks and enhanced productivity.



Granularity



Fast identification and recovery of individual files of indexed snapshots

- Allows granular and consistent recovery of applications and files
- Improves data availability and business productivity
- Ensures a fast and simple recovery process

The recovery of snapshots is often at the whole snapshot or VM level. The administrator uses ESM to decide which way to recover data from a snapshot:

- Snap revert, which recovers the whole snapshot. This feature is the fastest restore option and can be instrumental in meeting the highest RTO requirements.
- Granular recovery is used to restore only single files or applications. After snapshot creation, the snapshot is mounted to the ESM management server for indexing the contents of the snapshots. The generated index makes the snapshot browseable and facilitates the restoration of single files, e-mails or objects across physical and virtual environments.

Browse-able snapshots & granular recovery



Both granular recovery and snap revert improve data availability and business productivity.

How ESM works

The ETERNUS Snapshot Manager consists of two parts:

- The ESM Manager runs on a Windows server (we recommend a Fujitsu PRIMERGY server) or alternatively on the ETERNUS CS200c appliance and controls the complete snapshot process (snapshot scheduling, mounting, dismounting and recovery).
- The ESM Agent runs on the production servers and is available in dedicated versions representing the applications running on it.

The principle operation of ESM is as follows:

1. The agent quiesces the selected file system or application to bring it into a consistent state
2. After stabilizing the application, ETERNUS AF or ETERNUS DX creates a hardware-based consistent snapshot or clone which is stored on a specific part of the ETERNUS array. After confirming the successful snapshot creation, the application can continue to run.
3. The next steps in the process run in the background without impacting the production system. The ESM Manager mounts the snapshot or clone, creates an index and generates a detailed catalog of the stored snapshot data. This enables the administrator to quickly find and recover individual files, volumes or whole VMs using intelligent search functions across a collection of indexed snapshots.
4. The agent deletes (truncates) the log files having taken the snapshot successfully.
5. **Snapshot-based backup** – only available in combination with Fujitsu Storage ETERNUS CS200c. In combination with the ETERNUS CS200c backup appliance, the ESM software license features an extended functionality. The ETERNUS CS200c manages the ETERNUS hardware snapshots and can additionally store a copy of the created snapshot within the ETERNUS CS200c online storage. The ETERNUS CS200c also takes over the function of the ESM Manager, and that means the customer does not need an additional server for the ESM.

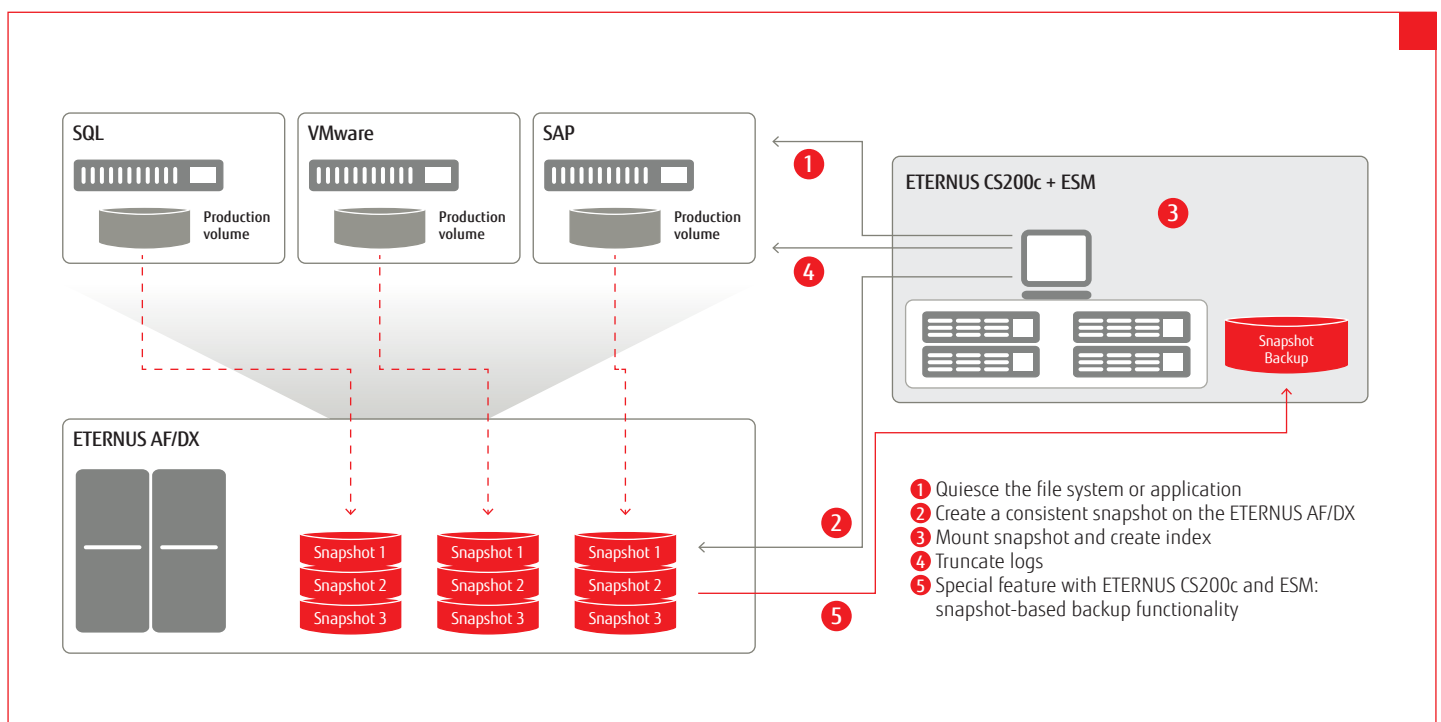
The combination ETERNUS CS200c with ESM offers a very-price attractive solution for snapshot-based backup to disk lowering implementation effort and risk.

The catalog generated by the snapshot process enables a granular, fast and coherent recovery of production and meta data for physical and virtual systems without restoring the complete contents of the disk.

Granular recovery technology can significantly reduce the time and resources spent backing up and recovering data. For example, Microsoft Exchange has become one of today's most critical business applications and losing access to this data for even a short period of time can be damaging to any business. The ability to quickly recover an Exchange server in the event of failure and to easily recover individual mail boxes or messages should be the cornerstone of any backup and disaster recovery solution.

ESM offers a rich set of central control and administration options to guarantee fast, secure and compliant snapshot management. ESM supports Windows, Linux/Unix and VMware/Hyper-V operating systems and Microsoft, Oracle and SAP business applications.

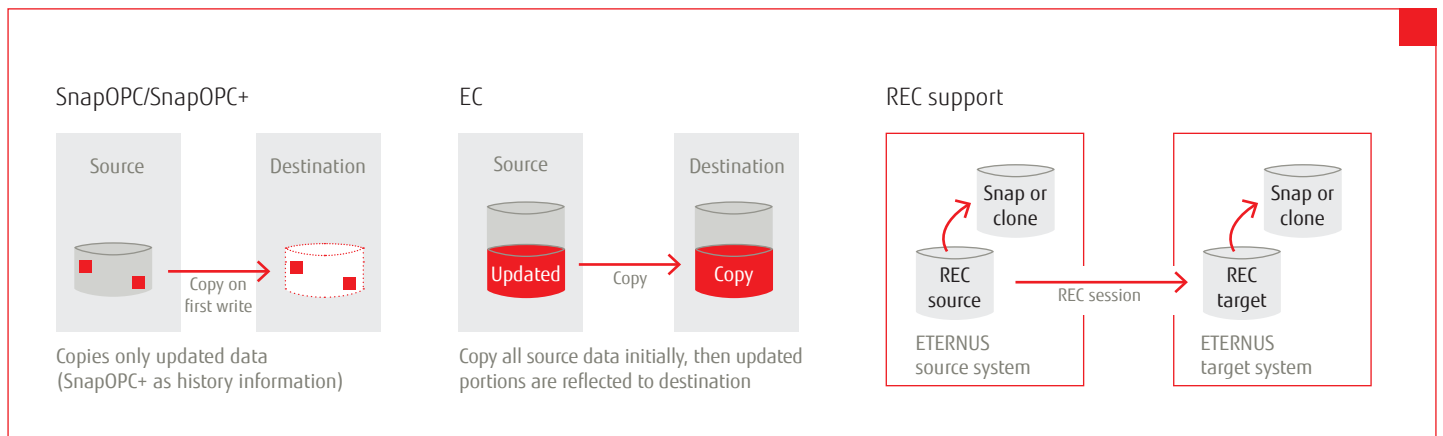
For detailed technical specification, please see the datasheet on www.fujitsu.com/emeia/esm



Integration in ETERNUS AF/DX environments

ESM is optimized for ETERNUS AF and ETERNUS DX and can control and manage some embedded Advanced Copy functions of these storage arrays. ETERNUS AF/DX systems support two distinct data copy modes – snapshot high-speed copy and synchronous high-speed copy.

- **Snapshot high-speed copy** creates a snapshot of data. The supported copy types are SnapOPC and SnapOPC+. Once an initial copy has been made with these AdvancedCopy functions, it is possible to perform differential copying, which copies only the modified portions.
- **Synchronous high-speed copy** provides a full copy of original data. The supported copy types are EC and REC.



For more details refer to the white paper: [ETERNUS AF and ETERNUS DX Feature Set](#)

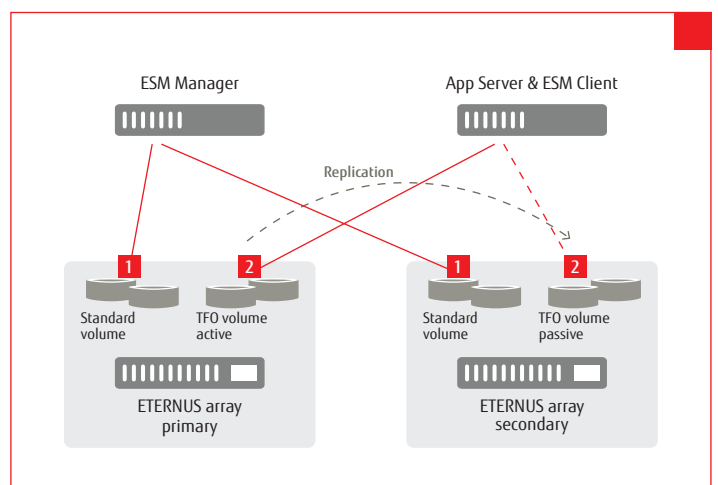
ESM supports snapshot replication

The ESM features array-based snapshot replication of hardware snapshots of ETERNUS AF arrays, ETERNUS DX arrays or in ETERNUS Storage Cluster configurations to create more frequent, more current disaster recovery copies – with full application awareness and granular recovery capabilities. The ESM creates a snapshot on the source array and automatically triggers the snapshot creation on the second (target) array.

You get nonstop operations with transparent failover in ETERNUS Storage Cluster configurations either automatically or manually that can be executed in both directions. The ETERNUS Storage Cluster offers a number of functions that safeguard businesses against disasters without complexity or high costs:

- Automatic failover during a disaster: The secondary storage takes over identities and data is still accessible; fully transparent to the hosts and applications without any actions by system administrators
- All application accesses are maintained in real time
- All systems in the high-availability environment can be run productively during normal standard operations

The ETERNUS Storage Cluster also supports a manual failover process which is required in the event of planned power shutdowns, DR tests and non-disruptive upgrades.



For more details about Storage Cluster refer to the white paper: [ETERNUS Storage Cluster](#)

ETERNUS CS200c and ESM – A powerful combination

The ESM creates a snapshot on the ETERNUS array and stores the snapshot data on the same array where the original data resides. If disaster should strike, or the source data is damaged, the snapshot will either be lost or inaccessible. There is no way to restore if the source is lost. Therefore, snapshots alone are not the ideal solution for bridging the data availability gap. Replication of the snapshot is one way of closing this gap, but it does not prevent data corruption or the accidental deletion of snapshots on primary storage. Another option is to back up the snapshots on another storage system and/or at a different location. ETERNUS CS200c, together with the ETERNUS Snapshot Manager, offers this possibility and more: ETERNUS CS200c acts as the ESM manager and also as the backup-to-disk target for the snapshots and clones created by the ESM. This approach enables snapshot-based backup to disk along with traditional backup to disk, to tape or cloud as a single consolidated operation by linking up the backup processes. This consolidation of resource management and backup destinations also prevents backup/restore operation failures that can occur in processes having low levels of automation. In addition, high-speed backup is possible without stopping operations.



This close integration of snapshots, snapshot-based backup and traditional backup results in a continuous or near-continuous data protection process, which in turn improves the quality of backup and recovery, increases data availability and data security, and safeguards the productivity of the entire IT environment. The affordably priced solution reduces implementation effort and risk.

ETERNUS CS200c and ESM

- Improves data availability and business productivity
- Lowers RPO and RTO tremendously
- Reduces CAPEX and OPEX

For more details about ETERNUS CS200c refer to the white paper: [ETERNUS CS200c Features](#)

ESM licensing

ESM is based on Commvault IntelliSnap technology and optimized for ETERNUS AF and ETERNUS DX. The following applies to licensing:

- One ESM license per ETERNUS AF/DX storage array is required; all agents for supported file systems, applications or media agents are included in this ESM license.
- There is no limitation for servers and capacity.
- The ESM license can be expanded by additional license keys for multiple ETERNUS AF/DX arrays or ETERNUS Storage Cluster, respectively.
- In addition the ESM offers an [easy upgrade path to the Commvault Software](#).

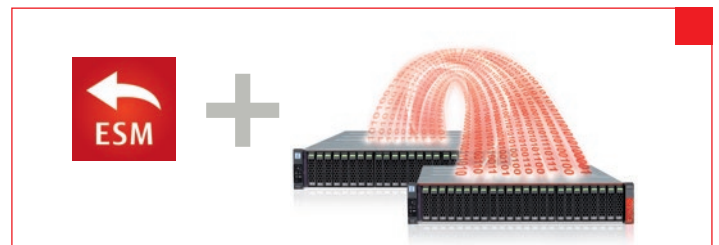
When ESM is used in the ETERNUS Storage Cluster, the following applies:

- You need two ESM licenses for ETERNUS Storage Cluster, one license per ETERNUS array
- Both cluster nodes must be configured in the ETERNUS Snapshot Manager

When ESM is used with ETERNUS CS200c:

- You need the standard ESM license for the appropriate ETERNUS array and the ETERNUS CS200c with the required backup capacity
- As ETERNUS CS200c takes over the function of the ESM Manager, customers do not need an additional server for the ESM

Fujitsu offers maintenance support and professional service for configuration and installation.



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