

SEP Hybrid Backup & Disaster Recovery



Back Up SAP HANA on IBM Power and SUSE Linux Enterprise Server with SEP sesam

Joint Whitepaper of:



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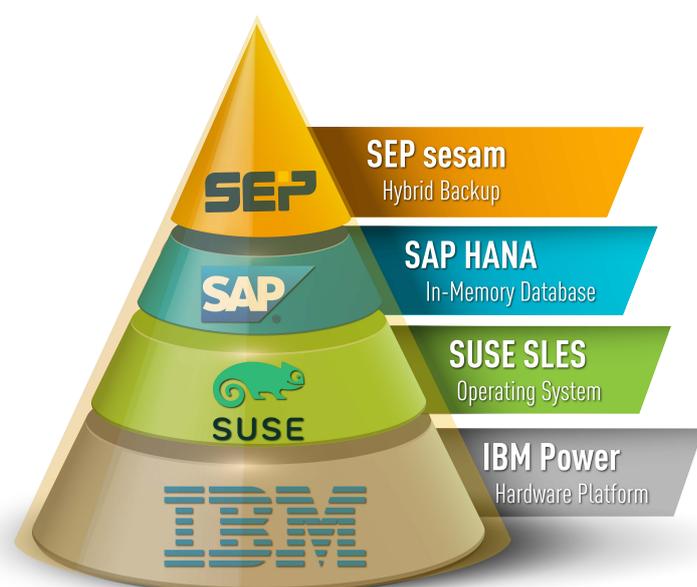
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1. Introduction and Overview

1.1. SUSE Linux Enterprise Server on IBM Power with SAP HANA protected by SEP sesam

SUSE, SAP, IBM and SEP are committed to meet customer needs providing all the functionality, performance and interoperability required to meet today's demanding customer environments. Together, they offer world-class solutions at an optimal price to implement, protect, and improve endusers' and service providers' investments in their IT infrastructures. SUSE, SAP, IBM and SEP have now formed a partnership using their industry-leading IT infrastructure and application technologies to provide a complete data protection solution for the SAP HANA environment.

SUSE Linux Enterprise Server (SLES) is the recommended and supported O/S for SAP HANA. SEP sesam, by SEP, is an SAP certified backup and disaster recovery solution to protect **SAP HANA on IBM Power platforms**. This whitepaper describes the benefits of using SEP sesam for the backup of SAP HANA and SUSE Linux Enterprise Server on IBM Power.



2. Solution Components

2.1. SAP HANA

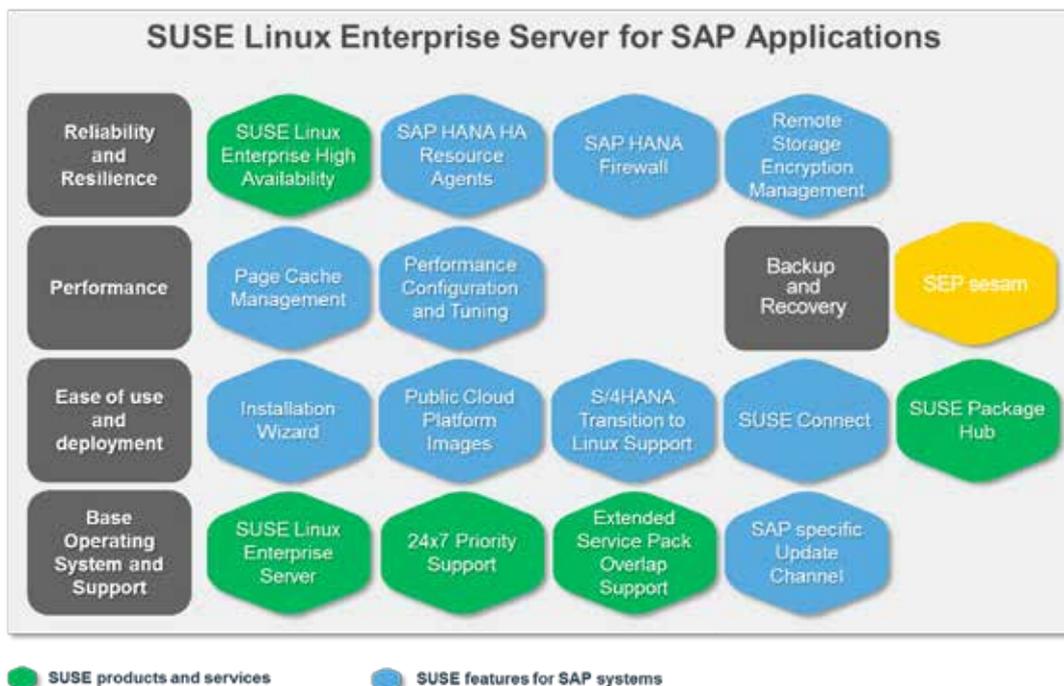
The SAP HANA in-memory database is the perfect solution to combine database, data processing, and application platform capabilities in one. It takes full advantage of the latest hardware technologies by combining data storage, massively parallel processing (MPP), and utilizing memory to optimize database performance. SAP HANA's advanced software design provides libraries for predictive planning, text processing, and both spatial and business analytics. Regardless of the industry, SAP HANA can provide high-speed, real-time insights into your business.

The SAP HANA database holds its data in-memory to maximize performance and utilizes storage capabilities to provide a fallback in the event of an error. After a power failure, for example, the database can be restarted like any conventional disk-based database and work can resume.

2.2. SUSE Linux Enterprise Server for SAP Applications

SUSE Linux Enterprise Server is a secure and reliable open-source operating system proven to reduce costs, increase availability, and improve system performance. The operating system is optimized for all mission-critical SAP software solutions and appliances.

SAP relies on the widely-used Linux platform to optimize its in-memory technology, and engaged SUSE as a development and innovation partner to collaborate in the creation of SUSE Linux Enterprise Server for SAP Applications.



This diagram shows the how much additional functionality and value is provided specifically for SAP environments by SUSE Linux Enterprise Server for SAP Applications over the base OS.

Each row is a category of products and features that are included with SUSE Linux Enterprise Server for SAP Applications. In each row, the green hexagons represent features that are either SUSE products, or features of a SUSE product that are included in SUSE Linux Enterprise Server for SAP Applications but are also available separately. The blue hexagons represent features that included specifically for SAP environments and are only available in SUSE Linux Enterprise Server for SAP Applications.

For a brief description of each feature, let's start with the bottom row which is the foundation for the SUSE Linux Enterprise Server for SAP Applications offering.

Base OS and Support

- **SUSE Linux Enterprise Server:** This is the same kernel and operating system available separately for general purpose workloads for the same release and service pack. That is SUSE Linux Enterprise Server for SAP Applications 12 SP2 has a base OS of SUSE Linux Enterprise Server 12 SP2. This is what SAP validates for SAP applications and SAP HANA, and SUSE Linux Enterprise Server for SAP Applications inherits that validation.
- **24 x 7 Priority Support:** This level of support is required by SAP for its Partners, like SUSE. There is no option for Standard Support. A key differentiator is that SUSE provides direct access to SUSE Level 3 support for OS-specific problems or questions.
- **Extended Service Pack Overlap Support:** This provides an additional 18-months of standard support for each Service Pack above the 12 months of support. This is ideal for customers who want to align OS updates with SAP application updates, or otherwise maintain stability of the SAP environment. Although this feature is specific to SUSE Linux Enterprise Server for SAP Applications, a customer could effectively do the same with a Long Term Service Pack Support (LTSS) subscription.
- **SAP-specific Update Channel:** As SAP updates its products, SUSE also updates and optimizes features for SAP environments. A dedicated update channel gives customers the ability to get these updates when it is convenient without updating the base OS.

Ease of use and deployment

- **Installation Wizard:** This feature automatically configures, tunes and installs the entire SAP solution stack including the Linux OS, SAP applications, SAP HANA and the high availability stack. This includes support for SAP HANA Tailored Datacenter Integration configurations.
- **Public Cloud Platform Images:** SAP and SUSE have created templates that make configuration set up faster and easier for SAP applications and SAP HANA implementations with major public cloud providers including Amazon Web Services, Google Cloud, IBM Cloud and Microsoft Azure. Note that SUSE Linux Enterprise Server is enabled for Amazon Web Services, and SUSE Linux Enterprise Server for SAP Applications are enabled for the others.
- **S/4HANA Transition to Linux Support:** S/4HANA only runs on Linux and by 2025 all support SAP applications will be based on S/4HANA. SUSE Linux Enterprise Server for SAP Applications includes features that make it easier for Microsoft Windows Server system administrators of SAP systems to become comfortable and productive working in a Linux environment.
- **SUSE Connect:** The SAP infrastructure is more than just the OS and applications. SUSE Connect provides access to selected SUSE partner products and services that complement SAP applications, with trial versions that can be installed using the SUSE Linux Enterprise Server for SAP Applications Installation Wizard.
- **SUSE Package Hub:** This feature is part of the base SUSE Linux Enterprise Server offering, and provides a way for users to access and upload packages for SUSE Linux Enterprise Server for SAP Applications. These packages are built and maintained by the community, but approved and supported by SUSE to ensure that they are of high-quality and up to date.

Performance

- **Page Cache Management:** This feature gives administrators control over Linux kernel caching to prioritize SAP application performance over that of the Linux file system. Note that this feature applies to SAP applications, but not SAP HANA.
- **Performance Configuration and Tuning:** SUSE works closely with SAP to optimize performance of the solution stack. Tuning parameters are included with SUSE Linux Enterprise Server for SAP Applications and used in a special package for the Installation Wizard, saving time and effort reading SAP set-up manuals.

Reliability and Resilience

- **SUSE Linux Enterprise High Availability Extension:** Since SAP applications are mission-critical, SUSE includes the full-function SUSE Linux Enterprise High Availability Extension with SUSE Linux Enterprise Server for SAP Applications. A graphical user interface reduces the time and effort to set up and manage any combination of clustered physical and virtual systems.
- **SAP HANA HA Resource Agents:** SAP HANA has the capability to replicate in-memory data to a back-up system, but the failover and recovery is a manual process. SUSE Linux Enterprise Server for SAP Applications includes resource agents that automate the process of switching the console to the new system and ensuring that the failing system does not try to become operational again. SUSE has six (6) best practices scenarios (5 on-premise and 1 cloud) defined for SAP HANA high availability.
- **SAP HANA Firewall:** The SAP HANA Firewall includes features that automate the process of installing and configuring the additional network zones required to create a secure SAP HANA system.
- **Remote Storage Encryption Management:** A built-in remote key server stores encryption keys of the SAP filesystem or HANA data volumes on a landscape of hundreds or thousands of servers, and each one can communicate with the key server we provide to fetch a key or certificate to unlock the volumes automatically.

2.3. SEP sesam Backup and Bare Metal Recovery on IBM platforms

SEP's flagship product, SEP sesam, is a comprehensive SAP and SUSE Linux Enterprise Server certified backup solution that integrates seamlessly into any IT-environment. SEP offers cost effective, scalable and reliable backup and restore solutions for SAP HANA.



When running Linux on IBM architectures, SEP not only provides a simple SEP sesam client for file backup but also provides its online agents for databases and applications (e.g. Oracle, DB2, PostgreSQL, MySQL, MariaDB), SEP's SAP certification for SAP HANA on Power SEP makes SEP a powerful solution. SEP also provides packages to use these powerful machines as the Backup Server or RDS which enables users to take advantage of this unlimited power by writing a large number of parallel backup streams directly to an attached SUSE Enterprise Storage. This combines the power of the server with the scalability of the SES system

3. SAP HANA: Data Protection

SAP HANA is an in-memory database, i.e., all data processing is done within the main memory. To help prevent data loss, SAP HANA writes regular save points using persistent storage volumes for log information and data.

With save points and log writing, SAP HANA can fully recover systems from power failures, but it cannot prevent data corruption through damage to storage media or logical error.

SEP provides comprehensive data protection of SAP HANA environments with its backup product, SEP sesam. This includes backups to protect the database against data corruption or data deletion and replication for disaster recovery purposes.

SEP sesam backups are necessary to:

- Insure against disk or other media failure
- Recover the database to an earlier point in time
- Prevent data loss from logical errors
- Provide protection beyond replication

Backups are also extremely useful in scenarios when copying a database or securing a fallback after a failed installation of updates. These backups can also be performed while the database is online. SAP HANA controls the backup with the help of SAP HANA Studio, where two destination options are available:

- File: backs up the database to files in the file system
- BACKINT: backs up the database using SEP sesam

The SAP BACKINT interface makes certain that all activities are defined and managed.

SEP sesam for SAP HANA on IBM POWER

In an intensive cooperation with IBM, SEP sesam has been compiled and tested on IBM's high-performance platform POWER. Due to the short geographical distance between SEP and IBM, the integration is always kept up-to-date with the latest POWER system generations. The SEP sesam for SAP HANA on IBM POWER module is available and supported on SUSE Linux Enterprise Server (SLES) and other operating systems.

4. SEP sesam Backup and Bare Metal Recovery

SEP sesam is a robust, easy-to-manage, and secure backup solution for businesses of any size. Backups, restores, and bare metal recovery are extremely fast and easy to implement and execute for SAP HANA on IBM Power and Intel platforms. SEP sesam is certified for SUSE Linux Enterprise Server, SAP HANA for IBM Power, traditional SAP installations using Oracle or MaxDB, as well as other popular databases that run on Linux or Windows.

The solution supports all common operating systems, virtualization platforms, applications, databases, storage technologies (NAS, SAN, tape libraries, etc.) and network protocols (NDMP). The SEP sesam Hybrid Backup solution eliminates the need for multiple backup products within company infrastructures.

SEP's patented Multi-Streaming Technology allows multiple streams to be backed up simultaneously and entire company infrastructures easily managed by a single interface. This enterprise-wide solution is designed to simplify and automate backups in any environment.

SEP sesam for SAP HANA - Backup and Recovery

Backups can be initiated using SAP HANA Studio, the DBA Cockpit in BW, SQL script commands, or third party tools, which are not automatically run by the SAP HANA system. The most efficient way to schedule backups is to use the SEP sesam scheduler or the SAP HANA administration tool within SAP HANA Studio.

SEP sesam backs up SAP HANA utilizing the SAP BACKINT API and no additional software agents are needed.

SEP sesam, communicating with the SAP HANA database through the SAP BACKINT API, backs up the database and writes the backup data to external storage.

5. Features and Functionality

Functionality	SAP HANA (Backint)	Compatible with SEP sesam
Data and Log Backup	Yes	Yes
Backup Scheduling	Not available in SAP HANA Studio. External schedulers can be used in conjunction with scripts (SQL interface)	Yes, SEP sesam polices can be configured to initiate SAP HANA backups
Manual Backups	YES. SAP HANA Studio, SQL commands (hbdsq), external scheduler triggering	Yes, SAP HANA Studio, SQL commands (hbdsq), SEP sesam Command Events
Backup of Configuration Files	No	Yes
Point-in-Time Recovery	Yes	Yes
Recovery to a Specified Location	Yes	Yes
Backup Media and Capacity Management	No	Yes
Data Encryption	No	Yes
Multi-Copy and Retention Management	No	Yes

6. SAP HANA on IBM Power - Backing Up To Disk

When implementing new IT-technologies, it is important to consider the entire data storage and recovery process.

SAP HANA administrators must manage all aspects of the data backup and bare metal recovery. These tasks include ensuring the availability of the backup storage, proper storage management, allocating enough backup space, cleaning out old backups, optimizing performance, maintaining firewall settings, and keeping track of retention times and data migration.

Backup and recovery is a multi-level process, requiring sufficient planning and design to ensure recovery time objectives (RTOs) and recovery point objectives (RPOs) are fulfilled.

7. Backing Up Using BACKINT with SEP sesam

Once SEP sesam has been configured for the SAP HANA environment, backups can be initiated from either the SAP HANA Studio console or the SEP sesam backup server. SAP HANA Studio monitors the details of the individual backup jobs in real-time while SEP sesam processes the SAP BRTOOLS requests which are transferred via the BACKINT API.

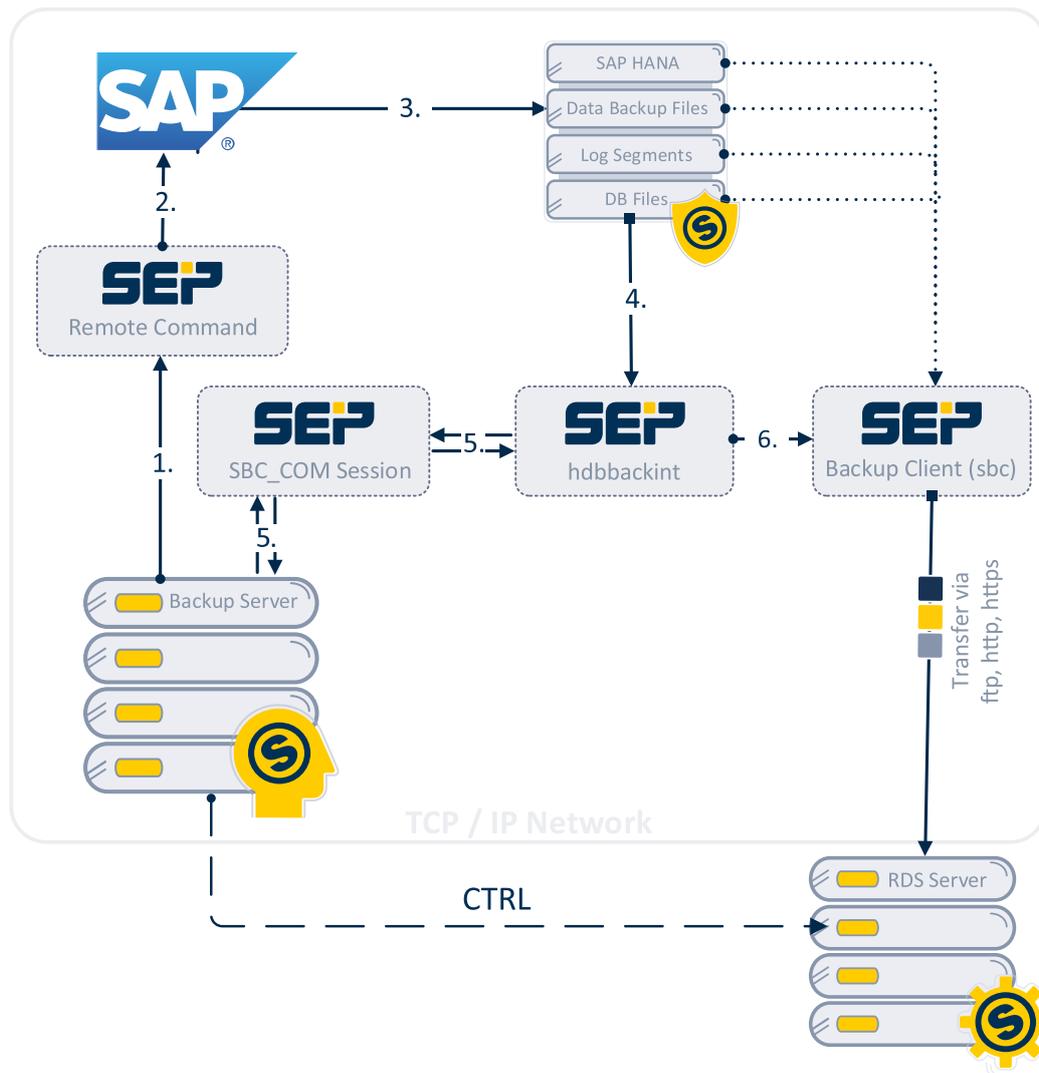
SEP sesam BACKINT support provides an easy method to manage and protect SAP data. SEP sesam defines the parameters for the backup jobs and how they will be executed - including all details regarding the backup clients, backup media information, and the backup schedule.

Using SEP sesam's patented Multi-Streaming Technology, backup tasks can be run simultaneously, thus significantly decreasing backup windows. SEP sesam's advanced data store technology allows the use of any available backup media to ensure that all backup jobs will be performed. The powerful SEP sesam restore wizard can be set up to automatically recover data as needed.

The data is directly transferred to and from the SEP sesam backup media, removing the intermediate step of restoring data to an additional backup medium. Backup results are stored in the SEP media catalog to allow an efficient inquiry of existing save-sets and a high-performance recovery.

The status of the SAP HANA backup and recovery tasks are monitored by SEP sesam. Almost all backup and recovery issues can be monitored and controlled by the SEP sesam management interface. In addition, SEP sesam offers an extensive list of commands to implement the most complete and user modifiable backup topology possible.

SAP HANA Backup Implementation



The SEP sesam SAP HANA implementation works like this:

1. / 2. SEP sesam Backup Server starts a remote command on the database server.
3. SAP HANA hdbsql is executed to run the backup query of the SAP HANA database.
4. / 5. The SAP HANA database prepares the backup savepoint and sends the metadata to the SEP sesam Backup Server
6. The SEP sesam Backup Client (SBC) process started to transfer the backup data to the SEP sesam Backup Server or Remote Device Server (RDS)

8. Restore Using SAP HANA Studio

There are three ways to restore backup data using SAP HANA Studio:

1. Restore the database to the latest version. This option restores the last successful backup of the database and applies all available logs.
2. Restore the database to a specific Point-In-Time. This option restores the last successful backup of the database and all logs until the specified Point-In-Time. This option is extremely valuable when a database has been corrupted or portions deleted by user error.
3. Restore the database to a specific data backup. This option provides the user a list of available database backups. The user or system administrator may restore any of the available backups.

In a recovery, SAP HANA shuts down the database and recovers the data and log files in one recovery operation. SAP HANA Studio offers various options to explore specific backup details, such as statistics, files sizes, and data throughput during backup tasks. The backup history can be retrieved from either the local SAP HANA backup catalog or from the SEP sesam backup server, e.g. in case of a lost SAP HANA backup catalog. The inquiry is done via the BACKINT API.

9. SEP sesam Si3 Deduplication & Replication

9.1. SEP sesam Si3 Deduplication

SEP's Si3 Inline Deduplication Technology organizes the incoming data into fragments or blocks for analysis. An algorithm generates hash values that clearly identify the values in the deduplication store, which are then stored in an index. As subsequent backups are completed, new values are saved. When the data has a hash value that is already indexed, the data will not be stored a second time and the hash count will increase with each backup. Unique data always generates a new hash code. The advantage of SEP's Si3 Inline Deduplication for SAP HANA is the ability to optimize storage consumption. Deduplication must always take place before compression and encryption.

9.2. SEP sesam Si3 Source-side Deduplication

SEP sesam applies deduplication technique at block level, and offers a hybrid of both, target-based (Si3T) and source-based deduplication. Source-side deduplication means that during backup only changed blocks are transferred from the SEP sesam Backup Client to the Deduplication Store connected to the SEP sesam Backup Server/Remote Device Server (RDS). On the client itself the backup process calculates hashes of data to be backed up and only changed or unknown blocks of the target Si3 deduplication store are sent to the backup server. It can be used to minimize the data transferred during backup in situations where bandwidth is a problem and SEP sesam RDS cannot be used.

9.3. SEP sesam Si3 Replication

SEP Si3 Replication is an easy and secure way to consistently replicate data between a main data center, a Bare Metal Recovery site, remote locations, or to the cloud, providing redundancy for disaster recovery as well as reducing overall disk and tape storage requirements. Users can maximize their existing infrastructure by creating off-site warm standbys and/or replicating data from any node to any other node. Since SEP is completely hardware agnostic, users can replicate to dissimilar hardware among as many nodes as desired. Used in conjunction with SEP Si3 Deduplication, a global, inline, block-level data deduplication solution, this feature will ensure faster backup windows, improved performance and additional data security.

10. Conclusion

SEP sesam provides a SAP-certified backup solution for mission-critical SAP HANA enterprise applications running on SUSE Linux Enterprise Server. SEP delivers a solution that excels in reliability and performance while minimizing costs which makes SEP sesam one of the most recommended backup and disaster recovery solutions on the market today. With SEP sesam for SUSE Linux Enterprise Server and SAP Applications, customers get the best backup solution for their mission-critical environments.

Want a personalized demonstration? SEP engineers can help users develop a world-class backup strategy by creating a test environment scaled to match the intended real-world application of the solution. To request proof of concept assistance, visit www.sepssoftware.com or email us at info@sepssoftware.com.

11. Link Collection

For more technical information on the SEP sesam Backup und Bare Metal Recovery, go to:

<http://wiki.sepssoftware.com/wiki>

For more information on the SEP sesam SAP HANA Backup und Bare Metal Recovery visit:

<http://wiki.sepssoftware.com/SAP>

Install the full version of SEP sesam today for a 30 day trial, which includes full support.

<https://www.sepssoftware.com/download>

SEP's support matrix lists a market leading variety of virtualization platforms, operating systems, databases and applications that can be successfully backed up and restored.

<https://www.sepssoftware.com/supportmatrix>

SEP sesam technical Wiki | SAP Hana Backup

http://wiki.sepssoftware.com/wiki/index.php/SAP_Hana_Backup

Video Tutorial | Step-by-step Tutorial for SAP Hana databases backups

https://www.youtube.com/watch?v=sQ_iA2Egocg

Video Tutorial | SAP Hana Backup and Bare Metal Introduction

https://www.youtube.com/watch?v=Gb1oF_XlNhM

On Demand Webinar | SEP sesam Hybrid Backup Introduction & Live Demo

<https://www.youtube.com/watch?v=P4cFUDf7wUA>

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