



# SANsymphony

## Software-Defined Storage

### Function and Feature

Version 1.2.1  
Referenced Product DX8200D SANsymphony V10.0 PSP12

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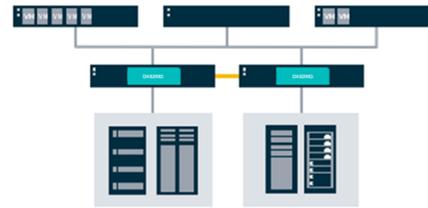
## Supported Deployment Models:



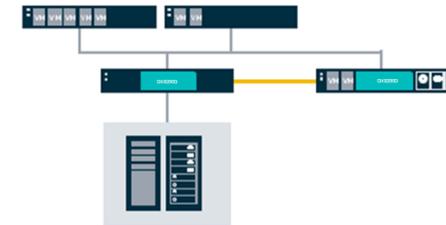
**Hyperconverged**



**Converged: 'Server SAN'**



**Storage-Virtualization**



**Hybrid: mixed Concept**

A non-disruptive transition or migration between the different deployment models while retaining existing licences can take place during normal operation. A unique selling point for DX8200D SANsymphony. Other unique selling points are referred to in the following as 'USP'.

SANsymphony is available in 3 editions, with different scopes and expansion options:

- Enterprise (EN)
- Standard (ST)
- Business (BZ)

All 3 are licensed in TBs only, based on the managed storage capacity. The number of instances, installations or users is not relevant for licensing. The same applies for the server/storage hardware used. All editions are optionally available as term licences (with a time limit, including 24x7 support, free software updates and DX8200D Insight Services) or perpetual licences (no time limit) plus support (24x7 and free software updates) with the exception of BZ, which is not available as a perpetual license.

'Lifetime' volume discounts apply per customer per edition and licence type.

## Overview

### Software Architecture – General

Feature / Description	USP	Enterprise	Standard	Business
The product is offered as pure software. No bundle with hardware mandated.		✓	✓	✓
The product works in-band as a layer between the application and the physical storage.		✓	✓	✓
The product uses x86-64bit industry standard servers or virtual machines as a foundation. <ul style="list-style-type: none"> <li>- The hardware manufacturer or hypervisor used as a basis is freely selectable. For example, Hyper-V, VMware ESXi, XenServer, etc.</li> <li>- This also includes IaaS-based machines from Cloud service providers.</li> </ul>		✓	✓	✓
The product can be deployed as storage virtualisation, converged 'Server SAN', hyperconverged (HCI), a mix of these on-premises or in the Cloud.	✓	✓	✓	✓
It is possible to migrate between the deployment models using redundancies without downtime. Existing licences can continue to be used without problems.	✓	✓	✓	✓
The product enables the architectures to be mixed (e.g., storage virtualisation, hyperconverged) in a management group.	✓	✓	✓	✓
A management group includes up to 64 instances (nodes). No minimum number of instances is specified.		✓	✓	
The product enables the setup of a storage grid based on any choice of internal storage components and/or external storage subsystems in the back end of the product (connected via iSCSI, SAS or FC).		✓	✓	✓
The product uses Windows server 2012R2, 2016 or 2019 as a runtime environment <ul style="list-style-type: none"> <li>- Standard or DataCenter edition is supported.</li> <li>- DataCenter edition is not an essential requirement (can be dependent on the hardware used).</li> <li>- The installation takes place optionally with a GUI or as a core installation.</li> </ul>		✓	✓	✓
The product supports an independent management GUI / management instance.		✓	✓	✓
The product offers the option of being managed via an HTML5 console.		✓	✓	✓
The product stores data as block and does not rely on a file system		✓	✓	✓
The product can be deployed as a grid (no witness required) or as a system with cluster-like behaviour (use of a witness).	✓	✓	✓	✓

Feature / Description	USP	Enterprise	Standard	Business
The solution can be configured as unified storage for simultaneous provisioning of block and file storage to applications.		✓	✓	✓
The file services in this solution can be designed with high availability and offer support for the following protocols. <ul style="list-style-type: none"> <li>- NFS 4.1</li> <li>- SMB 3.x</li> <li>- SMB 2</li> </ul>		✓	✓	✓
The product enables software updates / upgrades independent from hardware upgrade cycles.		✓	✓	✓
The product offers free minor and major releases during an active maintenance contract.		✓	✓	✓
The product is based on an interrupt-free software architecture.	✓	✓	✓	✓
The product is based on a software architecture that was designed for the parallelisation of data access	✓	✓	✓	✓
The product takes advantage of existing storage systems and thus provides investment protection.	✓	✓	✓	✓

## Main-Memory (DRAM) as Cache

Feature / Description	USP	Enterprise	Standard	Business
The product supports a memory expansion of up to 8 TB per instance.	✓	✓	✓	✓
The cache can be freely configured in a range from 128 MB up to 85% of the available memory.	✓	✓	✓	✓
The product has intelligent write cache management to ensure that the cache is emptied quickly in the event of an emergency to prevent possible data loss.		✓	✓	✓
The product dynamically caches reads for all LUNs based on the requirements of the workload.		✓	✓	✓
The cache offers a read-ahead function with detection of up to 4 parallel streams per LUN.	✓	✓	✓	✓
The cache offers write coalescing to relieve strain from the storage backend.		✓	✓	✓
The cache enables read and write caching even with synchronously mirrored environments.		✓	✓	✓
The write cache can be optionally switched off and on per LUN or instance during operation.		✓	✓	✓
The write cache is deactivated automatically if a synchronously mirrored LUN loses redundancy.		✓	✓	✓
The cache (both read and write) is only held in the RAM of the instance and not on flash.		✓	✓	✓

## Application-Server Connection

Feature / Description	USP	Enterprise	Standard	Business
The product enables connection of an application server via iSCSI using: <ul style="list-style-type: none"> <li>- 1 Gbit Ethernet</li> <li>- 10 Gbit Ethernet</li> <li>- 25 Gbit Ethernet</li> <li>- 40 Gbit Ethernet</li> <li>- 50 Gbit Ethernet</li> <li>- 100 Gbit Ethernet</li> </ul>		✓	✓	✓
The product enables connection of an application server via Fibre Channel (FC). <ul style="list-style-type: none"> <li>- 8 Gbit FC</li> <li>- 16 Gbit FC</li> <li>- 32 Gbit FC</li> <li>- 64 Gbit FC</li> </ul>		✓		✓
The product can simultaneously serves LUNs via FC and iSCSI.		✓		✓
The product supports direct connection of application servers without a switch.		✓	✓	✓
The product enables connection of application servers in 'Read-Write' and 'Read-Only' modes.		✓	✓	✓
The product enables up to 125 initiators per iSCSI target port.		✓	✓	✓
The product enables up to 896 initiators per 16/32/64 Gbit FC target port.		✓		✓
The product supports SCSI 2 Reserve/Release*. (*required feature for various cluster solutions)		✓	✓	✓
The product supports SCSI 3 Persistent Reservations*. (*required feature for Oracle RAC on OCFS, Microsoft Cluster, and other clusters)		✓	✓	✓
The product requires no installation of additional drivers on the application servers.		✓	✓	✓
The product offers a hardware VSS provider for integration with application servers running Windows operating systems. The function is installed as a software component on the application server.		✓	✓	✓

Feature / Description	USP	Enterprise	Standard	Business
The product is qualified for ALUA operation with at least the following operating systems: <ul style="list-style-type: none"> <li>- Microsoft Windows Server 2008R2/2012/2012R2/2016/2019</li> <li>- VMware ESXi 5.5/6.0/6.5/7.0</li> <li>- RedHat Enterprise Linux 6.5, 6.6, 7.0, 7.2, 7.3 and 7.4</li> <li>- SUSE Linux Enterprise Server 11.0 SP3, 11.0 SP4, 12.0 SP1, 12.0 SP3 and 15.0</li> <li>- Ubuntu 18.04</li> </ul>		✓	✓	✓
The product supports the following application server types: <ul style="list-style-type: none"> <li>- Microsoft Windows Server</li> <li>- VMware ESXi</li> <li>- IBM AIX (System P)</li> <li>- IBM AS400 (virtualised on System P)</li> <li>- Citrix XenServer</li> <li>- HP UX</li> <li>- Linux <ul style="list-style-type: none"> <li>o Oracle VM</li> <li>o Redhat Enterprise Linux</li> <li>o SUSE Linux Enterprise Server</li> <li>o Ubuntu</li> </ul> </li> </ul>		✓	✓	✓
The manufacturer offers the option to 'self-qualify' application server operating systems, and offers support based on this qualification (e.g. Debian, Rocky-Linux, Alma-Linux, etc.).		✓	✓	✓
The product is on the VMware HCL <a href="https://www.vmware.com/resources/compatibility/search.php">https://www.vmware.com/resources/compatibility/search.php</a>		✓	✓	✓
The product supports VMware Metro Stretched Clusters (PSVP) <a href="https://www.vmware.com/resources/compatibility/vcl/partnersupport.php">https://www.vmware.com/resources/compatibility/vcl/partnersupport.php</a>		✓	✓	✓
The product supports storage offloading via Microsoft ODX (Windows Server 2012 or newer).		✓	✓	✓
The product supports storage offloading via VMware VAAI.		✓	✓	✓
The product supports automatic reclaiming of freed-up storage space via SCSI Unmap Commands (e.g. for Microsoft Windows Server 2012 and newer).		✓	✓	✓
The product supports manual storage reclamation of freed-up space by writing zeroes in the pool (independently from the application server OS).		✓	✓	✓
The product offers VMware vVOL support.		✓	✓	✓

Feature / Description	USP	Enterprise	Standard	Business
The software product is certified for SAP HANA*. <a href="https://www.sap.com/dmc/exp/2014-09-02-hana-hardware/enEN/enterprise-storage.html">https://www.sap.com/dmc/exp/2014-09-02-hana-hardware/enEN/enterprise-storage.html</a> (*In conjunction with the use of SAP HANA certified backend storage)	✓	✓		
The product offers thin-provisioned LUNs, where the storage can be reserved either completely or in part as required.		✓	✓	✓
The product offers a LUN size of up to 1 Petabyte.		✓	✓	✓
The product enables up to 64 iSCSI target ports per instance.		✓	✓	✓
The product enables multiple iSCSI target ports per network card (physical and virtual).		✓	✓	✓
The product enables the configuration of up to 8192 outstanding commands on an iSCSI target port.	✓	✓	✓	✓
The product has no limit in the number of Fibre Channel ports that can be used*. (*Limits typically come from the hardware platform used)		✓		✓

## Data Exchange between Instances

Feature / Description	USP	Enterprise	Standard	Business
For data transfers between instances (nodes), the product supports iSCSI connections Possible connection speeds are: <ul style="list-style-type: none"> <li>- 1 Gbit Ethernet</li> <li>- 10 Gbit Ethernet</li> <li>- 25 Gbit Ethernet</li> <li>- 40 Gbit Ethernet</li> <li>- 50 Gbit Ethernet</li> <li>- 100 Gbit Ethernet</li> </ul>		✓	✓	✓
For data transfers between instances (nodes), the product supports FC connections. Possible connection speeds are: <ul style="list-style-type: none"> <li>- 8 Gbit FC</li> <li>- 16 Gbit FC</li> <li>- 32 Gbit FC</li> <li>- 64 Gbit FC</li> </ul>		✓		✓
The product supports direct connections between its instances without a switch.		✓	✓	✓
Besides 'in-band' communication, the product has an additional 'out-of-band' communication path for management, which can be configured for redundancy and uses standard TCP connections.		✓	✓	✓
The product allows more than 255 LUNs per synchronous mirror connection (a point-to-point connection).	✓	✓	✓	✓
The product offers dynamic management of the synchronous mirror relationships between the instances (nodes).	✓	✓	✓	✓
Dynamic management enables the use of FC and iSCSI connections.	✓	✓		✓

## Storage Connection

Feature / Description	USP	Enterprise	Standard	Business
<p>The product supports the following protocols for the backend storage for maximum flexibility and choice:</p> <ul style="list-style-type: none"> <li>- SCSI / SAS</li> <li>- SATA</li> <li>- FC (up to 64 Gbit/s)</li> <li>- iSCSI (up to 200 Gbit/s Ethernet)</li> <li>- FCoE</li> <li>- NVMe / PCIe attached</li> <li>- FCoE</li> </ul>	✓	✓	✓	✓

## Availability

Feature / Description	USP	Enterprise	Standard	Business
The product provides transparent failover between instances (nodes) that can be geographically separated up to 100km.		✓	✓	✓
The product makes no specifications regarding the line quality between sites. This is primarily determined by the requirements of the application.	✓	✓	✓	✓
The product offers a transparent failback on a preferred instance (node) as soon as the redundancy is restored.		✓	✓	✓
The product does not require a third site to ensure a transparent failover.		✓	✓	✓
The product does not require a witness instance to ensure a transparent failover. This means that only 2 instances are required for transparent failover.		✓	✓	✓
The product optionally enables one or multiple witness (Tie-Breaker, Failover Manager, etc.) instances to cover extended failure scenarios.	✓	✓	✓	✓
The product offers the option of prioritising the order in which synchronously mirrored LUNs are restored.		✓	✓	✓
The product offers the option of creating an additional third synchronous copy on a separate instance(node) for synchronously mirrored virtual disks (2 data sets).		✓	✓	✓
The product enables synchronous mirroring between instances (nodes) composed of <ul style="list-style-type: none"> <li>- different hardware manufacturers and devices</li> <li>- different backend devices (e.g. from FC storage to Direct Attached Storage, from iSCSI to FC, etc.).</li> </ul>		✓	✓	✓

Feature / Description	USP	Enterprise	Standard	Business
<p>The product offers the option of creating an additional asynchronous copy (replica) on a separate instance (node) for synchronously mirrored volumes (1 volume with 2 or 3 data copies). Regarding multiple disks</p> <ul style="list-style-type: none"> <li>- an instance (node) can be both the source and the destination for asynchronous replication. This enables configurations in the form: <ul style="list-style-type: none"> <li>o One instance replicating to multiple remote instances (one to many)</li> <li>o Multiple remote instances replicating to one instance (many to one)</li> <li>o Multiple instances replicating to multiple instances (many to many)</li> </ul> </li> <li>- <b>*Note: Each volume may have one asynchronous replica</b></li> </ul>		✓	✓	
<b>The product</b> supports replication between instances configured on different types of servers and using different types of backend storage devices.		✓	✓	
The data transfers for the asynchronous copy takes place via standard TCP connections and is fully compatible with standard network routing. The data packets are compressed by default.		✓	✓	
When resuming a replication, the product supports a process where only the changed blocks (delta) are transmitted.		✓	✓	
The product offers the option of checking the replicated data on the destination side (e.g., for disaster recovery/audit test purposes), without having to interrupt the replication process.		✓	✓	
The product uses a replication buffer to enable any line failures to be compensated for.		✓	✓	
The product offers an offline option for large scale initialisation scale of remote sites.		✓	✓	
The replication direction can be reversed if necessary (source becomes the destination, destination becomes the source) to restore a primary site from the disaster recovery site		✓	✓	

## Pooling

Feature / Description	USP	Enterprise	Standard	Business
The product supports multiple storage pools per instance.		✓	✓	✓
The product enables a maximum pool size of 8 Petabytes .		✓	✓	✓
The product offers native RAID services within the pool and thus enables the use of controllers without their own RAID logic (e.g. SATA and SAS-HBAs in conjunction with JBODs, NVMe PCIe Disks, etc.): <ul style="list-style-type: none"> <li>- Striping*            (*If automated tiering across different classes of storage is used, striping takes place within the tier)</li> <li>- Mirroring</li> </ul>		✓	✓	✓
The product enables the use of shared storage pools (external storage units) in the backend (active-passive operation) with a connection via iSCSI, SAS or FC.		✓	✓	
The product supports the competing access of up to 64 instances on a storage backend device that supports the SCSI commands required (including Persistent Reserve IN, Persistent Reserve OUT, Exclusive Access (type 3h), Exclusive Access Registrants Only (type 6h), etc.) and is connected via iSCSI or FC.	✓	✓		
The product enables the classification of different storage classes (tiers) within a pool.		✓	✓	✓
The storage class concept within a pool enables up to 15 storage classes (tiers).		✓	✓	✓
The storage class concept can be changed during operation without dissolving the pool, influencing replication or interrupting the application server I/O. Changes include: <ul style="list-style-type: none"> <li>- Number of tiers in the pool</li> <li>- Re-assignment of tier classes in the case of existing tiers</li> <li>- Making the pools larger (adding storage)</li> <li>- Making pools smaller (removing storage, requires sufficient remaining free space in the pool)</li> </ul>		✓	✓	✓
The storage class concept within a pool can include a Cloud storage tier.		✓	✓	✓
The tiering takes place in real time – no manual intervention required.		✓	✓	✓
Automatic tiering can be overridden manually (on-demand or scheduled).		✓	✓	✓

Feature / Description	USP	Enterprise	Standard	Business
A portion of space in each tier may be reserved for new data allocations can be defined for all except the lowest class tier.		✓	✓	✓
The dynamic migration of blocks by the automated storage tiering is determined based on frequency of access. Both read-only accesses and read-write accesses can be configured as an indicator of frequency.		✓	✓	✓
Data affinities can be defined for the tiering model via storage profiles.		✓	✓	✓
The product enables the use of 512b, 512e and 4k disks in the backend.		✓	✓	✓
The product enables the provisioning of 4k LUNs to an application server from a 512b or 512e based storage pool.		✓	✓	✓
The product enables dedicated pools, which store the data deduplicated and compressed. The deduplication takes place via post-processing.		✓	✓	
The product enables instance-wide deduplication and compression as an inline process.		✓		
Inline deduplication and compression can be configured per LUN individually at runtime.		✓		
The product does not require the use of flash memory and supports multiple types of SSDs (Flash and Optane) in a storage pool / instance.		✓	✓	✓
The product enables the connection of Cloud storage (via a gateway).		✓	✓	✓
The product enables 256-bit AES encryption (Data-at-Rest) on a LUN level.		✓		
Encryption of the LUNs can be switched on and off during operation.		✓		
The product supports Key Management Servers (KMS) for central key management according to the KMIP protocol.		✓		

## Additional Functions

Feature / Description	USP	Enterprise	Standard	Business
The product offers a function to accelerate random write processes. Optimisation can be switched on and off at runtime on specific volumes.		✓	✓	
The product offers a Continuous Data Protection (CDP) function for restoring data down to the exact second of monitored LUNs. The technology can be switched on and off per LUN during operation and monitors a period of up to 14 days.		✓	✓	
CDP restore points are additional writable/readable copies of the original data volume in the monitored LUNs.		✓	✓	
The product offers a snapshot function that supports the following options: <ul style="list-style-type: none"> <li>- Full</li> <li>- Differential</li> </ul> The snapshots are additional writable/readable copies of the original data volume.		✓	✓	✓
Up to 1024 snapshots can be managed per instance.		✓	✓	✓
The product supports the use or adoption of existing pre-formatted LUNs, including their original data (passthrough).		✓	✓	✓
The product offers extensive options for performance monitoring.		✓	✓	✓
The product offers configurable thresholds including alarms for <ul style="list-style-type: none"> <li>- capacity utilisation</li> <li>- latencies on different levels</li> <li>- error counters for Fibre Channel ports</li> </ul>		✓	✓	✓

<b>Feature / Description</b>	<b>USP</b>	<b>Enterprise</b>	<b>Standard</b>	<b>Business</b>
The product may be managed via PowerShell.		✓	✓	✓
The product may be managed via RESTful API.		✓	✓	✓
The product enables access to relevant performance data via WMI.		✓	✓	✓
The product enables sending of alarm messages via SNMP traps.		✓	✓	✓
The product enables sending of alarm messages via e-mail*. (*External e-mail gateway is required.)		✓	✓	✓
The product enables external sources (application servers, services, etc.) to write in its own event log / system.		✓	✓	✓
The product uses the logging system of the underlying operating system in addition to its own logging system.		✓	✓	✓
The product offers an integrated task scheduler, which enables triggers to be set for events, periods of time or manual execution of tasks.		✓	✓	✓
The product offers integration with VMware vSphere and the import of vCenter configuration information.		✓	✓	✓
The product offers Veeam Universal Storage API integration.		✓	✓	✓
The product is certified as Veeam Ready as backup storage.		✓	✓	✓
The product offers integration with Commvault Intellisnap.		✓	✓	✓

## Suggestions for Text Modules

The sequence is not a prioritisation.

### Hardware Independence / Investment Protection

The operation of the product should be possible on x86 industry standard servers of any make (key words: hardware independence and use of existing resources).

Installation of the product should be possible on both physical x86 industry standard servers and in virtual machines, regardless of the virtualisation platform (ESXi, Hyper-V, etc.).

The software-defined solution should be able to use both existing (key word: investment protection) and new (key word: provider independence) hardware storage capacity as resources. It must also be possible to use storage resources in parallel, provided via Fibre Channel, iSCSI, NVMe, SAS or SATA.

### Replication / Data Change Logging

The product must have the option of replicating data to far-away locations or in the Cloud. This replication must not require an identical (based on the setup) hardware configuration and must be possible via standard IP connections.

The software-defined solution must provide native internal (i.e. without additional HW/SW) logging of all data transfers in the storage and make it possible to return to any data status –for a period of at least one week. This must take place independently of the applications themselves (e. g. without the use of VSS) and without any impact on daily business.

### Application Server

The software-defined solution must be able to make its storage capacity available to a wide range of applications. The following operating systems or hypervisors must therefore be supported as a minimum: VMware vSphere, Microsoft Hyper-V, Linux KVM, Citrix XEN Server, Oracle VM Server, Microsoft Windows Server, Red Hat Enterprise Linux, SUSE Linux Enterprise, Ubuntu Linux, CentOS, Oracle Solaris, IBM AIX and HP-UX.

### Unified Storage – SAN/NAS System

The software-defined solution must be able to make its storage capacity available as both block storage and file services. Consequently, iSCSI (1/10/25/40/50/100 GbE), Fibre Channel (8/16/32/64 Gbps), SMB3 (incl. SMB Direct /SMB Multichannel) and NFS (NFS 3 and 4.1) storage capacities must be presented to the applications in parallel.

The product must support distributed file systems. In addition to supporting NFS (3 and 4.1), Microsoft Distributed File System (DFS) and its replicated version (DFSR) must be supported.

### High Availability

The software-defined solution must natively offer high availability transparent to the applications, typically achieved via a synchronous mirror with corresponding fully automated failover mechanisms from the client (ALUA/MPIO). The necessary network connections for this should be able to use both the Fibre Channel and the IP network.

Support for a synchronous mirror at three locations – high availability retained even if a location fails completely.

High availability from just 2 instances. Witness/tie-breaker option with 2-way mirror possible but not a requirement for real HA operation.

#### Data Migrations

The migration of data within the solution takes place without impairing daily operation and enables non-disruptive integration of new storage capacity and storage technology as required, and the substitution of available storage resources in any form.

The solution can incorporate existing LUNs including their data and present these to applications. This pass-through capability does not involve a data migration, but just the re-assignment of the LUN (re-attaching it, so to speak) to the product.

#### Uniform Data Services / Management

All storage functions are made available via the product and apply equally for all managed storage resources regardless of the manufacturer or their own functions. For example, auto-tiering is possible across all storage resources.

All storage resources (from different manufacturers, performance classes and technologies) can be aggregated in a shared pool by the product. The total capacity is managed and presented together for optimal use of space.

Standardised management in the local data centre and remote installations with the option of transferring the data to the Cloud and getting the data back from the Cloud again easily.