

IBM Spectrum Protect™ Snapshot 8.1.9 for UNIX®

Objective of this document

This document provides comprehensive information about the environment required to support IBM Spectrum Protect™ Snapshot solutions, including:

- How to prepare for implementation: Complete this checklist before installing the software to avoid issues.
- Identify stakeholders required for successful implementation.
- Identify supported release levels of ancillary software.
- Get the most current tips and hints for installation.

Tip: Beginning with Version 4.1.3, IBM Tivoli Storage FlashCopy Manager is now IBM Spectrum Protect™ Snapshot. Some applications such as the software fulfillment systems and IBM License Metric Tool use the new product name. To learn more about the rebranding transition, see <http://www.ibm.com/support/docview.wss?uid=swg21963634>.

Note: This document refers to the following storage systems: IBM System Storage DS8000, IBM System Storage SAN Volume Controller (SVC), IBM Storwize V7000, IBM Flex System™ v7000, IBM FlashSystem™, IBM XIV® Storage System, IBM Spectrum Accelerate™, and also for filesystem snapshots with the IBM General Parallel File System™ (GPFS™) in the context of Custom Application environments.

Note: In AIX and Linux environments, some checks are covered by the IBM Spectrum Protect™ Snapshot Prerequisite Checker v8.1.9. For such checks, you find a grey check mark (✓) in the corresponding check column, and a reference to the corresponding property name as it appears in the output of the prerequisite checker is listed, denoted by a double arrow (⇒).

On AIX and Linux environments, all checks that are not marked with a grey check mark (✓) must be performed manually.

Run the IBM Spectrum Protect™ Snapshot Prerequisite Checker on AIX and Linux in order to perform checks automatically. If the result of the prerequisite checker is "pass" the checks with a grey check mark were performed automatically and successfully. Otherwise, they must be performed manually.

Pre-Installation Checklist

Table of Contents

IBM Spectrum Protect™ Snapshot 8.1.9 for UNIX®.....	1
1. Hardware Requirements.....	3
1.1 General Hardware Requirements.....	3
1.2 Hardware Requirements for DS8000.....	8
1.3 Hardware Requirements for SVC / Storwize.....	8
1.4 Hardware Requirements for XIV.....	10
2. Software Requirements.....	12
2.1 Software Requirements – Operating System.....	12
AIX.....	12
Linux.....	14
2.2 Other Software Requirements.....	16
3. Requirements for DB2.....	17
3.1 Software requirements.....	17
3.2 Environmental requirements.....	18
3.3 Volume group layout requirements.....	19
3.4 NFS File system layout requirements.....	21
4. Requirements for SAP on Oracle.....	23
4.1 Software requirements.....	23
4.2 Environmental requirements.....	24
4.3 Volume group layout requirements.....	25
4.4 NFS File system requirements.....	26
5. Requirements for Oracle (non-SAP).....	27
5.1 Software requirements.....	27
5.2 Environmental requirements.....	28
5.3 Volume group layout requirements.....	30
5.4 Disk Group layout requirements (Oracle ASM).....	31
5.5 NFS File system layout requirements.....	32
6. Requirements for Custom Applications.....	33
6.1 Software requirements.....	33
6.2 Environmental requirements.....	34
6.3 Volume group layout requirements.....	34
6.4 NFS File system layout requirements.....	34
6.5 IBM Spectrum Scale file system layout requirements.....	34
7. Requirements for Snapshot Cloning.....	36
7.1 Environmental requirements (DB2).....	36
7.2 Environmental requirements (Oracle SAP and non-SAP).....	37
7.3 Volume group layout requirements for DB2.....	38
7.4 Volume group layout requirements for SAP on Oracle.....	38
7.5 Volume group layout requirements for Oracle (non-SAP).....	38
7.6 Disk Group layout requirements for Oracle ASM.....	38
7.7 Pre- and Post-Processing Scripts Requirements.....	39
8. Environmental Requirements.....	40
8.1 AIX LVM Mirroring Requirements.....	40

1. Hardware Requirements

1.1 General Hardware Requirements

	Prerequisite	checked
1.1.1	<p>For the use of IBM Spectrum Protect™ Snapshot backup, offloaded tape backup and cloning operations, different sets of systems are required:</p> <p>For Snapshot disk-only backup / restore:</p> <ul style="list-style-type: none"> • one or more UNIX or Linux production system(s) (hereafter PS) • each PS must have a data path to the storage system (DS/SVC/XIV/IBM N series/NetApp) via FC or iSCSI for SAN or LAN for NAS type storage <p>For Snapshot backup / restore with offloading to tape (except custom application environments in IBM Spectrum Scale filesystems):</p> <ul style="list-style-type: none"> • one or more UNIX or Linux production systems (PS) • one or more UNIX or Linux auxiliary system(s) for forced mount and offload (hereafter BS) • the OS release level on PS and BS must be the same • all of these PS/BS must have a data path to the same storage system (via FC or iSCSI for SAN, or LAN for NAS type storage) <p>For Snapshot backup / restore with offloading to tape of custom application environments in IBM Spectrum Scale filesystems:</p> <ul style="list-style-type: none"> • an IBM Spectrum Scale cluster consisting of at least one node An auxiliary system is not required. <p>For Snapshot cloning:</p> <ul style="list-style-type: none"> • one or more production system(s) (PS) • one or more auxiliary system(s) for cloning (hereafter CS) • BS and CS can be running on a single machine or on separate, dedicated machines. • the OS release level on PS and CS must be the same • all of these PS/CS must have a data path to the same storage system (via FC or iSCSI for SAN, or LAN for NAS type storage) 	

Pre-Installation Checklist

	Prerequisite	checked
	<p style="text-align: center;"> - : For FlashCopy disk-only backup / restore - + - : For FlashCopy backup / restore with offloading to tape - + : For FlashCopy cloning </p>	
	<p>Note 1: Offloaded backup and cloning operations can run on the same auxiliary system or on separate, dedicated auxiliary systems.</p> <p>Note 2: In an HA environment that uses AIX PowerHA or HACMP, the IBM Spectrum Protect Snapshot auxiliary system cannot act as the standby/takeover server for the production server. For Linux HA cluster environments are not supported.</p>	
1.1.2	<p>For the following tasks, a LAN connection is required between PS and the storage management server (like IBM Spectrum Protect):</p> <ul style="list-style-type: none"> • tape restore operations • backups and restores of the log files <p>For tape backup operations on the BS/CS a LAN connection to the storage management server is required as well unless PS and BS/CS are installed on the same system.</p> <p>For Snapshot disk-only backup / restore:</p> <ul style="list-style-type: none"> • LAN connection between PS and the storage system <p>Note: Under some conditions an auxiliary system (BS) is mandatory even for disk-only backups. For more information, see the <i>Installation and User's Guide</i>. In chapter 2, the section "Preparing backup and cloning servers" provides details.</p> <p>If a BS is mandatory it requires:</p> <ul style="list-style-type: none"> ◦ LAN connection between PS and BS ◦ LAN connection between BS and the storage system *see Note 2 <p>For Snapshot backup / restore with offloading to tape:</p> <ul style="list-style-type: none"> • LAN connection between PS and the storage system • LAN connection between BS and the storage system *see Note 2 below 	

Pre-Installation Checklist

	Prerequisite	checked
	<ul style="list-style-type: none"> • LAN connection between PS and BS • LAN connection between the BS and the storage management server for offloaded (tape) backups <p>For Snapshot cloning:</p> <ul style="list-style-type: none"> • LAN connection between PS and the storage system • LAN connection between CS and the storage system *see Note 2 below • LAN connection between PS and CS <p>Note 1: The PS has a LAN connection to the CIM Agent for DS, SVC cluster, IBM Storwize V7000, XIV.</p> <p>Note 2: (XIV) The BS/CS also has a LAN connection to the XIV management port to allow IBM Spectrum Protect Snapshot to issue XCLI commands. (SVC or IBM Storwize V7000 with dynamic host assignment) The BS/CS also have a LAN connection to the SVC cluster or IBM Storwize V7000.</p> <p>Note 3: For simplified installation and configuration of IBM Spectrum Protect Snapshot a LAN connection between production and backup/cloning servers is recommended.</p>	
1.1.3	<p>LUNs of the production database must not be distributed over multiple disk storage subsystems / SVC storage clusters.</p> <p>In some environments multiple storage systems must be configured:</p> <ul style="list-style-type: none"> • AIX LVM mirroring environments: Each mirror set of the production database must be located completely on a single storage cluster of the storage system (DS / SVC / XIV) • Oracle ASM support: <ul style="list-style-type: none"> • All failure groups representing a consistent database image must be located on a single disk storage subsystem DS / SVC storage cluster / XIV • For DS just one LUN per disk storage subsystem is supported • (Linux) For DS only one target set is allowed to be used • (Linux) For SVC the setting <i>PREASSIGNED_VOLUMES</i> is not supported for the profile parameter <i>BACKUP_HOST_NAME</i> in the device class section of the profile <p>⇒ <i>fcm.same_storage_device, fcm.warn_same_storage</i></p>	✓
1.1.4	<p>The LUNs of the storage system for the production application must be attached/accessible to the PS and must be visible to IBM Spectrum Protect Snapshot. They are used as the source volumes for the FlashCopy / snapshot process.</p> <p>Note: For performance reasons, keep the number of LUNs allocated to one application low.</p>	

Pre-Installation Checklist

	Prerequisite	checked
1.1.5	<p>For performing IBM Spectrum Protect Snapshot operations, so called target volumes / target LUNs must be created / available. For the different scenarios, consider the following:</p> <p>For Snapshot disk-only backup / restore:</p> <ul style="list-style-type: none"> • The target volumes must exist but must not be mapped to any host on the storage system. <p>For Snapshot backup / restore with offloading to tape:</p> <ul style="list-style-type: none"> • The target volumes must be accessible to the BS. <p>For Snapshot cloning:</p> <ul style="list-style-type: none"> • The target volumes must be accessible to the CS. <p>Note: Accessible in this context means the correct zoning/LUN masking (SAN) / network configuration (NAS) is configured to ensure the target volumes can be mapped to BS/CS.</p> <p>(DS/SVC/V7000) Note: This applies to DS storage system and also to SVC and IBM Storwize V7000 if preassigned volumes are used. It is recommended to use dynamic target volume mapping instead.</p> <p>(XIV/SVC with Dynamic Target Allocation (DTA)) Note: For XIV or SVC DTA the target LUNs are created automatically during snapshot process and are assigned to the BS/CS . See documentation of profile parameter <i>BACKUP_HOST_NAME</i> in the <i>Installation and User's Guide</i> for more details.</p>	
1.1.6	<p>The sizes of the target volumes must be the same as the source volumes.</p> <p>(DS) DS requires source and target volume pairs be located on the same storage system.</p> <p>(SVC/V7000) For SVC and IBM Storwize V7000 those can be located in different storage devices of one and the same SVC cluster.</p>	
1.1.7	<p>IBM Spectrum Protect Snapshot operations in VMware® Virtual Machines</p> <p>IBM Spectrum Protect Snapshot can back up, restore, and perform clone operations on VMware virtual machines that run Linux guest operating systems.</p> <p>All source LUNs that participate in backup or clone operations must be attached to the virtual machine by using one of the following attachment methods:</p> <ul style="list-style-type: none"> • VMware physical mode raw device mapping (pRDM) • iSCSI • Network File System (NFS) <p>IBM Spectrum Protect Snapshot can perform a Snapshot restore operation from a snapshot to an existing pRDM disk but does not create a virtual machine or pRDM definition as part of the restore process.</p>	

Pre-Installation Checklist

	Prerequisite	checked
	<p>If the backup or clone system is a virtual machine then all target LUNs that participate in backup or clone operations must be attached to the virtual machine by using one of the following attachment methods:</p> <ul style="list-style-type: none"> • iSCSI • Network file system (NFS) 	
1.1.8	<p>IBM Spectrum Protect Snapshot operations in Linux KVM Virtual Machines</p> <p>IBM Spectrum Protect Snapshot can back up, restore, and perform clone operations on Linux KVM virtual machines that run Linux guest operating systems.</p> <p>All source LUNs that participate in backup or clone operations must be attached to the virtual machine by using one of the following attachment methods:</p> <ul style="list-style-type: none"> • Block device mapping (BDM) • iSCSI • Network File System (NFS) • PCI Passthrough <p>For the IBM Spectrum Protect™ Snapshot KVM setup using Block Device Mapping (BDM), the LUNs must be mapped to the KVM guest as multipath devices. The LUNs must be visible inside the KVM guest as multipath devices.</p> <p>From within the KVM guest, run the multipath command. The output from running this command looks similar to the following example:</p> <pre>kvm-guest:~ # multipath -ll mpathat (360050768018205de4000000000001949) dm-7 IBM ,2145 size=2.0G features='1 queue_if_no_path' hwhandler='0' wp=rw `-+- policy='service-time 0' prio=50 status=active `- 3:0:0:3 sdf 8:80 active ready running</pre> <p>The LUN identifier is a unique number like this 360050768018205de4000000000001949, and must not be overwritten by the KVM stack. The product storage identifier like this IBM ,2145 must be visible inside the KVM guest.</p> <p>If the backup or clone system is a virtual machine then all target LUNs that participate in backup or clone operations must be attached to the virtual machine by using one of the following attachment methods:</p> <ul style="list-style-type: none"> • iSCSI • Network file system (NFS) 	

Pre-Installation Checklist

1.2 Hardware Requirements for DS8000

	Prerequisite	checked
1.2.1	<p>IBM System Storage DS8000 (DS8100, DS8300, DS8700, DS8800 or DS8870) with the Point in Time Copy feature enabled. With DS8000 Release 4.1 (bundle 64.1.16.0) and later the embedded CIM agent in the HMC is enabled and configured by default and can be used with IBM Spectrum Protect Snapshot.</p> <p>Note: IBM CIM Agent for DS Open API version 5.4.2 has a known problem with refresh of an incremental FlashCopy using IBM Spectrum Protect Snapshot. Therefore make sure that CIM Agent 5.4.2.xx is not used. Please upgrade the DS microcode to a level that provides CIM Agent \geq 5.4.3 (for example: DS8000 bundle version 64.30.78.0 comes with CIM Agent 5.4.3.52)</p>	
1.2.2	<p>DS8000 LIC level for FlashCopy to work with IBM Spectrum Protect Snapshot: IBM Spectrum Protect Snapshot supports all DS8000 Releases \geq R3.1. For older DS8000 releases, the following minimum microcode levels are required: mcode 6.1.600.52/DSCLI 5.0.5.17, mcode 6.2.400.7x/DSCLI 5.2.400 or higher mcode</p>	
1.2.3	Support is provided for Fibre Channel attached volumes	
1.2.4	The user defined for IBM Spectrum Protect Snapshot operations in DS8000 needs to be assigned to the "Administrator" user group.	

1.3 Hardware Requirements for SVC / Storwize

	Prerequisite	checked
1.3.1	<p>(SVC) IBM System Storage SAN Volume Controller versions 7.1, 7.2, 7.3, 7.4, 7.5, 7.6.0.2 and later 7.6.x levels, 7.7.0 and later 7.7.0.x levels, 7.7.1 and later 7.7.1.x levels, 7.8 and later 7.8.x levels, 8.1.0, 8.1.1, 8.1.2, 8.1.3, 8.2.0, 8.2.1, 8.3.0.1 and later 8.3.0.x levels, 8.3.1 and 8.4.0</p> <p>(Storwize) IBM Storwize V7000 v1 Disk System IBM Storwize V7000 Version 7.1, 7.2, 7.3, 7.4, 7.5, 7.6.0.2 and later 7.6.x levels, 7.7.0 and later 7.7.0.x levels, 7.7.1 and later 7.7.1.x levels, 7.8 and later 7.8.x levels, 8.1.0, 8.1.1, 8.1.2, 8.1.3, 8.2.0, 8.2.1, 8.3.0.1 and later 8.3.0.x levels, 8.3.1 and 8.4.0 IBM Storwize v3700 Version 7.1, 7.2, 7.3, 7.4, 7.5, 7.6.0.2 and later 7.6.x levels, 7.7.0 and later 7.7.0.x levels, 7.7.1 and later 7.7.1.x levels, 7.8 and later 7.8.x levels, 8.1.0, 8.1.1 and 8.1.2 IBM Storwize v5000 Version 7.1, 7.2, 7.3, 7.4, 7.5, 7.6.0.2 and later 7.6.x levels, 7.7.0 and later 7.7.0.x levels, 7.7.1 and later 7.7.1.x levels, 7.8 and later 7.8.x levels, 8.1.0, 8.1.1, 8.1.2, 8.1.3, 8.2.0, 8.2.1, 8.3.0.1 and later 8.3.0.x levels, 8.3.1 and 8.4.0 IBM Storwize V7000 Unified v1.3 Disk System (block level support only) IBM Storwize V7000 Unified v1.4 Disk System (block level support only)</p>	

Pre-Installation Checklist

	<p>IBM Storwize V7000 Unified v1.5 Disk System (block level support only) IBM Flex System™ v7000 Version 7.1 and 7.2 IBM FlashSystem™ V840 IBM FlashSystem™ 7200 Version 8.3.0.1 and later 8.3.0.x levels, 8.3.1 and 8.4.0 IBM FlashSystem™ V9000 Version 7.4, 7.5, 7.6, 7.7.0 and later 7.7.0.x levels, 7.7.1 and later 7.7.1.x levels, 7.8 and later 7.8.x levels, 8.1.0, 8.1.1, 8.1.2, 8.1.3, 8.2.0, 8.2.1, 8.3.0.1 and later 8.3.0.x levels, 8.3.1 and 8.4.0 IBM FlashSystem™ 9100 Version 8.2.0, 8.2.1, 8.3.0.1 and later 8.3.0.x levels, 8.3.1 and 8.4.0 IBM FlashSystem™ 9200 Version 8.3.0.1 and later 8.3.0.x levels, 8.3.1 and 8.4.0</p> <p>Note: HyperSwap configurations are not supported Note: Multi-site high availability and disaster recovery configurations are not supported Note: NVMe host attachments are not supported</p> <p>Note: IBM Spectrum Protect Snapshot communicates with the SVC/Storwize only. There is no communication between IBM Spectrum Protect Snapshot and storage systems attached to the SVC.</p>	
1.3.2	Support is provided for Fibre Channel and iSCSI attached volumes	
1.3.3	<p>Support for Metro Mirror and Global Mirror: The target volumes of the Metro/Global Mirror relationships are usually located on a secondary storage system in a remote site. It can be the Disaster Recovery site. For Remote Snapshot backups, IBM Spectrum Protect Snapshot requires that the remote relationships are created, started and added to a unique consistency group. For Metro Mirror, the relationships must be synchronized. For Global Mirror the relationships must already be copied for the first time, otherwise IBM Spectrum Protect Snapshot could wait too long and fail running out of time.</p> <p>If you are going to offload the Snapshot disk backup to IBM Spectrum Protect, an additional backup host is needed on the secondary site. Prior to the offload backup, IBM Spectrum Protect Snapshot will attach the Snapshot target volumes on the secondary site to this backup host.</p> <p>If you are using the Snapshot backup on the secondary site for restores, you need a takeover host for the restore containing the same instance structure as in the production host on the production site.</p>	
1.3.4	<p>SVC and Storwize must be configured for https or http communication. By default, SVC/Storwize is configured for HTTPS communication.</p> <p>Note: This does not apply when configuring the storage for dynamic target allocation (new type SVCDTA). In this case IBM Spectrum Protect™ Snapshot communicates with the storage-system via ssh.</p>	
1.3.5	For SVC and Storwize, the user defined for IBM Spectrum Protect Snapshot operations in SVC/Storwize needs to be assigned to the "Administrator" user group.	
1.3.6	When dynamic target allocation is used (new type SVCDTA), OpenSSH needs to be installed on the servers where IBM Spectrum Protect™	

Pre-Installation Checklist

	<p>Snapshot is installed. This applies to production servers, backup servers, and cloning servers. In addition, a public/private key pair is required for accessing the SVC CLI via ssh. The public key needs to be imported on the storage device while the private key needs to be imported on the production server. See the User's Manual for more details (chapter "Configuring to use the Storwize family and SAN Volume Controller with dynamic target allocation (SVCDTA)).</p>	
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1.4 Hardware Requirements for XIV

	Prerequisite	checked
1.4.1	<p>IBM XIV Storage System Hardware: IBM XIV 3rd Generation Storage System 11.5, 11.6 levels</p> <p>IBM Spectrum Accelerate™: IBM Spectrum Accelerate™ Version 11.5.x</p> <p>IBM FlashSystem® A9000 and A9000R: IBM FlashSystem® A9000 and A9000R software version 12.0.1 and later 12.0.x levels IBM FlashSystem® A9000 and A9000R software version 12.1 and later 12.1.x levels IBM FlashSystem® A9000 and A9000R software version 12.2 and later 12.2.x levels IBM FlashSystem® A9000 and A9000R software version 12.3 and later 12.3.x levels</p> <p>Note: Multi-site high availability and disaster recovery configurations are not supported</p> <p>IBM XIV Storage System Software: IBM XIV Management Tools 3.x or 4.2.x for all IBM XIV® Generations or XIV CLI 2.3.1 and later 2.x and 3.x levels for IBM XIV 2nd Generation XIV CLI 3.0.1 and later 3.x levels for IBM XIV 3rd Generation XIV CLI 4.2 and later 4.2.x levels for IBM XIV 3rd Generation XIV CLI 4.6 and later 4.6.x levels for IBM XIV 3rd Generation XIV CLI 4.8 and later 4.8.x levels for IBM XIV 3rd Generation or IBM FlashSystem® A9000 and A9000R XIV CLI 5.0 and later 5.0.x levels for IBM XIV 3rd Generation or IBM FlashSystem® A9000 and A9000R XIV CLI 5.2 and later 5.2.x levels for IBM XIV 3rd Generation or IBM FlashSystem® A9000 and A9000R</p>	
1.4.2	Support is provided for Fibre Channel and iSCSI attached volumes	
1.4.3	<p>Support for Synchronous and Asynchronous Mirroring: The target volumes of the Remote Mirroring relationships are usually located on a secondary storage system in a remote site. It can be the Disaster Recovery site. For Remote Snapshot backups, IBM Spectrum Protect Snapshot requires that the remote relationships are created, started and added to a unique consistency group. For Synchronous Mirroring, the relationships must be synchronized. For Asynchronous Mirroring the relationships must already be copied for the first time, otherwise IBM Spectrum Protect Snapshot could wait too long and fail running out of time.</p> <p>If you are going to offload the Snapshot disk backup to IBM Spectrum Protect, an additional backup host is needed on the secondary site. Prior to the offload backup, IBM Spectrum Protect Snapshot will attach the remote snapshots on the secondary site to this backup host.</p>	

Pre-Installation Checklist

	If you are using the Snapshot backup on the secondary site for restores, you need a takeover host for the restore containing the same instance structure as in the production host on the production site.	
1.4.4	The user account that will be used by IBM Spectrum Protect Snapshot to log onto the storage system must have "Storage Administrator" privileges	
1.4.5	All volumes participating in a backup or clone operation must be contained within the same storage pool.	

2. Software Requirements

2.1 Software Requirements – Operating System

The following software - if not otherwise specified - is required on the PS and if applicable on the BS/CS:

AIX

	Prerequisite	checked PS	checked BS/CS
2.1.1	AIX 7.1 (64 bit) AIX 7.2 (64 bit) ⇒ <i>os.version and os.architecture</i>	✓	
	The following minimum C++ runtime levels are required:		
	• (AIX 7.1, 7.2): xIC.rte 11.1.0.0 and xIC.aix61.rte 11.1.0.0 (or later) filesets ⇒ <i>os.lib.xIC.aix61.rte and os.lib.xIC.rte</i>	✓	
	Note 1: The operating system levels must be the same on the PS and BS/CS servers.		
	Note 2: Virtual I/O support for SAN, see 2.1.8		
2.1.2	File systems: <ul style="list-style-type: none"> JFS or JFS2, see 2.1.3 ⇒ <i>fcm.fileSystemType</i> 	✓	✗
	• (IBM Spectrum Protect Snapshot 4.1.1.2 only) IBM General Parallel Filesystem (GPFS) 4.1.0.5 as a minimum level in combination with Custom Applications		
	• Oracle ASM		
2.1.3	JFS2 inline logs and concurrent I/O are supported. For concurrent I/O make sure that the option 'cio' is in the /etc/filesystems (check with command 'lsfs') and in the LVCB (logical volume control block) of the filesystem. This can be checked with the command getlvcb: x1:root:/#getlvcb -AT fslv01 AIX LVCB intrapolicy = m copies = 1 interpolicy = m lvid = 0059d79a000004c00000000fb53c1c4d1.9 lvname = fslv01 label = /oracle/C01/sapdata7 machine id = 9D7AA4C00 number lps = 13 relocatable = y		

Pre-Installation Checklist

	Prerequisite	checked PS	checked BS/CS
	<pre>strict = y stripe width = 0 stripe size in exponent = 0 type = jfs2 upperbound = 32 fs = vfs=jfs2:log=/dev/loglv10:mount=true:*options=cio,*rw:account=false time created = Wed Mar 10 13:50:33 2004 time modified = Tue Aug 16 17:11:15 2005</pre>		
2.1.5	<p>AIX Base System Locale ISO Code Set - U.S. English (the command 'locale -a' must show that the locale en_US.ISO8859-1 is available) ⇒ <i>os.localeInstalled.en_US.ISO8859-1</i></p>	✓	
2.1.7	<p>If SDD is installed, the correct vpath device configuration must be checked with lsvpcfg. On the production and backup systems, all pvids containing storage-system volumes must be converted to vpath (hd2vp command, only in case of SDD). SDDPCM with AIX MPIIO can be used instead of SDD.</p> <p>Note: When AIX LVM mirroring is used, then SDD must not be used. Instead AIX MPIIO and SDDPCM must be used.</p>		
2.1.8	<p>Virtual I/O for HBA is supported through</p> <ul style="list-style-type: none"> - native VIOS on p5 / p6 / p7 with SVC, Storwize V7000 and DS8000 with target disks mapped statically to the backup host (parameter <i>BACKUP_HOST_NAME</i> set to <i>PREASSIGNED_VOLUMES</i>) - N_Port ID Virtualization (NPIV) on p6 and p7 with all storage systems and with target disks mapped statically to the backup host (parameter <i>BACKUP_HOST_NAME</i> set to <i>PREASSIGNED_VOLUMES</i>) or mapped dynamically to the backup host (parameter <i>BACKUP_HOST_NAME</i> set to <i><hostname></i>) <p>6</p> <p>NPIV is a Fibre Channel facility allowing multiple N_Port IDs to share a single physical N_Port. This allows multiple Fibre Channel initiators to share a single physical port.</p>		
2.1.9	<p>Disks used with Oracle ASM need the <i>reserve_policy</i> attribute set to <i>no_reserve</i>. Change it with: <code>chdev -l hdiskn -a reserve_policy=no_reserve</code></p>		

Pre-Installation Checklist

Linux

	Prerequisite	checked PS	checked BS/CS
2.1.20	<p>Red Hat Enterprise Linux 6 x64 releases 6.1 up to 6.10 Red Hat Enterprise Linux 7 x64 release 7.0, 7.4 up to 7.7 Red Hat Enterprise Linux 8 x64 release 8.0</p> <p>SUSE Enterprise Linux 11 x64, and later service packs SUSE Enterprise Linux 12 x64, up to service pack 3 SUSE Enterprise Linux 15 x64 GA level ⇒ <i>os.version and os.architecture</i></p> <p>Note: The operating system levels must be the same on the PS and BS/CS.</p>	✓	
2.1.21	<p>A volume manager must be installed, configured, and running. Volume Managers supported:</p> <ul style="list-style-type: none"> • LVM2, supported up to lvm2-2.02.115 • For higher LVM2 versions the following updates (or any superseding updates) are required: <ul style="list-style-type: none"> ○ RHEL 7: RHBA-2016:1445-1 https://rhn.redhat.com/errata/RHBA-2016-1445.html ○ SLES 12: SUSE-RU-2016:1287-1 https://www.suse.com/support/update/announcement/2016/suse-ru-20161287-1.html ⇒ <i>os.package.lvm2 and os.fileInfo.lvm.conf</i> • <i>The Spectrum Protect Snapshot Prerequisite Checker V8.1.4 does not check for correct lvm2 level and lvm2 to be disabled</i> <p>Note: Starting with RHEL 7 and SLES 12 LVM2 has enabled the Metadata Daemon (lvm2) by default. The LVM Metadata Daemon causes Spectrum Protect Snapshot operations to fail. It is required to disable the LVM Metadata Daemon as described in the Red Hat documentation https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Logical_Volume_Manager_Administration/metadata_daemon.html</p>	(✓)	
	<ul style="list-style-type: none"> • Oracle ASM 		
	<p>Note: Refer to the following URL for Known Issues and Limitations</p> <ul style="list-style-type: none"> • http://www-01.ibm.com/support/docview.wss?uid=swg21990179 		

Pre-Installation Checklist

	Prerequisite	checked PS	checked BS/CS
2.1.22	Filesystems: <ul style="list-style-type: none"> ext2, ext3, ext4, xfs ⇒ <i>fcm.fileSystemType</i> 	✓	✗
	<ul style="list-style-type: none"> (IBM Spectrum Protect Snapshot 4.1.1.2 only) IBM General Parallel Filesystem (GPFS) 4.1.0.5 as a minimum level in combination with Custom Applications 		
	<ul style="list-style-type: none"> Oracle ASM 		
2.1.23	<p>Only entire disks are part of the volume groups managed by IBM Spectrum Protect Snapshot.</p> <p>Note1: Disk partitions within volume groups are not supported. Note2: Disk partitions for Oracle ASM disk groups are supported.</p>		✗
2.1.24	<p>Multipathing needs to be installed and configured. The according package names are:</p> <ul style="list-style-type: none"> multipath-tools on SLES systems ⇒ <i>os.package.multipath-tools</i> 	✓	
	<ul style="list-style-type: none"> device-mapper-multipath on RHEL systems ⇒ <i>os.package.device-mapper-multipath</i> 	✓	
2.1.25	<p>Native DM-MPIO is installed. ⇒ <i>os.lsmod.dm_multipath</i></p>	✓	
2.1.26	<p>The sg3_utils package needs to be installed. ⇒ <i>os.package.sg3_utils</i></p>	✓	

2.2 Other Software Requirements

	Prerequisite	checked PS	checked BS/CS
2.2.1	For the installation of IBM Spectrum Protect Snapshot, the IBM Spectrum Protect Snapshot package according to the application to be protected must be available.		
2.2.2	<p>For Snapshot only backup/restore: -</p> <p>For Snapshot backup / restore with offloading into a storage management server:</p> <ul style="list-style-type: none"> • An IBM Spectrum Protect Server (min. V6.3.x) • Alternative to IBM Spectrum Protect - a third party storage management server. IBM Spectrum Protect Snapshot makes the data available on the BS. The transfer into the storage management server must be performed by third party components • Optional: IBM Spectrum Protect Storage Agent for LANfree data transfer on PS (for logs) and BS <p>For Snapshot cloning: -</p>		

3. Requirements for DB2

3.1 Software requirements

The following software - if not otherwise specified - is required on the PS and BS/CS.

	Prerequisite	checked PS	checked BS/CS
3.1.1	64-bit DB2 Enterprise Server Edition V10.1 Fix Pack 2 and later 10.1.x Fix Packs 64-bit DB2 Enterprise Server Edition V10.5 and later 10.5.x Fix Packs 64-bit DB2 Enterprise Server Edition V11.1 and later 11.1.x Fix Packs 64-bit DB2 Enterprise Server Edition V11.5 and later 11.5.x Fix Packs ⇒ <i>fcm.db_Version</i>	✓	
	On the BS a DB2 instance with the same name as on PS needs to be created with the same configuration as on PS.		
	In case parallel processing in non-SAP environments is requested, the following DB2 version is required: 64-bit DB2 Enterprise Server Edition V10.5.8 and later 10.5.x fixpacks DB2 pureScale is no longer supported by IBM Spectrum Protect Snapshot v8.1 and later.		
3.1.2	<p>For Snapshot only backup/restore: -</p> <p>For Snapshot backup / restore with offloading into a storage management server:</p> <ul style="list-style-type: none"> (SAP) an IBM Spectrum Protect for Enterprise Resource Planning v7.1 or v8.1 can be used to backup the database redo logs on the PS and to backup the database on the BS/CS or the DB2 native IBM Spectrum Protect agent can be used to backup the database redo logs on the PS and to backup the database on the BS/CS (non-SAP) the DB2 native IBM Spectrum Protect agent must be used to backup the database redo logs on the PS and to backup the database on the BS/CS <p>For Snapshot cloning: -</p>		

Pre-Installation Checklist

3.2 Environmental requirements

	Prerequisite	checked PS	checked BS/CS
3.2.1	<p>All DB2 database files must reside on source volumes with supported file systems, see 2.1.2, 2.1.22 (raw devices are not supported)</p> <ul style="list-style-type: none"> • all tablespace containers • the local database directory • the online log directory <p>⇒ <i>fcm.fileSystemType</i> (checked for tablespace containers on default DB2 storage groups only)</p>	(✓)	✘
3.2.2	<p>All table spaces must be DMS table spaces except system temporary table spaces or user temporary table spaces which can be SMS table spaces. DB2 automatic storage table spaces are also supported.</p> <p>⇒ <i>fcm.tablespace_format</i></p>	✓	✘
3.2.3	The DB2 database must be in log retain mode.		✘
3.2.4	Make sure that the same unique UID can be used for the DB2 instance owner user on PS and BS		
3.2.5	<p>Make sure that the same unique GID can be used for the primary group of the DB2 instance owner on PS and BS</p> <p>The DB2 instance owner on both PS and BS must have the same home directory.</p>		
3.2.6	<p>For hardware snapshots, soft links to DB2 tablespace files are supported as long as they are pointing to files residing in volume groups that can be flashed.</p> <p>The normal SAP setup of DB2 tablespaces files is not using links.</p>		✘

3.3 Volume group layout requirements

	Prerequisite	checked PS
3.3.1	<p>Make sure that the VGs listed in 3.3.2/3/4 do not contain any other file system (FS) than listed below. Only the FS listed below need to be and are allowed to be included in the snapshot backup.</p> <ul style="list-style-type: none"> the FS of VG1 and VG2 can be put together into one VG the FS of VG3 must be separated from all other listed FS ⇒ <i>fcml.volume_group_layout (only data VGs of default DB2 storage groups are checked)</i> <p>Important: In database instances managing multiple databases, the database protected by IBM Spectrum Protect Snapshot must be located on its own volume groups according to this layout specification.</p>	(✓)
3.3.2	<p>Volume group layout: Note: In the following rows <SID> means the database name in capital letters and <sid> means the database name in small letters. Also the FS names listed are an example for a SAP database where the DB2 instance owner is db2<sid> and its \$HOME directory is /db2/<SID>. The VG names VG1, VG2 and VG3 are samples. The VGs can have any name.</p> <ul style="list-style-type: none"> VG1 (can be more than 1 VG): /db2/<SID>/sapdata1..N all FS containing data tablespaces /db2/<SID>/sapdatat or /db2/<SID>/saptemp1..N all FS containing temporary tablespaces Location: Supported storage subsystems⇒ <i>fcml.volume_group_layout (only tablespace containers in default DB2 storage groups are checked)</i> 	(✓)
3.3.3	<ul style="list-style-type: none"> VG2: /db2/<SID>/db2<sid> the FS containing the local database directory (which includes /db2/<SID>/db2<sid>/NODE0000/SQL00001) Location: Supported storage subsystems ⇒ <i>fcml.volume_group_layout</i> 	✓
3.3.4	<ul style="list-style-type: none"> VG3: /db2/<SID>/log_dir the FS containing the online log files. Location: Supported storage subsystems ⇒ <i>fcml.volume_group_layout</i> 	✓

Pre-Installation Checklist

	Prerequisite	checked PS
3.3.5	<p>For multipartitioned databases (DPF) a dedicated set of VGs must be defined for each partition for a partition-based source- target relation, e.g.</p> <pre> VGdata0000: /db2/<SID>/sapdata1..N/NODE0000 /db2/<SID>/sapdatat/NODE0000 /db2/<SID>/saptemp1/NODE0000 /db2/<SID>/db2<sid>/NODE0000 VGlog0000: /db2/<SID>/log_dir/NODE0000 . . VGdata<NNNN>: /db2/<SID>/sapdata1..N/NODE<NNNN> /db2/<SID>/sapdatat/NODE<NNNN> /db2/<SID>/saptemp1/NODE<NNNN> /db2/<SID>/db2<sid>/NODE<NNNN> VGlog<NNNN>: /db2/<SID>/log_dir/NODE<NNNN> </pre> <p>For DB2 automatic storage make sure that the storage path resides in dedicated file systems on dedicated VGs for each partition. For example: Database AS1 (instance db2as1) is created with storage path /db2/AS1/sapdata1. In this case the following filesystems/VGs must exist:</p> <pre> VGdata0000: /db2/AS1/sapdata1/db2as1/NODE0000 . . VGdata<NNNN>: /db2/AS1/sapdata1/db2as1/NODE<NNNN> ⇒ fcm.no_shared_volumes (only data VGs of default DB2 storage groups are checked) </pre>	(✓)
3.3.6	<p>Other FS like</p> <pre> /db2/<SID>/sqllib /db2/<SID> /db2 /opt/IBM/db2/V10.x </pre> <p>and other application specific FS are not allowed to be on the same VGs VG1, VG2 and VG3. They are allowed to reside on local storage or on any storage system. ⇒ <i>fcm.volume_group_layout</i></p>	✓
3.3.7	For performance reasons the number of LUNs should be kept as low as possible.	

3.4 NFS File system layout requirements

Note: For NFS support of IBM N series or NetApp storage, the snapshot granularity are independent NFS filesystems on dedicated NetApp volumes. IBM Spectrum Protect Snapshot does not support the export of sub-directories from the same NetApp volume. Since IBM Spectrum Protect Snapshot v8.1 N series or NetApp is supported using the Rocket Device Adapter Pack for IBM Tivoli Storage FlashCopy Manager only. The following prerequisites are related to independent NFS filesystems.

	Prerequisite	checked PS
3.4.1	<p>Make sure that the NFS filesystems listed in 3.4.2/3/4 do not contain any other directories than listed below. Only the directories listed below need to be and are allowed to be included in the snapshot backup.</p> <p>⇒ <i>fcf.volume_group_layout (only filesystems of default DB2 storage groups are checked)</i></p>	(✓)
3.4.2	<p>Volume group layout:</p> <p>Note: In the following rows <SID> means the database name in capital letters and <sid> means the database name in small letters. Also the directory names listed are an example for a SAP database where the DB2 instance owner is db2<sid> and its \$HOME directory is /db2/<SID>. The NFS filesystems names NFS-filesystem1 , NFS-filesystem2 and NFS-filesystem3 are samples. The NFS filesystem can have any name.</p> <ul style="list-style-type: none"> NFS-filesystem1 (can be more than one NFS filesystem): /db2/<SID>/sapdata1..N all directories containing data tablespaces /db2/<SID>/sapdatat or /db2/<SID>/saptemp1..N all directories containing temporary tablespaces Location: Supported storage subsystems ⇒ <i>fcf.volume_group_layout (only filesystems of default DB2 storage groups are checked)</i> 	(✓)
3.4.3	<ul style="list-style-type: none"> NFS-filesystem2: /db2/<SID>/db2<sid> the directory containing the local database directory (which includes /db2/<SID>/db2<sid>/NODE0000/SQL00001) Location: Supported storage subsystems ⇒ <i>fcf.volume_group_layout</i> 	✓
3.4.4	<ul style="list-style-type: none"> NFS-filesystem3: /db2/<SID>/log_dir the directory containing the online log files. Location: Supported storage subsystems ⇒ <i>fcf.volume_group_layout</i> 	✓

Pre-Installation Checklist

	Prerequisite	checked PS
3.4.5	<p>For multipartitioned databases (DPF) a dedicated set of NFS filesystems must be defined for each partition for a partition-based source- target relation, e.g.</p> <p>NFS FS for partition 0: /db2/<SID>/sapdata1..N/NODE0000 /db2/<SID>/sapdatat/NODE0000 /db2/<SID>/saptemp1/NODE0000 /db2/<SID>/db2<sid>/NODE0000 /db2/<SID>/log_dir/NODE0000 . . NFS FS for other partitions: /db2/<SID>/sapdata1..N/NODE<NNNN> /db2/<SID>/sapdatat/NODE<NNNN> /db2/<SID>/saptemp1/NODE<NNNN> /db2/<SID>/db2<sid>/NODE<NNNN> /db2/<SID>/log_dir/NODE<NNNN></p> <p>For DB2 automatic storage make sure that the storage path resides in dedicated file systems on dedicated VGs for each partition. For example: Database AS1 (instance db2as1) is created with storage path /db2/AS1/sapdata1. In this case the following NFS filesystems must exist: NFS FS for partition 0: /db2/AS1/sapdata1/db2as1/NODE0000 . . NFS FS for other partitions: /db2/AS1/sapdata1/db2as1/NODE<NNNN> ⇒ <i>fcm.no_shared_volumes</i> (only filesystems of default DB2 storage groups are checked)</p>	(✓)
3.4.6	<p>Other directories like /db2/<SID>/sqllib /db2/<SID> /db2 /opt/IBM/db2/V10.x and other application specific directories are not allowed to be on the same NFS filesystems NFS-filesystem-1, NFS-filesystem-2 and NFS-filesystem-3. They are allowed to reside on local storage or on any storage system. ⇒ <i>fcm.volume_group_layout</i></p>	✓

4. Requirements for SAP on Oracle

4.1 Software requirements

Note: The following software - if not otherwise specified - is required on PS and BS/CS by IBM Spectrum Protect Snapshot.

	Prerequisite	checked PS	checked BS/CS
4.1.1	<p>Oracle Enterprise Edition at a level certified by the respective SAP release</p> <p>The following Oracle release at a level certified by the respective SAP release is currently supported:</p> <ul style="list-style-type: none"> • Oracle Enterprise Edition 11gR2 – 64-bit • Oracle Enterprise Edition 12cR1 – 64-bit • Oracle Enterprise Edition 12cR2 – 64-bit • Oracle Enterprise Edition 18c – 64-bit • Oracle Enterprise Edition 19c – 64-bit <p>Oracle 12c, 18c, and 19c multitenant (pluggable) databases are not supported ⇒ <i>fcm.db_Version</i></p>	✓	
	<p>Note: If off-loading or cloning shall be used, an Oracle DBMS must be installed on BS server.</p>	✗	
4.1.2	<p>The following BR*Tools releases are currently supported:</p> <ul style="list-style-type: none"> • BR*Tools release 7.40 <p>Note: IBM Spectrum Protect Snapshot only interfaces with the SAP BR*Tools through the backint interface (BC-BRI volume based).</p>		
4.1.3	<p>For Snapshot only backup/restore: -</p> <p>For Snapshot backup / restore with offloading into a storage management server:</p> <ul style="list-style-type: none"> • an IBM Spectrum Protect for Enterprise Resource Planning v7.1 or v8.1 on PS and BS <p>For Snapshot cloning: -</p>		

4.2 Environmental requirements

	Prerequisite	checked PS	checked BS
4.2.1	<p>All Oracle database files must reside on source volumes in supported file systems, see 2.1.2, 2.1.22 (raw devices are not supported)</p> <ul style="list-style-type: none"> • all tablespace data files • all control files • all redo log files (origlogA/B, mirrlogA/B) <p>⇒ <i>fcm.fileSystemType</i></p>	✓	✗
4.2.2	<p>The SAP environment files (.sapenv_<hostname>.csh, .sapenv_<hostname>.sh) of the user ora<sid> must not contain statements like 'tset -I -Q'. If this statement exists in the environment files, the FlashBack Restore does not work. The software reports that a source volume is no longer attached to the production system.</p>		
4.2.3	<p>Make sure that the same unique UID can be used for user ora<sid> on PS and BS The user ora<sid> on both PS and BS must have the same home directory.</p>		
4.2.4	<p>Make sure that the same unique GID can be used for group dba on PS and BS</p>		

4.3 Volume group layout requirements

As a general rule: Layouts which were supported with previous releases also work with this one.

	Prerequisite	checked PS
4.3.1	<p>Make sure that the VGs listed do not contain any other FS than those listed below. Only the FS listed below need to be and are allowed to be included in the snapshot backup.</p> <p>⇒ <i>fcv.volume_group_layout</i></p>	✓
4.3.2	<p>Volume group layout:</p> <p>Note: In the following rows <SID> means the database name in capital letters. The VG names VG1 and VG2 are samples. The VGs can have any name.</p> <ul style="list-style-type: none"> • VG1 (can be more than 1 VG): /oracle/<SID>/sapdata1..N all FS containing tablespaces and the control files Location: Supported storage subsystems ⇒ <i>fcv.volume_group_layout</i> 	✓
4.3.3	<ul style="list-style-type: none"> • VG2 (can be more than 1 VG): /oracle/<SID>/origlogA the FS containing the online redo logs and optionally a copy of the control file /oracle/<SID>/origlogB the FS containing the online redo logs and optionally a copy of the control file /oracle/<SID>/mirrlogA the FS containing the online redo logs and optionally a copy of the control file /oracle/<SID>/mirrlogB the FS containing the online redo logs and optionally a copy of the control file <p>Location: Allowed to reside on local storage or on any storage system as long as only IBM Spectrum Protect Snapshot online backup but not IBM Spectrum Protect Snapshot offline backup or cloning is desired.</p> <p>The DB control files can be stored in the origlogA/origlogB and mirrlogA/mirrlogB as well as in sapdata1..N.</p> <p>⇒ <i>fcv.volume_group_layout</i></p>	✓
4.3.4	<p>Note: For performance reasons the number of LUNs should be kept as low as possible.</p>	
4.3.5	<p>Other FS like /oracle/<SID>/oraarch /oracle/<SID>/saparch /oracle/<SID>/sapbackup /oracle/<SID>/sapreorg /oracle/<SID> /oracle and other application specific FS are not allowed to be on the same VGs VG1 and VG2. They are allowed to reside on local storage or on any storage system.</p> <p>⇒ <i>fcv.volume_group_layout</i></p>	✓

4.4 NFS File system requirements

Note: For NFS support of IBM N series or NetApp storage, the snapshot granularity are independent NFS filesystems on dedicated NetApp volumes. IBM Spectrum Protect Snapshot does not support the export of sub-directories from the same NetApp volume. Since IBM Spectrum Protect Snapshot v8.1 N series or NetApp is supported using the Rocket Device Adapter Pack for IBM Tivoli Storage FlashCopy Manager only. The following prerequisites are related to independent NFS filesystems.

	Prerequisite	checked PS
4.4.1	<p>Make sure that the NFS filesystems listed do not contain any other FS than those listed below. Only the FS listed below need to be and are allowed to be included in the snapshot backup. ⇒ <i>fcml.volume_group_layout</i></p>	✓
4.4.2	<p>Volume group layout: Note: In the following rows <SID> means the database name in capital letters. The NFS filesystems names NFS-filesystem1 and NFS-filesystem2 are samples. The NFS filesystems can have any name.</p> <ul style="list-style-type: none"> NFS-filesystem1 (can be more than 1 NFS filesystem): /oracle/<SID>/sapdata1..N all FS containing tablespaces and the control files Location: Supported storage subsystems ⇒ <i>fcml.volume_group_layout</i> 	✓
4.4.3	<ul style="list-style-type: none"> NFS-filesystem2 (can be more than 1 NFS filesystem): /oracle/<SID>/origlogA the FS containing the online redo logs and optionally a copy of the control file /oracle/<SID>/origlogB the FS containing the online redo logs and optionally a copy of the control file /oracle/<SID>/mirrlogA the FS containing the online redo logs and optionally a copy of the control file /oracle/<SID>/mirrlogB the FS containing the online redo logs and optionally a copy of the control file <p>Location: Allowed to reside on local storage or on any storage system as long as only IBM Spectrum Protect Snapshot online backup but not IBM Spectrum Protect Snapshot offline backup or cloning is desired.</p> <p>The DB control files can be stored in the origlogA/origlogB and mirrlogA/mirrlogB as well as in sapdata1..N. ⇒ <i>fcml.volume_group_layout</i></p>	✓
4.4.4	<p>The FS listed here are not allowed to be located on the same NFS filesystems NFS-filesystem1 and NFS-filesystem2:</p> <ul style="list-style-type: none"> /oracle/<SID>/oraarch /oracle/<SID>/saparch /oracle/<SID>/sapbackup /oracle/<SID>/sapreorg /oracle/<SID> /oracleVGs <p>and other application specific FS. They are allowed to reside on local storage or on any storage system. ⇒ <i>fcml.volume_group_layout</i></p>	✓

5. Requirements for Oracle (non-SAP)

5.1 Software requirements

The following software - if not otherwise specified - is required on both the production and backup systems.

	Prerequisite	checked PS	checked BS/CS
5.1.1	<p>The following Oracle releases are currently supported:</p> <ul style="list-style-type: none"> • Oracle Database Standard Edition 11gR2 – 64-bit • Oracle Database Standard Edition 12cR1 – 64-bit • Oracle Database Standard Edition 12cR2 – 64-bit • Oracle Database Standard Edition 18c – 64-bit • Oracle Database Standard Edition 19c – 64-bit <p>Oracle 12c, 18c, and 19c multitenant (pluggable) databases are not supported</p> <ul style="list-style-type: none"> • Oracle Database Enterprise Edition 11gR2 – 64-bit • Oracle Database Enterprise Edition 12cR1 – 64-bit • Oracle Database Enterprise Edition 12cR2 – 64-bit • Oracle Database Enterprise Edition 18c – 64-bit • Oracle Database Enterprise Edition 19c – 64-bit <p>Oracle 12c, 18c, and 19c multitenant (pluggable) databases are not supported</p> <ul style="list-style-type: none"> • Oracle Real Application Clusters (RAC) option on supported Oracle Database releases <p>⇒ <i>fcmdb_Version</i></p>	✓	
	<p>Note 1: Oracle Real Application Clusters (RAC) is only supported in combination with Oracle ASM only. Please also consider <i>Known Issues and Limitations</i> on following URL:</p> <ul style="list-style-type: none"> • http://www-01.ibm.com/support/docview.wss?uid=swg21990179 		
	<p>Note 2: An Oracle DBMS must be installed on the backup server for offloaded tape backups. An Oracle DBMS does not need to be installed on the BS for disk-only backups.</p>	✗	
5.1.2	<p>For Snapshot only backup / restore: -</p> <p>For Snapshot backup / restore with offloading to tape:</p> <ul style="list-style-type: none"> • IBM Spectrum Protect for Databases - Oracle version v7.1 or v8.1 on PS and BS <p>For Snapshot cloning: -</p>		
5.1.3	<p>For ASM on AIX, the following patches are required:</p>	✓	

Pre-Installation Checklist

	Oracle Enterprise Server 11gR2: <ul style="list-style-type: none"> • Patch 11785938 (included in 11.2.0.3) • Patch 11666137 (included in 11.2.0.3) • Patch 13366202 ⇒ <i>fcm.oracleASMPatches</i>		
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5.2 Environmental requirements

	Prerequisite	checked PS	checked BS/CS
5.2.1	All Oracle database files must reside <ul style="list-style-type: none"> • on source volumes in supported file systems, see 2.1.2, 2.1.22 ⇒ <i>fcm.fileSystemType</i> 	✓	✗
	<ul style="list-style-type: none"> • or Oracle ASM storage 	✓	✗
5.2.2	One dedicated Oracle instance owner OS user is required per database instance. Set ORACLE_SID and ORACLE_HOME permanently in this user's environment so that it can make SQL*Plus connections to the database that is to be protected. Make sure that the same unique UID can be used for the Oracle instance owner user on PS and BS. The instance owners on both PS and BS must have the same home directory.		
5.2.3	Make sure that the same unique GID can be used for the primary group of the Oracle instance owner on PS and BS		
5.2.4	RMAN catalog database needs to be configured (even for disk only backups). It should not reside on the PS (because it would be lost in the case of a disaster) but must be accessible from both PS and BS. ⇒ <i>fcm.catalog_db_connection</i>	✓	
5.2.5	The RMAN catalog database must only contain a single DBID for the source database name that is selected for an offloaded backup.		
5.2.6	(Linux) On Linux IBM Spectrum Protect Snapshot supports only ASM environments setup with Oracle ASMLib since Oracle recommends ASMLib over raw devices for ease-of-use and performance reasons. Raw devices are not supported. ASMLib 2.0 is required by IBM Spectrum Protect Snapshot.		
5.2.7	(Linux) For multipathing to work properly the parameters ORACLEASM_SCANORDER and ORACLEASM_SCANEXCLUDE need to be set in the ASMLib configuration. For example exclude single paths from the scan by setting ORACLEASM_SCANEXCLUDE="sd" and force multipath devices by setting ORACLEASM_SCANORDER="dm-*". For details see section "Configuring the Scan Order" on this page: http://www.oracle.com/technetwork/topics/linux/multipath-097959.html		
5.2.8	(Linux) In Oracle ASM environments with ASMLib on Linux, the ASM_DISKSTRING parameter is required to be set to 'ORCL:*' on production and backup system. For further information see: http://docs.oracle.com/cd/E11882_01/install.112/e41961/storage.htm#CWLIN293		
5.2.9	(AIX) For Oracle ASM the setting of the ASM_DISKSTRING parameter has to be left to the default for the backup server.		

Pre-Installation Checklist

5.2.10	<p>For Oracle ASM one dedicated OS user with SYSASM privilege to the Oracle Grid infrastructure is required per host. In this user's environment, permanently set ORACLE_SID to the Oracle ASM instance ID and ORACLE_HOME to the Oracle Grid infrastructure home directory. This setting enables SQL*Plus connections to the ASM instance to administer disk groups on that Oracle ASM instance.</p> <p>If the Oracle Grid infrastructure and the Oracle Database have been installed under a single user id, then a second user with the privileges described above must be created.</p>		
5.2.11	For Oracle Real Application Clusters (RAC) databases, the database instance owner user is required to be member of the group: asmadmin		
5.2.12	For Oracle Real Application Clusters (RAC) databases, a shared file system across all RAC nodes of the production database is required. It is used to share the IBM Spectrum Protect Snapshot binaries, configuration and repository.		✘
5.2.13	For Oracle Real Application Clusters (RAC) databases, a path that matches the path name (which includes the acs directory) for the shared file system mentioned in 5.2.12 must exist on the backup/clone system and the Oracle instance owner user on the backup/clone system must have write permissions to it. This path can be local to the backup/clone system.	✘	

5.3 Volume group layout requirements

	Prerequisite	checked PS
5.3.1	<p>One or more Oracle control file copies can be placed in the same VG as the data files. If they are, follow the recovery procedure described in the user's guide chapter "Restoring Oracle snapshots" after a restore operation.</p> <p>Make sure that the VGs listed do not contain any other FS than those listed below. Only the FS listed below need to be and are allowed to be included in the snapshot backup. ⇒ <i>fcv.volume_group_layout</i></p>	✓
5.3.2	<p>Volume group layout: Note: In the following rows <SID> means the database name in capital letters. The VG names VG1 and VG2 are samples. The VGs can have any name.</p> <ul style="list-style-type: none"> • VG1 (can be more than 1 VG): /oracle/<SID>/data1..N all FS containing tablespaces Location: Supported storage subsystems ⇒ <i>fcv.volume_group_layout</i> 	✓
5.3.3	<ul style="list-style-type: none"> • VG2 (can be more than 1 VG): containing the online redo logs and optionally a copy of the control file Location: Allowed to reside on local storage or on any storage system as long as only IBM Spectrum Protect Snapshot backup but not IBM Spectrum Protect Snapshot cloning is desired. ⇒ <i>fcv.volume_group_layout</i> 	✓
5.3.4	For performance reasons the number of LUNs should be kept as low as possible.	
5.3.5	<p>The FS listed here are not allowed to be located on the VGs (VG1, VG2) where data, log and control files are located and must be explicitly separated:</p> <ul style="list-style-type: none"> • /oracle/<SID>/oraarch • /oracle/<SID> • /oracle <p>They are allowed to reside on local storage or on any storage system. ⇒ <i>fcv.volume_group_layout</i></p>	✓

5.4 Disk Group layout requirements (Oracle ASM)

	Prerequisite	checked
5.4.1	One or more Oracle control file copies can be placed in the same disk group as the data files. If they are, follow the recovery procedure described in the user's guide chapter "Restoring Oracle snapshots" after a restore operation. ⇒ <i>fcv.volume_group_layout</i>	✓
5.4.2	Disk Group DG1 (can be more than 1 DG): One or multiple disk groups containing the tablespace files. Location: Supported storage subsystems ⇒ <i>fcv.volume_group_layout</i>	✓
5.4.3	DG2 (can be more than 1 DG): One or more additional disk groups containing the online redo logs and control files. Location: Allowed to reside on local storage or on any storage system and also in regular file systems rather than ASM disk groups as long as only IBM Spectrum Protect Snapshot backup but not IBM Spectrum Protect Snapshot cloning is desired. ⇒ <i>fcv.volume_group_layout</i>	✓
5.4.4	Disk groups must not be shared between multiple database instances. ⇒ <i>fcv.extrafiles</i>	✓
5.4.5	On the backup system (if used) all disk groups that are specified with parameter <i>control_files</i> as control file locations in the database profile need to be created manually for the control file restore that is part of the IBM Spectrum Protect backup operation.	
5.4.5	Note. For performance reasons the number of LUNs should be kept as low as possible.	

5.5 NFS File system layout requirements

Note: For NFS support of IBM N series or NetApp storage, the snapshot granularity are independent NFS filesystems on dedicated NetApp volumes. IBM Spectrum Protect Snapshot does not support the export of sub-directories from the same NetApp volume. Since IBM Spectrum Protect Snapshot v8.1 N series or NetApp is supported using the Rocket Device Adapter Pack for IBM Tivoli Storage FlashCopy Manager only. The following prerequisites are related to independent NFS filesystems.

	Prerequisite	checked
5.5.1	<p>One or more Oracle control file copies can be placed in the same NFS filesystems as the data files. If they are, follow the recovery procedure described in the user's guide chapter "Restoring Oracle snapshots" after a restore operation.</p> <p>Make sure that the NFS filesystems listed do not contain any other FS than those listed below. Only the FS listed below need to be and are allowed to be included in the Snapshot to the backup system. ⇒ <i>fcv.volume_group_layout</i></p>	✓
5.5.2	<p>Volume group layout: Note: In the following rows <SID> means the database name in capital letters. The NFS filesystems names NFS-filesystem1 and NFS-filesystem2 are samples. The NFS filesystems can have any name.</p> <ul style="list-style-type: none"> NFS-filesystem1 (can be more than 1 NFS filesystem): /oracle/<SID>/data1..N all FS containing tablespaces Location: Supported storage subsystems ⇒ <i>fcv.volume_group_layout</i> 	✓
5.5.3	<ul style="list-style-type: none"> NFS-filesystem2 (can be more than 1 NFS filesystem): containing the online redo logs and optionally a copy of the control file Location: Supported storage subsystems ⇒ <i>fcv.volume_group_layout</i> 	✓
5.5.4	<p>The FS listed here are not allowed to be located on the NFS filesystems NFS-filesystem1 and NFS-filesystem2:</p> <ul style="list-style-type: none"> /oracle/<SID>/oraarch /oracle/<SID> /oracle <p>They are allowed to reside on local storage or on any storage system ⇒ <i>fcv.volume_group_layout</i></p>	✓

6. Requirements for Custom Applications

6.1 Software requirements

In principle, IBM Spectrum Protect Snapshot for Custom Applications just creates snapshot copies of plain filesystems. However, the data residing on these filesystems is usually owned by some kind of application (e.g. a DBMS, a FTP server, or a Web-Server). To get a transaction-consistent snapshot copy these custom applications may need to be suspended before and resumed after the snapshot. This can be realized by customized scripts specific to your application which are invoked by IBM Spectrum Protect Snapshot at the right time.

	Prerequisite	checked PS	checked BS/CS/offload node
6.1.1	Your custom application is properly installed.		✘
6.1.2	If applicable: Pre- and post processing scripts to suspend / resume your custom application for the snapshot copy process are prepared, tested and accessible by IBM Spectrum Protect Snapshot.		✘
6.1.3	<p>For Snapshot only backup / restore: -</p> <p>For Snapshot backup / restore with offloading to tape (except IBM Spectrum Scale environments):</p> <ul style="list-style-type: none"> • IBM Spectrum Protect Backup Archive Client version v7.1 or v8.1 on PS and BS • Alternative to IBM Spectrum Protect - a third party storage management server. IBM Spectrum Protect Snapshot makes the data available on the BS. The transfer into the storage management server must be performed by third party components <p>For Snapshot cloning:</p> <ul style="list-style-type: none"> • not supported 		
6.1.4	<p>For Snapshot backup / restore with offloading to tape in IBM Spectrum Scale environments:</p> <ul style="list-style-type: none"> • IBM Spectrum Protect client v7.1.3 or a later v7.1 or v8.1 deliverable on all cluster nodes participating in an offload operation • IBM Spectrum Scale v4.1.1 or a later v4.1 deliverable IBM Spectrum Scale v4.2.0 or a later v4.2 deliverable <p>Under the covers, IBM Spectrum Protect Snapshot uses IBM Spectrum Scale command mmbackup to send data to an IBM Spectrum Protect server. On cluster nodes participating in such an offload operation, all requirements for using the mmbackup command must be met. For details, see the appropriate IBM Spectrum Scale documentation.</p>		

6.2 Environmental requirements

	Prerequisite	checked PS	checked BS/CS
6.2.1	All data files must reside on source volumes in supported file systems, see 2.1.2, 2.1.22		✘
6.2.2	Make sure that the same unique UID can be used on PS and BS to access the application data.		
6.2.3	Make sure that the same unique GID can be used on PS and BS to access the application data.		

6.3 Volume group layout requirements

	Prerequisite	checked PS
6.3.1	Ensure that no alien files are located on the filesystems being subject to the snapshot backup.	
6.3.2	Ensure that the corresponding volumes of the protected filesystems are sole members of a dedicated volume group. Alien volumes must not be included in the same VG.	

6.4 NFS File system layout requirements

Note: For NFS support of IBM N series or NetApp storage, the snapshot granularity are independent NFS filesystems on dedicated NetApp volumes. IBM Spectrum Protect Snapshot does not support the export of sub-directories from the same NetApp volume. Since IBM Spectrum Protect Snapshot v8.1 N series or NetApp is supported using the Rocket Device Adapter Pack for IBM Tivoli Storage FlashCopy Manager only.
The following prerequisites are related to independent NFS filesystems.

	Prerequisite	checked PS
6.4.1	Ensure that no alien files are located on the NFS filesystems being subject to the snapshot backup.	

6.5 IBM Spectrum Scale file system layout requirements

Starting with version 4.1.4.0, IBM Spectrum Protect Snapshot for Unix and Linux has full support for IBM Spectrum Scale (a.k.a GPFS) file system snapshots for Custom Applications.

Note: For Custom Applications, the snapshot granularity is an independent fileset. The following prerequisites are related to independent filesets. Note that each IBM Spectrum Scale file system

Pre-Installation Checklist

has a default independent fileset named root. That means either multiple IBM Spectrum Scale file systems and/or independent filesests within one or more file systems can be used for separating data according to the rules listed in the table below.

	Prerequisite	checked PS
6.5.1	Ensure that no alien files are located on the IBM Spectrum Scale filesets being subject to the snapshot backup.	
6.5.2	Snapshots are located in the IBM Spectrum Scale file systems. Due to the copy-on-write technology used, their sizes grow over time as the database is modified. Database administrators must keep monitoring free space in the file systems in order to avoid a file-system-full condition for the productive database. The number of snapshots kept in the file systems can be controlled with IBM Spectrum Protect Snapshot profile parameter MAX_VERSIONS.	
6.5.3	Due to limitations concerning root filesets in the integration of IBM Spectrum Scale with the IBM Spectrum Protect Client, using root filesets is not recommended if snapshot backups are to be offloaded to an IBM Spectrum Protect server.	

7. Requirements for Snapshot Cloning

To create clones of databases the same requirements apply as mentioned in the previous chapters. The following chapter provides additional requirements especially for Snapshot Cloning operations.

Note 1: Snapshot cloning is not supported for NFS filesystems.

7.1 Environmental requirements (DB2)

	Prerequisite	checked PS	checked BS/CS
7.1.1	On the cloning system a DB2 instance with the same name like on PS needs to be created with the same configuration like on PS (backup instance is named in the following section). Even if a cloning system is used for cloning only the DB2 database instance of the backup instance must exist. Make sure the DB2 database manager configuration parameter DFTDBPATH points to the correct location.	✘	
7.1.2	In addition to the DB2 instance with the same name like on PS a second DB2 instance with the clone instance name needs to be created on the clone system if the clone target database and instance should be renamed. Make sure the DB2 database manager configuration parameter DFTDBPATH points to the correct location.	✘	
7.1.3	(SAP only) On the cloning server the same SAP release level needs to be installed and a SAP clone instance needs to be created prior to the first Snapshot Cloning.	✘	
7.1.4	The clone database instance owner must be a member of the primary group of the backup instance owner (see 7.1.1).	✘	
7.1.5	For DPF environments the clone database instance must be configured with the same amount of nodes like the production and backup database instances.	✘	
7.1.6	(SAP only) For SAP Kernel releases ≥ 6.10 : On the cloning system the environment variable • <code>db2_db6_schema</code> must be set correctly for user <code>db2<sid></code> and <code><sid>adm</code> to the production system database schema. Normally this should be <code>'SAP<SID>'</code> .		
7.1.7	If Snapshot Cloning should be used for more than one clone target database then each clone target requires a unique database name.	✘	

7.2 Environmental requirements (Oracle SAP and non-SAP)

	Prerequisite	checked PS	checked BS/CS
7.2.1	Oracle DBMS needs to be installed on the cloning server. Also an Oracle clone target database instance owner user must be created. It must be in the same groups as the instance owner user of the production instance.	✘	
7.2.2	If a system is used for backups and clones the instance owner of the backup and clone instance must be in the same groups or the clone database instance owner must be a member of the primary group of the backup instance owner.	✘	
7.2.3	(SAP only): For SAP Kernel releases >= 6.10: On the cloning system the environment variable <ul style="list-style-type: none"> • db_sora_schema must be set correctly for user ora<sid> and <sid>adm to the production system database schema. Normally this should be 'SAP<SID>'.		
7.2.4	Make sure that the instance owner of the cloning instance on the cloning system uses ksh or bash as login shell. Otherwise the cloning process will fail because of problems in environment variable substitution.	✘	
7.2.5	If an Oracle spfile does exist on the clone server it must be removed. Such file may be created when a full SAP instance is installed on the clone server to prepare the environment for the clone. The default name of the spfile is \${ORACLE_HOME}/dbs/spfile\${SID}.ora.	✘	
7.2.6	If the database is configured to use a pfile, ensure this pfile does not contain any IFILE statements. Such statements are not supported.		✘
7.2.7	Oracle ASM: The clone target database instance owner must be member of the group: asmdba.	✘	
7.2.7	If Snapshot Cloning should be used for more than one clone target database then each clone target requires a unique database name.	✘	

7.3 Volume group layout requirements for DB2

	Prerequisite	checked PS	checked BS/CS
7.3.1	The mount points for the file systems subject to the cloning operation must contain the database SID: /db2/<SID>/data Note: <SID> means the database name in capital letters		✘

7.4 Volume group layout requirements for SAP on Oracle

	Prerequisite	checked PS	checked BS/CS
7.4.1	The volume group(s) listed in 4.3.3 containing online redo logs are required to be located on supported disk subsystems.		✘
7.4.2	The mount points for the file systems subject to the cloning operation must contain the database SID: /oracle/<SID>/sapdata1		

7.5 Volume group layout requirements for Oracle (non-SAP)

	Prerequisite	checked PS
7.5.1	The volume group(s) listed in 5.3.3 containing online redo logs are required to be located on supported disk subsystems.	
7.5.2	At least one control file must be located on the same volume groups as the online redo log files. ⇒ <i>fcv.volumes_for_cloning</i>	✓
7.5.3	The mount points for the file systems subject to the cloning operation must contain the database SID: /oracle/<SID>/data	

7.6 Disk Group layout requirements for Oracle ASM

	Prerequisite	checked PS
7.6.1	Snapshot Cloning of an Oracle database that resides on Oracle ASM is supported for AIX and Linux starting with IBM Spectrum Protect Snapshot version 4.1.1.	
7.6.2	The disk group(s) listed in 5.4.3 containing online redo logs are required to be located on supported disk subsystems.	
7.6.3	All control file copies must be located on ASM disk groups on supported storage subsystems.	

7.7 Pre- and Post-Processing Scripts Requirements

	Prerequisite	checked PS	checked BS/CS
7.7.1	<p>All pre- and post-processing configuration files and the scripts that are defined in the configuration files must meet the following requirements:</p> <ul style="list-style-type: none"> • They must exist on the clone system. • They must have a minimum permission of read and execute access for the clone database instance owner. The preprocessing and postprocessing scripts must have a minimum permission of read and execute access for the user who owns the scripts and who is the operator of the scripts. Furthermore, if the scripts are intended to be run by any user registered on the system, the scripts must be owned by the root user and the must have a minimum permission of read and execute for the User, Group, and World user group. • They must have a minimum permission of read access for the production database instance owner. • They must exists in the same directory. • They must be valid files. Symbolic links are not allowed. • They must be specified with a fully qualified path and name. • SQL scripts (DB2 SQL or Oracle SQL) must have the extension „.sql“. • Shell scripts must have the extension „.sh“. 	✘	

8. Environmental Requirements

	Prerequisite	checked PS	checked BS/CS
8.0.1	<p>The ulimits of the DB2 instance owner (DB2 UDB), Oracle instance owner (Oracle) user or custom application owner user and root on the production and backup system should at a minimum be set to (check with ulimit -a):</p> <pre>data seg size (kbytes) unlimited max memory size (kbytes) 131000 stack size (kbytes) 131000</pre> <p>Depending on the user's shell and OS level, the output of the command ulimit -a can vary.</p>		
8.0.2	<p>The environment files (e.g. .profile, .login, etc.) of the database instance user must not contain statements like 'tset -I -Q', any tty-statements like 'stty', 'tty' or 'ttytype' and statements like 'tabs'.</p>		
8.0.3	<p>The time on all hosts must be synchronized.</p>		

8.1 AIX LVM Mirroring Requirements

	Prerequisite	checked PS
8.1.1	<p>IBM Spectrum Protect Snapshot for AIX supports AIX LVM mirrored environments with the following specifications:</p> <ul style="list-style-type: none"> • Only two copy (mirror) sets are allowed • One complete copy set must reside in one single storage subsystem (or SVC cluster). It is not allowed to spread a copy set across multiple subsystems with LVM mirroring. • The other complete copy set must reside in the second storage subsystem (or SVC cluster). 	
8.1.2	<p>For all logical volumes in one of the volume groups involved in the Snapshot, check the following:</p> <ul style="list-style-type: none"> • mirror write consistency must be set on and must be active • mirror write scheduling policy must be set to parallel write (with parallel, sequential or round robin read) or striped. In addition, for all jfslog or jfs2log volumes in one of the involved volume groups the mirror write scheduling policy must be parallel. 	
8.1.3	<p>For each of the involved volume groups check the following:</p> <ul style="list-style-type: none"> • quorum must be set off 	
8.1.4	<p>For performance reasons the number of LUNs should be kept small.</p>	

Pre-Installation Checklist

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