



# Storage Management for the Oracle Database on Red Hat Enterprise Linux 6: Using ASM With or Without ASMLib

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On 22 March 2011, Oracle posted the following statement in the Oracle Support Portal (formerly MetaLink) article 1089399.1:

For RHEL 6, Oracle will provide ASMLib software and updates only when configured with a kernel distributed by Oracle. Oracle will not provide ASMLib packages for kernels distributed by Red Hat as part of RHEL 6. ASMLib updates will be delivered via Unbreakable Linux Network (ULN), which is available to customers with Oracle Linux support. ULN works with both Oracle Linux or Red Hat Linux installations, but ASMLib usage will require replacing any Red Hat kernel with a kernel provided by Oracle.

This document clarifies Oracle's ASMLib statement and describes options for running Oracle workloads in a single instance or Oracle Real Application Cluster (RAC) configuration. Note that Oracle's MetaLink statement above pertains to ASMLib on Red Hat Enterprise Linux 6 only. Oracle provides ASMLib software and updates for Red Hat Enterprise Linux 5.

## What is ASM?

Oracle Automatic Storage Management (ASM) is a volume manager and an Oracle specific file system that supports single instance Oracle Database and Oracle RAC configurations. It is Oracle's recommended storage management solution on Unix, Linux, and Windows, and provides an alternative to conventional volume managers, file systems, and raw devices. Compared to managing raw devices, ASM is designed to simplify disk management. By keeping track of disk drives dedicated for Oracle databases and allocating space on these drives according to the requests from the regular Oracle database instances, ASM is roughly equivalent to a Linux single node file system (ext4) and logical volume manager (LVM). ASM can be used to assemble multiple disks into a few disk groups and perform allocations among them with striping and mirroring. It can also reallocate data transparently among disks for non-clustered databases.

## How is ASM delivered?

ASM ships with Oracle 10g and 11g R1 database servers. In Oracle 11g R2, ASM ships with the Grid Infrastructure.

## What is ASMLib?

ASMLib is an *optional* set of tools and a kernel driver that can be inserted between ASM and the hardware, as well as an application library used by the Oracle database software to access ASM disks. It is a support library for the ASM feature of Oracle 10g and 11g single instance database servers as well as RAC installations. ASM and regular database instances can use ASMLib as an alternative interface for disk access. ASMLib has three components:



- Kernel driver – **oracleasm** is a Linux kernel driver also known as the Oracle ASMLib kernel driver. This is an open-source (GPL) kernel driver and is available from Oracle as source and binary RPMs. Note that although this driver is provided under an open source license, it has not been accepted into the mainline Linux kernel.
- Support tools – **oracleasm-support** provides the utilities to manage the ASM library driver. Oracleasm-support is an open-source package (GPL) and is available from Oracle as source and binary RPMs.
- Application library – **oracleasmLib** package provides the actual ASM library. This is a closed source, binary-only RPM, available as a free download from Oracle.

Oracle introduced ASMLib in 2004 to provide Oracle workloads on Linux with performance and stability comparable to equivalent workloads on UNIX. ASMLib addressed deficiencies – including a lack of async and direct I/O -- that existed in the 2.4 Linux kernel.

The Linux community addressed these deficiencies in the 2.6 Linux kernel with the addition of udev and device-mapper multipath which together with LVM provided native multipathing, scalable native volume management, and persistent device naming. Additionally, the 2.6 Linux kernel added tools for handling large numbers of disks, especially SAN-attached disks.

### **How is ASMLib delivered?**

ASMLib is available as a free download from the Oracle ULN website. Unlike ASM, ASMLib is not included with the Oracle database product. ASMLib is available for Linux only; it does not exist for any other platform. For more details on how ASMLib is distributed, refer to:

<http://www.oracle.com/technetwork/topics/linux/asmlib/index-101839.html>

### **When would I want to use ASM and ASMLib together? What are the advantages and disadvantages?**

Oracle recommends using ASM with ASMLib together for better manageability and persistent device naming. Note that Oracle makes no claims that ASM with ASMLib delivers performance benefits over ASM without ASMLib.

### **Advantages**

- Perceived better manageability.
- Well documented and recommended by Oracle.
- Some Oracle DBAs and SysAdmins are trained in how to use ASM with ASMLib and are comfortable with this environment.
- Optimized for database applications via direct and async I/O provided by the ASMLib kernel driver. Note Red Hat Enterprise Linux kernel 2.6.X supports optimized direct and async I/O for all supported filesystem EXT3/4, XFS, GFS and NFS.



## Disadvantages

- Requires ASMLib kernel driver that is not included in the mainline Linux kernel.
- ASMLib delivers no known performance benefits.
- Red Hat Enterprise Linux with ASMLib does not have government security certification.
- ASMLib is not compatible with SELinux.
- ASMLib is not multipath aware and can silently choose to work through a single path, causing performance and reliability issues.
- Non POSIX system calls for device access lead to issues with trouble-shooting and performance monitoring.

## Can I run an Oracle single instance database with ASM and without ASMLib? What are the advantages and disadvantages? What are the alternatives?

Yes. It is possible to run an Oracle Single Instance database with ASM and without ASMLib by specifying **udev** rules and/or using device mapper multipathing to achieve persistent device naming, both of which are a standard part of Red Hat Enterprise Linux 5 and Red Hat Enterprise Linux 6. The Oracle 11g R2 installation manual, available at the following location, describes how to configure this:

[http://download.oracle.com/docs/cd/E11882\\_01/install.112/e17212/storage.htm#CDEBFDEH](http://download.oracle.com/docs/cd/E11882_01/install.112/e17212/storage.htm#CDEBFDEH)

ASM can use the following for storage resources:

- Block devices (SATA, SAS, FC, iSCSI, FCoE, regular LUNs and LUNs with thin provisioning) with udev naming and/or multipathing.
- Raw Devices.
- NFS v3 with verified NAS vendors.

For more information, see:

[http://download.oracle.com/docs/cd/E11882\\_01/server.112/e16102/asmprepare.htm#BABJBGEE](http://download.oracle.com/docs/cd/E11882_01/server.112/e16102/asmprepare.htm#BABJBGEE)

## Advantages

- Using ASM without ASMLib avoids the overhead resulting from an extra, non-mainline Linux kernel driver.
- Supported and documented by Oracle.
- Using ASM without ASMLib provides the ability to use operating system's native I/O multipathing.
- Using POSIX system calls for disk access enables improved performance monitoring and trouble-shooting.

## Disadvantages

- Customers may have standardized on Oracle deployments using ASMLib.



### **Can I use the Oracle single instance database without ASM or ASMLib ? What are my alternatives? How do I set it up?**

Yes. There are two alternatives to using the Oracle single instance database without ASM or ASMLib:

- Use a local file system such as ext4.
- Use logical volumes such as provided by lvm2 with **dm-multipath** or an optional third party commercial multipathing software.

Red Hat will address this configuration in a forthcoming reference architecture whitepaper.

### **Can I use Oracle Real Application Clusters (RAC) with ASM and without ASMLib? What are my alternatives? How do I set it up?**

ASMLib is an *optional* component of either an Oracle single instance or RAC configuration. Below are alternatives to using ASMLib for RAC:

- ASM with LVM: ASM + block devices + udev naming + multipathing.
- Cluster file systems with cluster volume manager: gfs/clvm (Red Hat Enterprise Linux 5) or Symantec Cluster File System and Symantec Cluster Server (<http://www.symantec.com/business/storage-foundation-for-oracle-rac>).
- NFS v3 with verified NAS vendors.

Red Hat will address this configuration in a forthcoming reference architecture whitepaper.

### **Can I use Oracle Real Application Clusters (RAC) without ASM or ASMLib? What are my alternatives? How do I set it up?**

Although most Oracle RAC installations with SAN-attached storage use ASM, RAC can be deployed without ASM if database files are located on an NFS server, certified cluster file system, or raw devices. (Note that Oracle discourages the use of raw devices.)

Red Hat will address this configuration in a forthcoming reference architecture whitepaper.

### **Can I use a Red Hat Enterprise Linux 5 system with ASMLib installed to configure storage that will eventually be used with Oracle on Red Hat Enterprise Linux 6 with ASM?**

Yes. You can use Red Hat Enterprise Linux 5 running ASM with ASMLib, or ASM without ASMLib, to configure ASM devices and then reconnect them to Red Hat Enterprise Linux 6.

### **I already use ASM and ASMLib. How do I migrate from using them to something else?**

This is a simple migration. Perform the following:

1. The DBA stops all database instances using storage through ASM and ASMLib.
2. The system administrator configures **udev** (or **multipath**) to assign permissions allowing ASM processes to have read and write access to ASM devices
3. The DBA changes one ASM parameter to point ASM to the assigned devices.
4. The DBA restarts the ASM instance and databases.
5. As with all data-related changes, a backup is highly recommended.



Red Hat will address this configuration in a forthcoming reference architecture whitepaper.

**Do any reference architectures address the subject of running Oracle workloads on Red Hat Enterprise Linux?**

Yes. A Red Hat Enterprise Linux 5 specific reference architecture whitepaper on this topic can be downloaded here: <https://access.redhat.com/knowledge/refarch/oracle-10g-server-red-hat-enterprise-linux-5-deployment-recommendations>.

Red Hat is working to refresh this whitepaper for Red Hat Enterprise Linux 6.