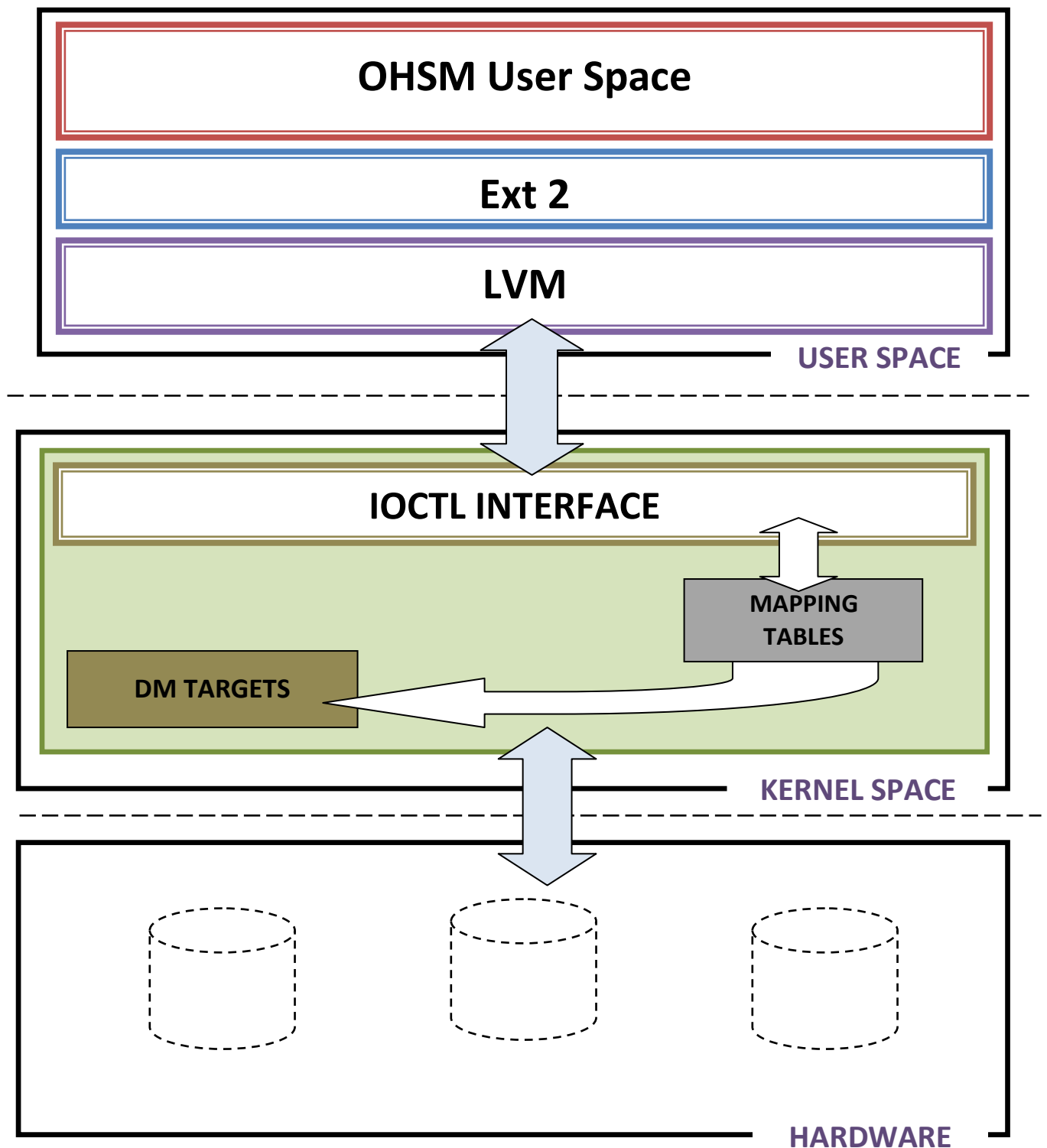


DM in OHSM - implementation Perspective

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Device Mapper API control Interface

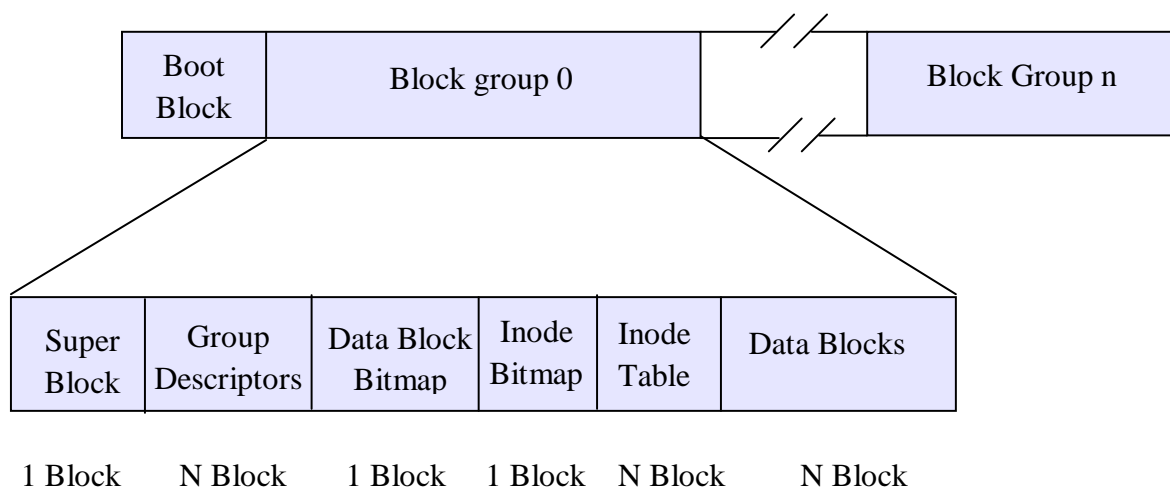


The above diagram displays the device mapper API control interface. The whole system is divided into three parts user space and kernel space and the underlying hardware.

USERSPACE:

The user space consists of logical volume management layer on which a file system is created and on top of it end user application works. This all is supported by device mapper from kernel space. The logical volume management layer i.e. LVM layer is sub divided into three layers which are physical volume, volume group and logical volume.

1. File System:



EXT2 File System

File system is method to store, organize and retrieve all data or files stored in the system effectively. Many File systems are in existence and user uses the one which fulfill his purpose. Well in OHSM we are using ext2 as the file system. It is an open source file system present in Linux. As OHSM is online hierarchical storage management system and it uses multiple devices as tier and Ext2 does not support multiple devices so we require LVM for combining multiple devices so that we can create a file system over it.

Logical Volume Management LVM 2:

Logical Volume Management or LVM is a method of allocating space on mass storage devices. In particular, a volume manager can concatenate together or combine together different partitions of same or different disk into a larger virtual volume that can be used for storing data and information and can be easily resized or moved while it is in use.

Logical Volume Management or LVM provides the system administrator much more flexibility in allocating storage to applications and users. The main advantage of using Logical Volume Management is concatenation of multiple disk and easy expansion of the partitions when they begin to fill up.

KERNEL SPACE:

The kernel space consists of ioctl interface, device mapper. Ioctl are interface that is used for communication between the kernel space and user space. Device Mapper is a generic device mapping facility that is used to map lower level hard disk with Logical Volume Management or LVM.

1. Device mapper:

Device Mapper is a generic device mapping facility introduced in Linux 2.6 Kernel. A paper was produced on device mapper in July 2005, Linux Symposium at Ottawa. It forms the base of LVM2 and offers additional features such as file system snapshots.

Device Mapper is capable of mapping block devices in various ways (e.g. linear, striped, and mirrored). The mappings are implemented in runtime loadable plug-ins called mapping targets. Thus, Device mapper is a modular Linux 2.6 kernel driver. It provides a generic framework to map one block device onto another

Device Mapper is just a core in the Linux kernel which maintains mapped devices (accessible as regular block devices) and their segmented mappings defined in tuples of offset, range, target, and target-specific parameters. Offset and ranges are in units of sectors of 512 bytes. Such tuples are called targets. A list of targets defining segments in the logical address space of a mapped device make up a device mapping table known as dm table.

The role of device mapper is to maintain a table which contains complete information of all the devices on which LVM is formed. It stores all this information in a structure known as dm-table which has many fields like num targets which store the number of disk attached to the device mapper and it contain another structure dm-target which hold the logical begin offset and the length of a particular device which are used to map the data from the user space to the hardware level.

HARDWARE LEVEL:

The hardware level comprise of only hard disk in which actual data is stored by the help of device mapper. These disk are divided into fast skuzzy disk or tape drives .

CONTROL FLOW OF DM-API

The role of dm-API is to fill the table which is used by the OHSM administrator for inode and block allocation.

- As OHSM is carried on multiple tier and ext2 file system does not support it, so we have to create a logical volume on multiple disks.
- As the logical volume is created the device mapper maps and store the device information in its table known as dm table. It is linear table which store all the information such as begin, length and major and minor number which is required to indentify the device.
- Now we can store the information mapped by the dm table in our OHSM_DM_INFO table
- We can create an ext2 file system on the created logical volume.
- As Ext2 file system is divided into block groups and in OHSM as we are allocating inodes and blocks depending on the user policies so we require block group range of each tier or disk before allocation.
- To set the block group range in BG_INFO table we require the block size and number of block groups of the current file system and thereby carrying out some simple algebraic operation we can get the block range.
- Once we have filled both our table the work of dm-api is finished and now we have to supply both table to OHSM administrator for block allocation.