



PROFESSIONAL SERVICES TECH NOTE #059

Fixing LUN Alignment issues

The Concept

Every layer of Filesystem and operating system is like a musician in a band. In a NAS environment, the WAFL Filesystem is an orchestra conductor setting the rhythm and tempo. In a SAN or virtual environment, each musician sets their own rhythm and tempo. If they aren't playing in sync, they sound like a bad Jazz band rather than the London Symphony Orchestra. Instead of instruments, each layer uses block boundaries to specify the 'rhythm' of how the blocks are addressed and the 'tempo' of how data is saved into the data blocks.

NetApp's WAFL Filesystem uses 4KB block sizes so each layer of client Filesystem and OS must align to 4KB using offsets (different storage vendors require different offsets). Misalignment occurs when any of these layers uses an offset not divisible by 4KB. Each layer builds on the layer above it so misalignment becomes further compounded. Performance is degraded because WAFL may be forced to read and write to twice as many blocks than the host requests because data is partially filling two blocks rather than one block. The SnapDrive application accounts for many of these conditions, which is why NetApp recommends it over other LUN creation methods. Use the following resources and documents to find alignment issues and fix them.

Tools

mbrscan – checks VMDK partition alignment and is included in ESX Host Utilities Kit

http://now.netapp.com/NOW/download/software/sanhost_esx/ESX/

mbralign – aligns VMDK partitions (with several caveats) and is included in ESX Host Utilities Kit

fdisk – Linux command to manage partitions. Follow instructions in TR-3747

diskpart.exe – Windows command to manage disk partitions. Follow instructions in TR-3747

Documentation

Windows:

How to diagnose misaligned I/O on Windows hosts -

<https://now.netapp.com/Knowledgebase/solutionarea.asp?id=kb36108>

Linux:

Best Practices for creating partitions in Linux for use with NetApp LUNs

<https://now.netapp.com/Knowledgebase/solutionarea.asp?id=kb8190>

Virtual Environments:

TR-3747 Best Practices for File System Alignment in Virtual Environments (great read on alignment in general)

<http://media.netapp.com/documents/tr-3747.pdf>

ESX Host Utilities 5.1 Install Guide: How to troubleshoot VMDK partition alignment issues:

<http://now.netapp.com/NOW/knowledge/docs/hba/esx/esxhu51/html/software/install/GUID-8A801FFE-AE44-4BDB-853F-B488A4899031.html>

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