

WHITE PAPER

# **Automatic FAL Remediation and Improved Performance for MEDITECH**

## Overview

According to MEDITECH Technical Support, a significant number of MEDITECH customers have faced unscheduled downtime due to excessive NTFS file fragmentation that resulted in the File Attribute List (FAL) reaching its size limit. As a result, MEDITECH requires all 5x and 6x customers to address this issue, and has endorsed both ConduSiv® Technologies' V-locity® and Diskeeper® I/O reduction software for "...their ability to reduce disk fragmentation and eliminate File Attribute List (FAL) saturation. Because of their design and feature set, we have also observed they accelerate application performance in a measurable way," said Mike Belkner, Associate VP, Technology, MEDITECH.

Belkner added, "We are pleased that ConduSiv has continued to enhance their solution and their products are strongly recommended."

After extensive experience in helping MEDITECH hospitals remediate the FAL issue and accelerate performance, this brief is a compilation of what we have learned about the FAL size growth issue, why and how it affects MEDITECH hospitals, and the MEDITECH-specific tools we have further enhanced to eliminate downtime risk while also delivering significantly faster EHR performance without any additional hardware.

## The Problem

When someone mentions heavy fragmentation on a Windows NTFS Volume, the first thing that usually comes to mind is performance degradation. While performance degradation is certainly bad, what's worse is application failure. That is exactly what happens in severely fragmented environments when no more data can be added to files or no more files can be inserted under a folder file. These are show-stoppers that can stop a business in its tracks until the problem is remediated.

In the Windows NTFS file system, there is a file record created for every file that exists on a volume.

Each file record contains metadata structures that define the file. As some files grow in size and complexity (i.e., more and more fragmented data), they can be assigned additional metadata structures. One of these metadata structures is called the File Attribute List (FAL). The FAL structure can point to different types of file attributes, such as security attributes or standard information such as creation and modification dates and, most importantly, the actual data contained within the file. For example, the FAL can keep track of where all the data is for the file. The FAL actually contains pointers to file records that indicate the location of the file data on the volume. If that data has to be stored at different logical locations on the volume, which means more fragmentation, more pointers are required, which in turn increases the size of the FAL. Herein lies the problem: the FAL size has an upper limitation of 256KB. When that limit is reached, no more pointers can be added, which means NO more data can be added to the file. And, if it is a folder file which keeps track of all the files that reside under that folder, NO more files can be added under that folder file. Once that occurs, application failure can result, causing a shut down of the program until resolved which can require a long period of system downtime. Not what users want!

So what can be done about it?

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The logical solution would be – why not just defragment the volume? The problem is that traditional defragmentation utilities can cause the FAL size to grow. While it can decrease the number of pointers, it will not decrease the FAL size. In fact, due to limitations within the file system, traditional methods of defragmenting files cause the FAL size to grow even larger, making the problem worse even though you are attempting to remediate it.

### **AUTOMATIC FAL REMEDIATION AND IMPROVED PERFORMANCE FOR MEDITECH**

Currently, if a FAL reaches the size limitation, the only resolution is to bring the volume offline, which can mean bringing the system down, then copying the file to a different location (a different volume is recommended), deleting or renaming the original file, making sure there is sufficient contiguous free space on the original volume, rebooting the system to reset the free space cache, then copying the file back. This is not a quick cycle, and if that file is large in size, this process can take hours to complete, which means the system will remain offline while attempting to resolve.

## **The Solution**

ConduSIV Technologies has introduced a new innovative technology into the latest V-locity® 7.0 and Diskeeper® 18 Server product lineup to address this FAL size issue. This new technology is called MediWrite which contains features to help prevent this issue from occurring in the first place and give sufficient warning if it is occurring, so it can be properly handled at the user's convenience.

- **Unique FAL handling:** As indicated above, traditional methods of defragmentation can cause the FAL size to grow even further. MediWrite™ will detect when files are having FAL size issues and depending on the severity, dynamically determine how to apply an exclusive method of defragmentation that helps stem the FAL growth. An industry first.
  - **Unique FAL safe file movement:** With other defragmentation processing in V-locity and Diskeeper, such as free space consolidation, it will automatically detect if the file being processed has a FAL size issue. If so, it will use the unique method above in defragmenting it to suppress any further FAL size growth and also prevent any further FAL growth during the defragmentation processing.
  - **Enhanced Free space consolidation engine:** One indirect cause of FAL size growth is the extreme free space fragmentation found on some MEDITECH volumes. A new Free Space method has been developed to handle these extreme cases while also supporting the above FAL safe file movement technology.
  - **Unique FAL growth prevention:** Along with MediWrite, V-locity and Diskeeper contain another very important technology called IntelliWrite® which automatically prevents new fragmentation from occurring. By preventing fragmentation from occurring, IntelliWrite minimizes any further FAL size growth issues.
  - **Unique Offline FAL Consolidation tools:** The above technologies help stop the FAL size from growing any larger, but due to File System restrictions, it cannot shrink or reduce the FAL size online. To do this, ConduSIV developed proprietary offline tools that will reduce the FAL-IN-USE size in minutes. This is extremely helpful for companies that already have a file FAL size issue before installing our software. With these tools, the user can reduce the FAL-IN-USE size back
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down to 100kb, 50kb, or smaller and feel completely safe from the maximum FAL size limits. The reduction process itself takes less than 5 minutes. This means that the system will only need to be taken offline for minutes which is much better than all the hours needed with the current Windows copy method.

- **FAL size Alerts:** MediWrite will dynamically scan the volumes for any FAL sizes that have reached a certain limit (the default is a conservative 50% of the maximum size) and will create an Alert indicating this has occurred. The Alert will also be recorded in the Windows Event log, plus the user has the option to get notified by email when this occurrence happens.

It is important to note that MediWrite and the patented fragmentation prevention engine, IntelliWrite in V-locity and Diskeeper Server does much more than just eliminate downtime risk – it significantly boosts MEDITECH EHR performance. For additional resources, including case studies, visit <http://www.conduSiv.com/solutions/meditech-solutions/>

By automatically preventing fragmentation from occurring, files will be processed from server to storage in a clean, sequential manner, which enables systems to process more data in less time. In a SAN environment, a highly fragmented logical disk amplifies the IOPS requirement for any given file since the Windows OS sees that file existing as multiple separate pieces at the logical layer with each piece requiring its own dedicated I/O operation to process. Fragmentation prevention enables Windows to write (and subsequently read) files in a more contiguous fashion, so only minimal I/O is required to process any given file from server to storage.

This also reduces the performance dampening that occurs in virtual environments from the “I/O blender” effect since less I/O is being pushed through the hypervisor to process any given workload. MEDITECH customers looking for additional performance tend to opt for the V-locity I/O reduction solution as it includes an additional server-side caching engine to further reduce I/O to the storage subsystem.

To request a V-locity or Diskeeper evaluation, visit [www.conduSiv.com/try](http://www.conduSiv.com/try)

To contact a solutions specialist, email [sales@conduSiv.com](mailto:sales@conduSiv.com)

For more information, visit [www.conduSiv.com](http://www.conduSiv.com)

## About ConduSiv

ConduSiv® Technologies is the world leader in software-only storage performance solutions for virtual and physical server environments, enabling systems to process more data in less time for faster application performance. ConduSiv guarantees to solve the toughest application performance challenges with faster than new performance via V-locity® for virtual servers or Diskeeper® or SSDkeeper® for physical servers or PCs. With over 100 million licenses sold, ConduSiv solutions are used by 90% of the Fortune 1000 and almost three-quarters of the Forbes Global 100 to increase business productivity and reduce datacenter costs while extending the life of existing hardware.

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