



Best Practices with Dynamic Capacity

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compellent

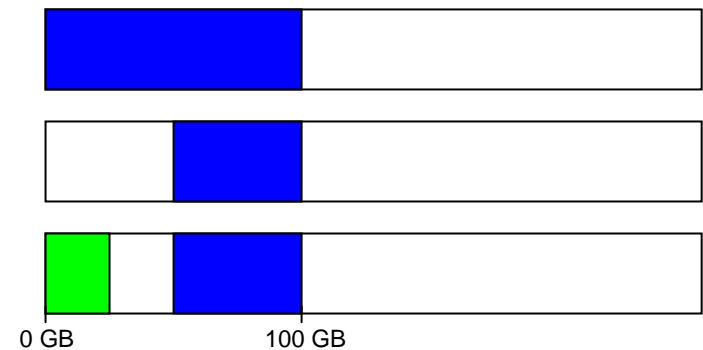
- Problem definition
 - How different operating systems recover file space
- Tools available
- Compellent recommended software
- Test case scenario
- Recommend settings
- Resources
- Demonstration

- **Dynamic Capacity**
 - Allocate more virtual space than actual space
 - Operates on a block level
 - Has no file system knowledge
- **Dynamic Capacity presents Volume(s) to OS**
 - OS determines where volume data is written
 - Windows does not re-use free space on volume after data has been deleted
- **Specific Microsoft OS limitation**

- Linux and Solaris
 - Accurately report high watermarks

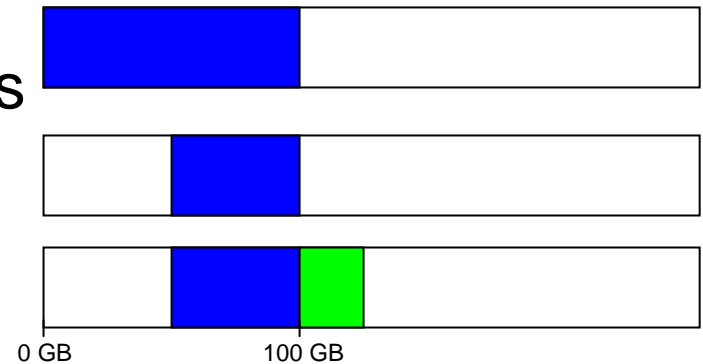
- Example

- Write 100 GB of data in Solaris
- Delete 50 GB
- Write out another 25 GB
- OS reports 75 GB

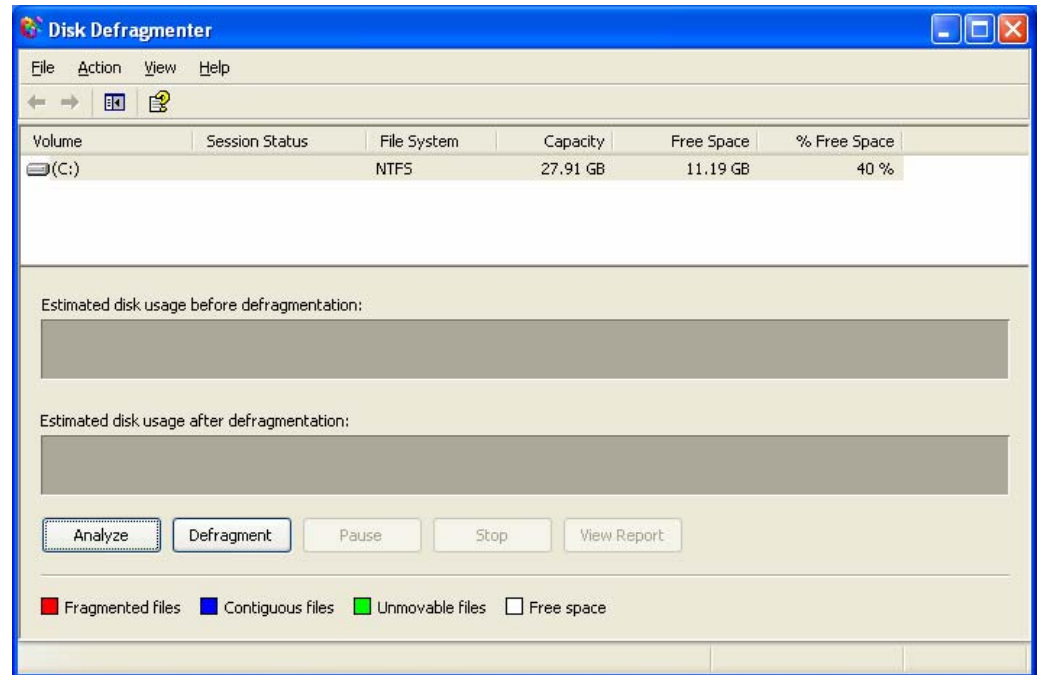


- Storage Center reports 100 GB of written data, but the OS shows 75 GB
- Storage Center volume will not increase until 100+ GB of data mark is passed of actual data written

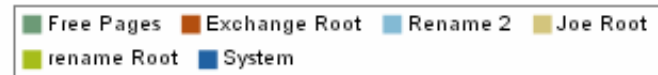
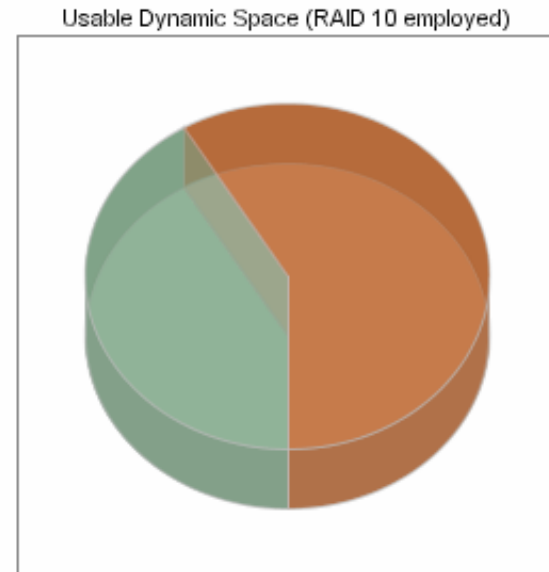
- Windows will actually go out and grab new space in the same scenario
- Example
 - Write 100 GB of data in Windows
 - Delete 50 GB
 - Write another 25 GB
 - OS reports 75 GB
- Windows OS allocates next available free space
 - Compellent Reports 125 GB of written data
 - Actual data is 75 GB
 - Windows does not re-use free space on volume after data has been deleted



- Windows environments require a defragmentation utility
- Microsoft's Disk Defragmenter manager does not reorder the space on a windows volume



- Full View of Pagepool with Volumes
 - Total space = raw space
 - Usable space = raw space not currently used
 - Volumes are listed as different colors in the Pie Chart
 - Volume size listed below Pie Chart



Total Space: 170.88 GB	Exchange Root: 100.10 GB
Usable Space: 70.77 GB	Rename 2: 0.00 MB
System Space: 14.00 MB	Joe Root: 0.00 MB
	rename Root: 0.00 MB

- Test case
 - Write 50 GB of data
 - Delete 25 GB
 - Write another 25 GB
 - Windows does not re-use free space on volume after data has been deleted

Storage Center

■ solaris8 test vol Root ■ defrag test vol Root ■ System

Total Space: 325.40 GB

Usable Space: 213.09 GB

System Space: 26.00 MB

test vol Root: 256.00 MB

FS2 Vol1 Root: 15.00 GB

solaris8 test vol Root: 21.95 GB

defrag test vol Root: 75.08 GB

Windows Disk Defrag Tool

Estimated disk usage before defragmentation:



New Volume (E:)

Local Disk

199 GB

149 GB

- **Winternals Defrag Manager™**
- **Executive Software V3.0Diskeeper™**
- **Raxco V9.0PerfectDisk™**
- **O&O Defrag V6**

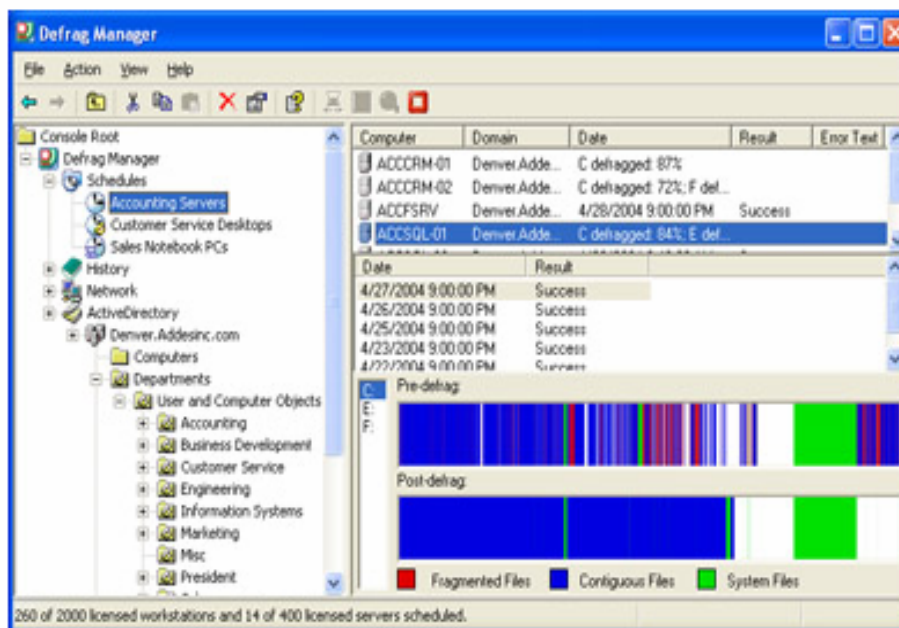


Defrag Manager



Defrag Manager: Product Overview

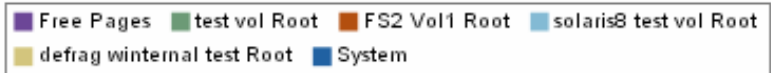
Defrag Manager is an advanced enterprise defragmenter that delivers maximum data safety, exceptional performance, and unmatched ease of use. Defrag Manager makes it easy to defragment every Windows NT, 2000, XP, and Server 2003 computer on the network automatically, from a single installation on your machine.



260 of 2000 licensed workstations and 14 of 400 licensed servers scheduled.

- Test case
 - Write 50 GB of data
 - Delete 25 GB
 - Run Winternals Defrag manager
 - Write another 25 GB

Storage Center



Total Space: 325.40 GB

Usable Space: 238.08 GB

System Space: 28.00 MB

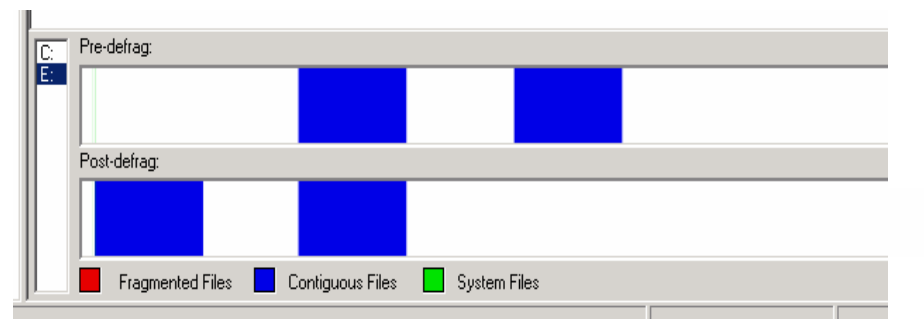
test vol Root: 256.00 MB

FS2 Vol1 Root: 15.00 GB

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defrag winternals test Root: 50.08 GB

Windows Disk Defrag Tool



New Volume (E:) Local Disk

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149 GB



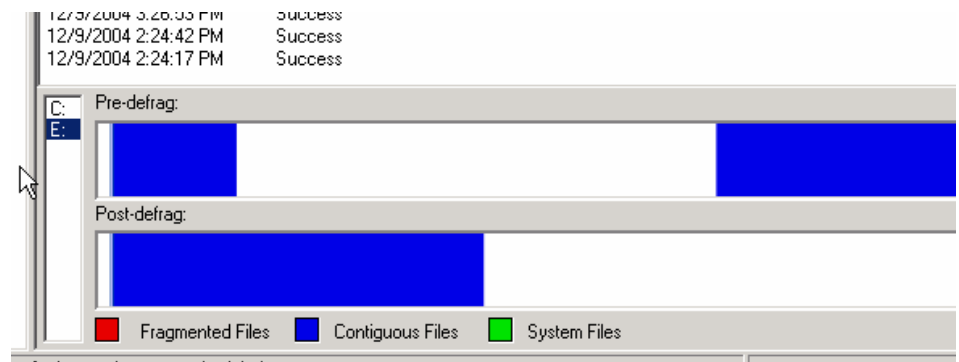
Winternals Best Practices



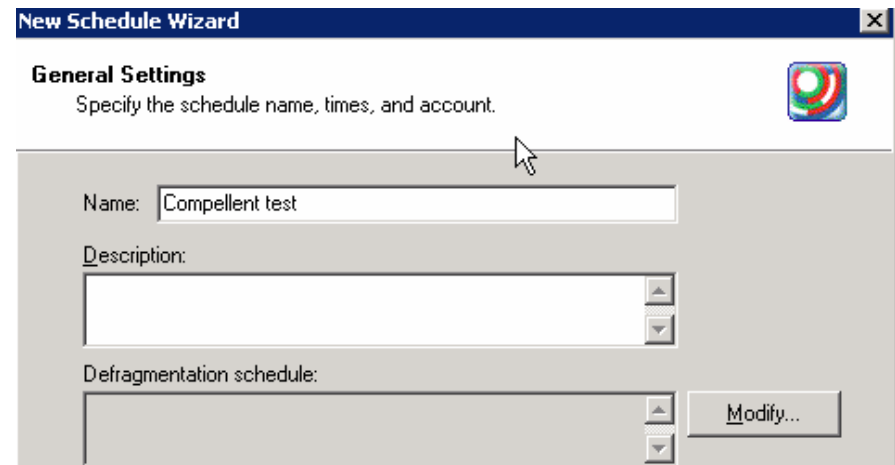
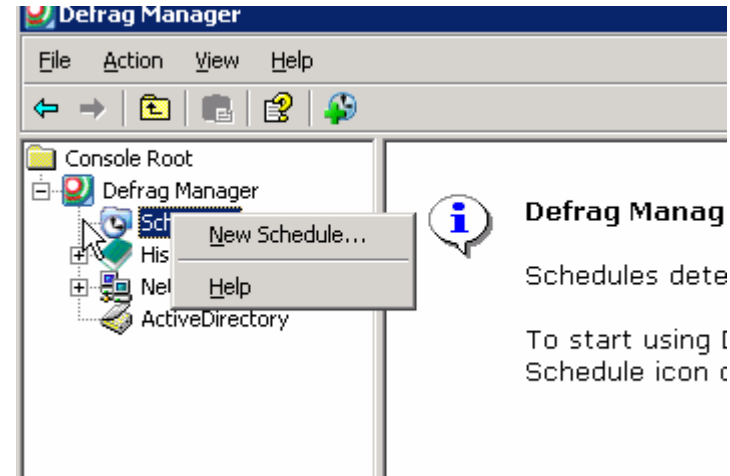
compellent

- Winternals re-orders space within windows
- **MUST** be run aggressively to be effective
 - Once a month will not reorder space on volumes that have large amounts of read/write/deletions of files
- May need to be run more than once to get space to re-order
 - Initial run may only defragment files, continuous usage will reorder space appropriately

Winternals Defrag Manager



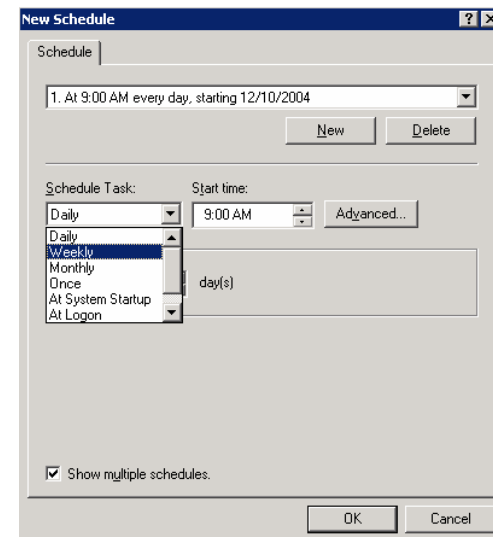
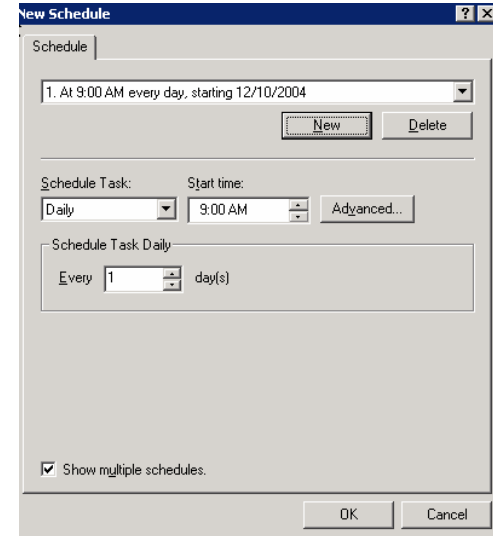
- To schedule defrag manager, account with admin rights is required
- Right click on schedule, then left click “New Schedule”
- Name the schedule and then click “modify” to set the actual frequency of using the utility



- **MUST** be run aggressively to be effective
 - Once a month will not consolidate free space
- **File/Print servers**
 - With large amounts of written and deleted data will benefit with increased performance
- **Volumes with SQL/Exchange**
 - Logs will benefit from consolidation and not grow as rapid
 - NOT to be run on databases
 - Databases have own Defrag utility

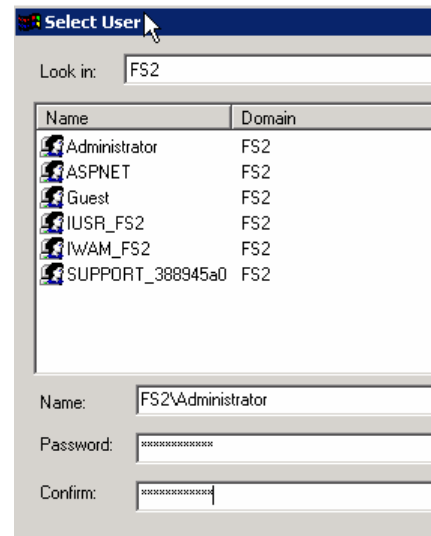
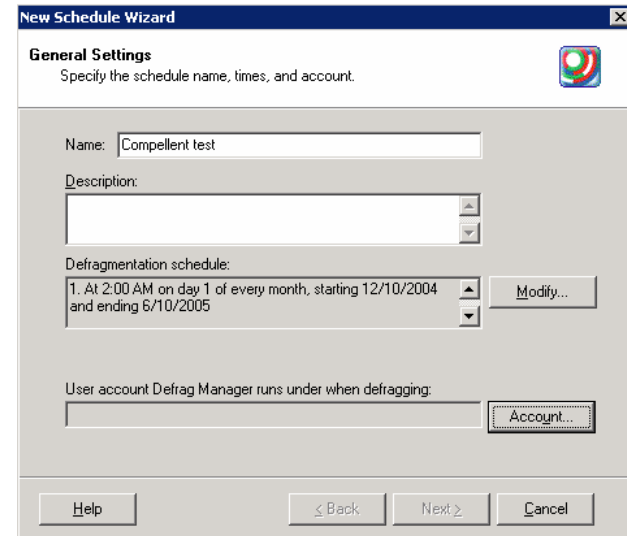
- CPU intensive
 - Schedule to run off hours AND for a specific amount of time
- Defragmentation time decreases with aggressive scheduling
 - First time may take hours, next schedule can decrease to minutes depending on volume size

- Modify the schedule to business requirements
- Best practice for this is to schedule off-hours defragmentation (low server usage time)
- Scheduler integrates in Active Directory
- Scheduling allows for daily, weekly, monthly cycle
- You can also schedule multiple days within a week (example: Wednesday/Saturday weekly schedule set to run for a year)
- Schedule can be modified at any time

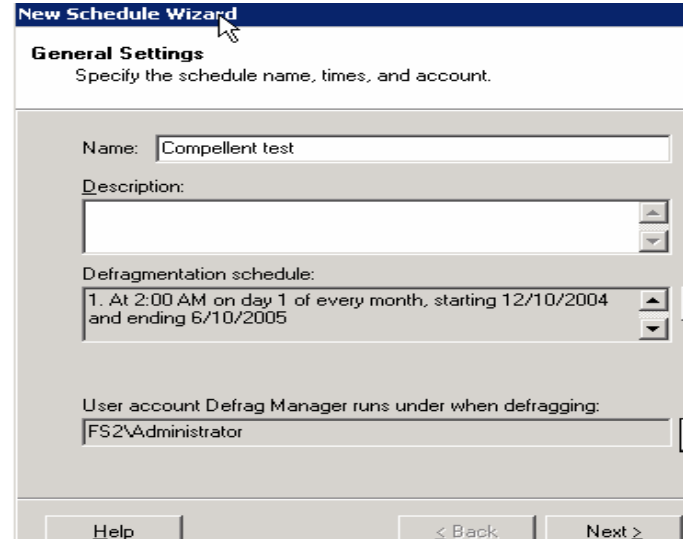


- Scheduled the utility to run
 - At 2:00 AM on the 1st of every month
 - Until June 10th of 2005
 - Can be set to run daily, weekly, monthly or on boot

- Select an account that has Administrator privileges to run the product



- Ready to run with a few settings included
- As a system administrator / engineer, use the following settings



New Schedule Wizard

General Settings
Specify the schedule name, times, and account.

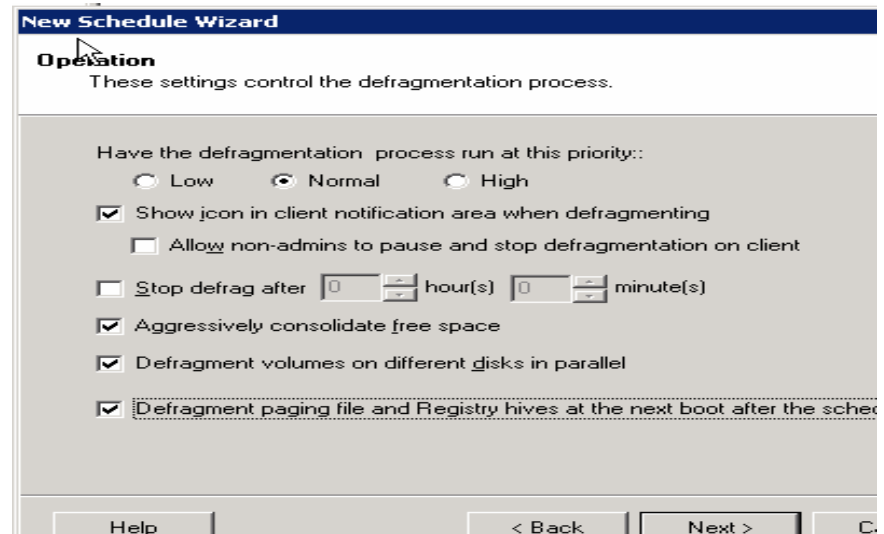
Name:

Description:

Defragmentation schedule:
1. At 2:00 AM on day 1 of every month, starting 12/10/2004 and ending 6/10/2005

User account Defrag Manager runs under when defragging:

Buttons: Help, < Back, Next >



New Schedule Wizard

Operation
These settings control the defragmentation process.

Have the defragmentation process run at this priority::
 Low Normal High

Show icon in client notification area when defragmenting

Allow non-admins to pause and stop defragmentation on client

Stop defrag after hour(s) minute(s)

Aggressively consolidate free space

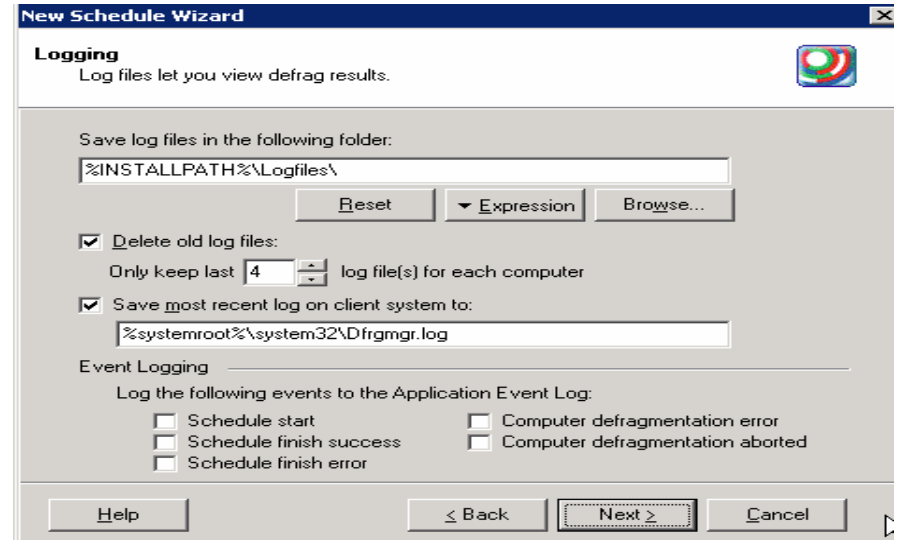
Defragment volumes on different disks in parallel

Defragment paging file and Registry hives at the next boot after the sched

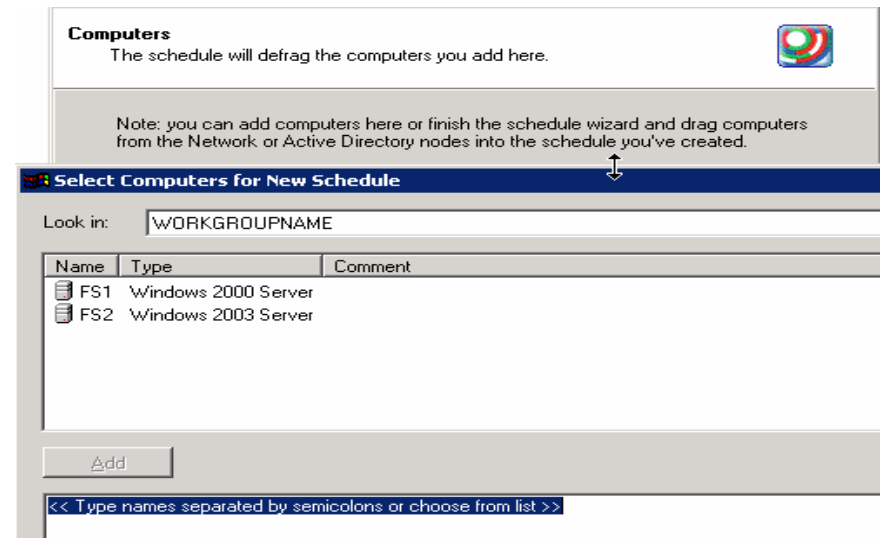
Buttons: Help, < Back, Next >

Defrag Manager optional settings

- Select which event you would like to see in the System event viewer



- Select which servers to defrag



- Defrag runtime on a server with an 18 GB local partition
 - 66% consumed
 - Run time approximately 20 minutes
 - Multiple small files
 - Second run took 2 minutes with normal file changes over a week

- Defrag runtime on 200 GB Compellent Drive
 - 25% consumed
 - 2 25 GB large block files
 - First run took 70 minutes
 - Second run with minimal changes took 5 minutes

- Winternals Informational links/whitepapers
 - <http://winternals.com/es/documentation/DefragmenterPerformance.pdf>
 - <http://winternals.com/es/solutions/defragnewfeatures.asp>
- Contact information
 - www.winternals.com