Tunable NT Knobs
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Tunable NT Performance Knobs…..Yes, Virginia, they really do exist.
The NT operating system can be turned, but it's knobs are hidden.
Benefits: Learn which NT knobs are most important to performance
                Learn where to find these knobs and how to use them
                Learn how to test the results

Intro

Microsoft wanted the reputation of creating an operating system with "no knobs" that would automatically do everything the administrator would normally do without the administrator. However, they also understood the need for some human intervention and tuning "knobs". So they created Windows NT with, what they thought would be, the best of both worlds. They put in the knobs, …they just didn't tell anybody about them! There are a few of us who have found out what they are, and where to find them, and I am willing to pass this information on to you.

Background

During my years working with the Windows NT operating system, I have been impressed by its versatility and user-friendliness. It is exactly these attributes that make this operating system so popular. Beneath its user-friendly appearance, however, it is a complicated animal. Since it "does everything" by itself in the background, it is difficult to understand just how it does it and make changes to run better in a particular environment. This can be an administrator's nightmare! How do you change the virtual memory setting? How do you keep it from running so slowly? How do you…..?

This paper will help to give you a better understanding about the performance issues of your NT box, and where all those hidden parameters reside, and how to change them.

Let's talk "Dedicated Systems"

One thing all administrators agree on is that NT is NOT what they would consider a "robust" system. It is not forgiving when an extra load is put on the system. It is does not like a Mixed environment; it tends to crash when used to service printers, along with networks, and databases.

Administrators of high-volume shops have been using dedicated systems for a few years now with excellent results. "Dedicated System" simply means using only one NT machine as a server for each task needed to maintain your business. Printer functions would, therefore, be serviced by one machine dedicated only to the task of managing spool files and printers. Network functions would be serviced by another machine, and so on. Due to the reasonable cost of NT machines (as compared to a Unix server), using one NT per task type is not out of the question. Granted, the Unix box is robust enough to handle such a mixed environment, therefore only one of these expensive machines is necessary. However, this dedicated configuration has one added advantage over a more robust server; redundancy. If one machine goes down, your shop does not have to close. The users simply cannot perform certain functions for a while. This may prove to be an inconvenience, even an annoyance, but is it hardly a catastrophic corporate event.

System Knobs

Processor

If you find you have a slow system, and the task manager shows a particular process using all the CPU, you can change the process's priority by right-clicking on the Image Name of the process (in the Task Manager's Processes tab), and choosing Set Priority. Most priorities run at the NORMAL level. These can be changed to run at the LOW priority level. A HIGH priority can be reset to run at the NORMAL level for a short period of time; however, there is normally a reason they were set to run at the HIGH level in the first place. After waiting a few seconds, replace the priority setting back to HIGH and call the vendor of that application for help. Most REALTIME priority processes are operating system processes and should NOT be altered.

Memory and Paging

Start with enough memory. Memory prices have come down in the past 5 years. Now we are able to work on the "More is better" rule.
For Windows NT 4.x;
16 MB = MS minimum standard but not enough to **effectively** run applications on an NT workstation and should not be used as a server.
32 MB = Effective as a server for most user environments with 1-5 users or as a workstation.
64 MB = No problems. Run graphics applications and multitask.
128MB = For large servers, multi-role environments and is standard for DB and file servers.
256MB = Would be necessary for large, mission critical servers.

For Windows 2000:
64 MB = MS minimum for the Professional Version on workstations but tends to
        be buggy.
128MB = Is recommended by most independent sources.
256 MB =Is the MS recommended minimum for Servers

Wondering how much virtual memory you need to configure? Try these ratios:
For a 64MB system to a 128MB system the Virtual : Real ratio should be 1.5 :
2.0, or 50% to 100% more virtual memory as physical (real) memory depending
on demand. For larger machines with 256MB of RAM, a 1.0 : 1.5 ratio will be
enough without dedicating too much harddrive space.

Change the virtual memory size through Start \ Control Panel \ System \
Performance \ Virtual Memory Change button.   For example; 128MB of RAM
should have 192MB of Initial VM space and 256MB of Maximum space. Although
the "Recommended" size is usually too low, swap files take up valuable storage
space. Do not configure more than is needed.

A good way to decide how much swap space your system needs is to begin by
dedicating swap space equal to physical memory. Then watch the Task
Manager's Performance tab. If the "Commit Change" peak (or high water mark) is
close to the Limit, you will want to increase this limit by increasing the Initial and
Maximum sized through the Control Panel as discussed in the previous
paragraph. You may also notice that the system is slow or having high page
faults. These are also indications that the virtual memory should be increased.
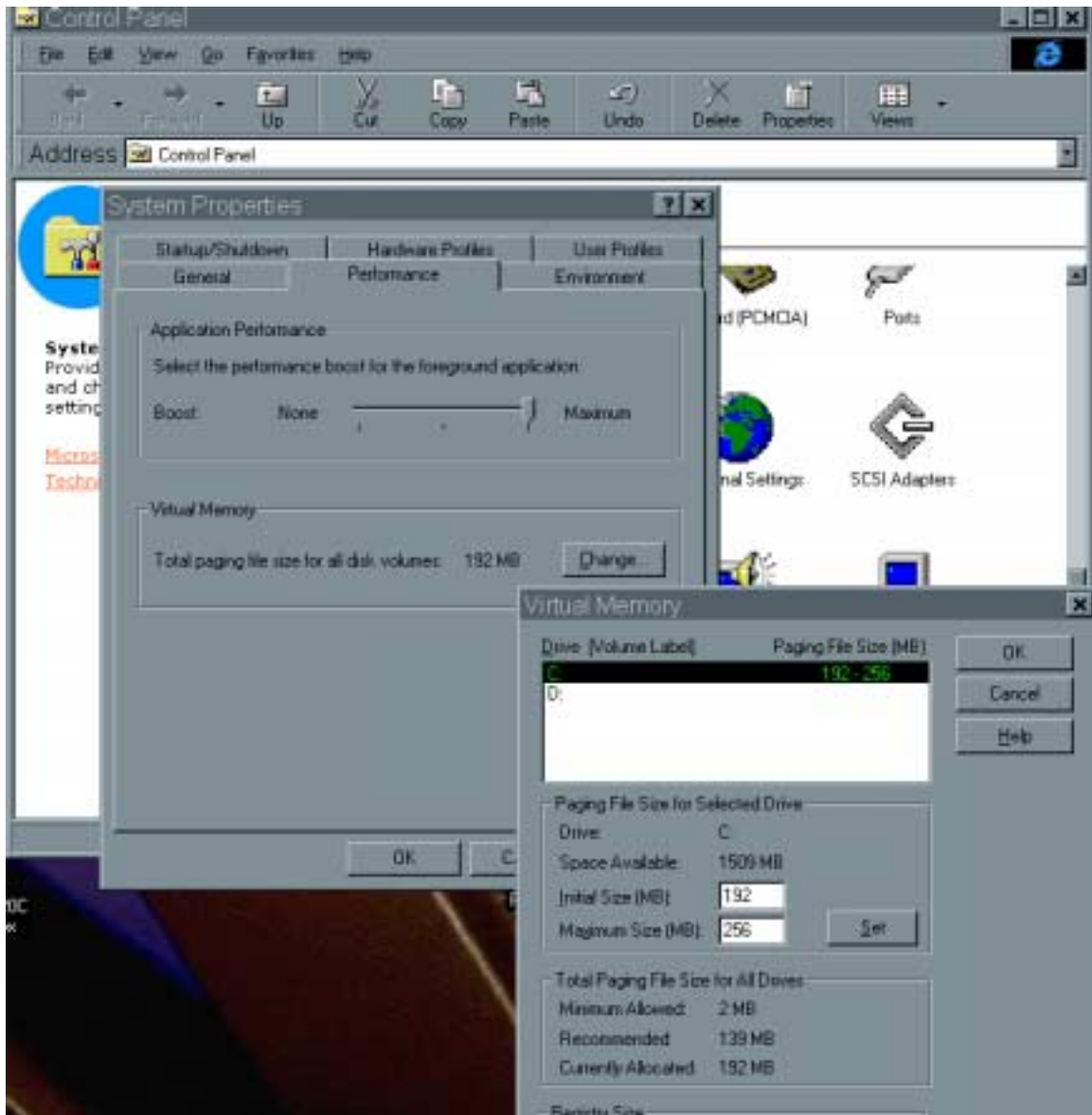
Remember to make the paging file bigger when you add memory!

Increase the Internet Information Services counter to get better cache hits performance – tune, monitor, tune, monitor.

Since writes are normally deferred until the system runs out of memory, a UPS (Un-interruptible Power Supply) is especially important. New data that is not saved to disk will be lost in the event of a power surge or brown-out.

For network servers use the "Maximize Throughput for Network Applications" setting for best performance. In the case of a file server, however, use the default server setting "Maximize Throughput for File Sharing" instead. SQL (Network

application) servers do their own memory management so no settings need to be changed.

To find this, go to network properties, select the services tab, then select the "Server" item. Click on the "Properties..." button and the dialog with those server settings will pop up.

The network dialog can be reached by right clicking on Network Neighborhood and selecting Properties or by entering the Control Panel and clicking on the Network icon.

Network Knobs

"Trusted domains" can be set up to make the network data more accessible. A domain is a grouping of data information. You might have one domain with only the accounting database in it, another domain for shipping data, and still another for employee information. Each user, having a limited amount of responsibilities can have a logon that will allow access to only one of these databases. Accounting people can log on to the accounting database; shipping clerks can access just the shipping information; Managers could access to the employee information.

So what happens when you hire an employee with a title of "Customer's Advocate?" We will call this employee Pat. If a customer complains that he/she has not received products that were suppose to arrive last week, Pat would need to know when this shipment was sent to this customer. If it was never shipped, Pat may need to find out from the accounting database if the customer's payment was received. Let's say Pat finds the payment and the check has cleared, but she has also found the status of the shipment to read "on hold". Now Pat will need to ask the sales representative and/or shipping clerk why this shipment is being held. To do this, Pat will need access to the employee database where the business phone extensions and home phone numbers are stored. The shipping clerk says the sales representative wanted the shipment held. However, the sales rep is working from home today, so Pat needs to call him there. Finally the sales rep explains that the customer actually wanted an updated version of the product. The current version, which is in stock and being shipped, does not have the features the customer was looking for. Now Pat can report back to the customer that it has taken a few days longer than anticipated to get the "new and improved" product version into production, but it will be available and shipped tomorrow.

As you can see, during this process, Pat needed information from three different departments (accounting, shipping, and employee database). Since most employees do not need this level of access, Pat's need to access 3 databases is unique. Hence the need for "trusted domains".

The idea here is that "any user of yours is a user of mine". This can be administered from one centralized location or from any machine in the workgroup through the Primary Domain Controller (PDC). This makes it easier to administer than a workgroup where a user must have an account on the log on computer. The domain user can log on to any machine in the domain to obtain the information required. So, Pat can be set up as a user of a particular domain called "Advocates" and would then be able to access the required information from any domain machine.

How to Set Up the Trust Domain

On the trusted server under START \ PROGRAMS \ ADMINISTRATIVE TOOLS \ USER MANAGER FOR DOMAINS \ POLICIES \ TRUST RELATIONSHIPS \ ADD BUTTON \ enter the PERMITTING DOMAIN name and passwords. Do this on each trusted Primary Domain Controller.

On the Permitting Domain box, start the USER MANAGER \ POLICIES \ TRUST RELATIONSHIPS \ ADD BUTTON \ add name of Trusted Domain name.

Setting up Domains: CONTROL PANEL \ NETWORK ICON \ NETWORK PROPERTY SHEET \ IDENTIFICATION tab - be sure to set security ID's accordingly and change the configuration of all the groups in the domain you want to be accessed. Then, update the Backup Domain Controllers. All existing trust relationships will have to be reconfigured; and at the workstations, you will need to update all persistent connections to resources on the servers.

Hardware Knobs

Disk Knobs

Turn on DiskPerf with options " diskperf -y" to see performance data in PerfMon. Otherwise, NO disk information will be seen. The DiskPerf must start during the boot process to be seen by the Performance Monitor tool. To set the disk performance counters on a computer called PRODUCTION to start at boot, type; "diskperf -y \\production " at the START \ RUN \ OPEN field.

The correct syntax is;
diskperf [-y|-n] [\\computername]
Where "-y" sets the system to start disk performance counters when the system is rebooted, and "-n" sets the system to not use disk performance counters when the system is rebooted.

If possible, install CD-ROMs on their own IDE (Integrated Drive Electronics) chains so as not to reduce the performance of any permanent storage devices.

Miscellaneous Knobs

- For faster installs, copy the contents of CD-ROM to the hard drive. Hard drives work faster.

- Use the Audit menu under START \ PROGRAMS \ ADMINISTRATION TOOLS \ USER MANAGER \ POLICIES \ Audit to enable the events you want to see in the Events Viewer to be found in Start \ Programs \ Administration Tools (Common) \ Event Viewer.
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- The GPO (Group Policy Objects) are held in the following administration access locations and can help you to configure user groups:
  HKEY_CURRENT_USER \ Software \ Policies
  HKEY_LOCAL_MACHINES \ Software \ Policies
  HKEY_CURRENT_USER \ Software\Microsoft \ Windows \ Current Version\ Policies
  HKEY_ LOCAL_MACHINES \ Software\Microsoft \ Windows \ Current Version\ Policies
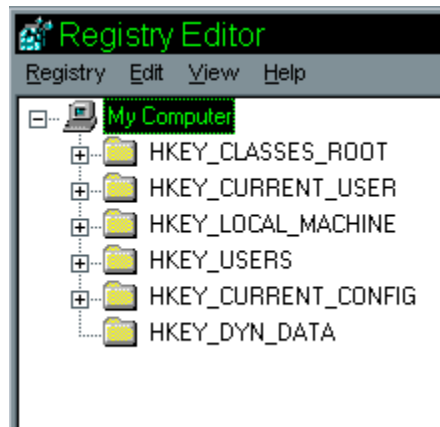
These can be found by running "regedit" from the START \ RUN command. When adding policies, remember to use only 10-12 larger Policies. This has less overhead than 60 smaller policies. The more policies there are on the system, the longer the individual log on time will be.

- Uninstall unused protocols. Each one has it's own downfall. For example, if you are using NetBeui for file server access, uninstall IPX. IPX will continue to tell the network it is available, causing some overhead when it is not used. If you are using the IPX protocol, uninstall NetBeui since NetBeui has been found to have many security holes.

- Limit the Active Directory events. Too many events will cause Domain Controllers to slow down. Auditing at the root level, will cause **Every** DC (Domain Controller) to be logged. This monopolizes resources.

- For Batch processing, use the START command to run jobs in the background and to set their priority.
Syntax:
Start [title] [options] command [arguments]

Example;
Start /b /low run MyJob.exe

Where *Start* initiates the process, (*title* is optional and not included in this example), */b* is the option to run the job in the background, */low* keeps the job running at the low priority level, *run* is the process command *MyJob.exe* is the file to be run.

- The AT command can also be used to run commands and batch jobs at specific times of the day. Since these activities run as background processes, no output is displayed on the computer's screen. You may wish to redirect output to a file. To do this, use the redirection symbol (>). If you redirect output to a file, enclose the name of the command you are scheduling in quotation marks. The current directory for the executing command is the %systemroot% directory.

```
STATUS   ID   Day      Time      Command Line

         0    Each F   04:30PM   net send group leads status due
         2    Each M   12:00AM   chkstor > check.fil
         3    Each F   11:59PM   backup2.bat
```

Example of the use of AT command

For more information regarding the AT command, see the on-line help found under START \ HELP.

As you can see from this report, there are many settings an administrator can use to avoid being at the mercy of Microsoft. Most of these can also be found in Windows 2000, although most settings in the memory section are not configurable for that operating system. Windows 2000 is designed with greater intelligence regarding the use of memory. Therefore, these knobs have been taken away.

Thank you for attending this presentation. Good luck on all your NT tuning.

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