


Windows NT/2000 Performance and Capacity Key Metrics

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Capacity and Performance

- Performance Tuning
 - Identify bottlenecks and take immediate corrective action
- Capacity Planning
 - Anticipate future bottlenecks and avoid them
 - Understand current usage
 - Project for expected changes


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NT Data

- There is a very rich set of data available in NT from Performance Monitor
- It is critical to avoid data overload
 - Particularly in time critical performance situations, it is vital to pinpoint the problem and correct it rapidly

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INFORMATION IS NOT KNOWLEDGE!!

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Still only categories of data



- Processor
 - I/O
 - Memory
-
- What about Network ?

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Performance Standard



- If the processor is not excessively busy and work is completing on schedule, all is well.
- If work is not meeting service levels and the processor use is excessive, begin by examining the processor.

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Performance Standard



- If work is not meeting service levels and the processor use is not excessive, look to I/O or memory as the problem.
- Beware: It is not quite that simple.

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NT Differences



- NT servers will run short of memory before any other resource. Watch this carefully. NT seems to consume memory.
- Even when it looks like there is another resource problem, check memory as well.
- When memory problems have been ruled out, disk and network should be checked next.
- The best performance gains in NT will come from tuning memory, disk and network subsystems, in that order.
- In case it hasn't become obvious, NT exhibits a change from previous platforms in that CPU is the least important resource to consider

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Performance Analysis Process



1. Start monitoring your system now and develop a baseline.
2. Monitor and review your system regularly to anticipate problem.
3. Identify the problem resource using the program outlined above; using the metrics defined below.
4. Make sure you have a tested backup of the system, files and applications before making any changes.
5. Whenever possible, change one variable at a time and document everything.
6. Benchmark after the change to quantify the effects and to ensure system stability.
7. Go back to step 2.

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Prerequisites



1. If you are interested in network data, make sure to add the SNMP service to collect data on the network interface object so that you will get info concerning the network interface card.
 - Select Start/Settings/Control panel/Networks/Services/Add and add the SNMP service. You will need to reboot to activate.
2. You should also add the Network Tools and Agent to collect network segment data.
 - Select Start/Settings/Control panel/Networks/Services/Add and add Network Tools and Agent. You will need to reboot to activate. Note: network monitoring under NT 4.0 will put the selected NIC in promiscuous mode, which will add overhead. Not so in W2K.
3. I strongly urge you to collect disk performance statistics by turning on diskperf. The rumors of high overhead are unfounded on today's processors. Just enter diskperf - ye from the command prompt and reboot. Full options for the diskperf command can be obtained by typing diskperf /? At the command line. This facility will stay on through subsequent reboots until it is disabled.

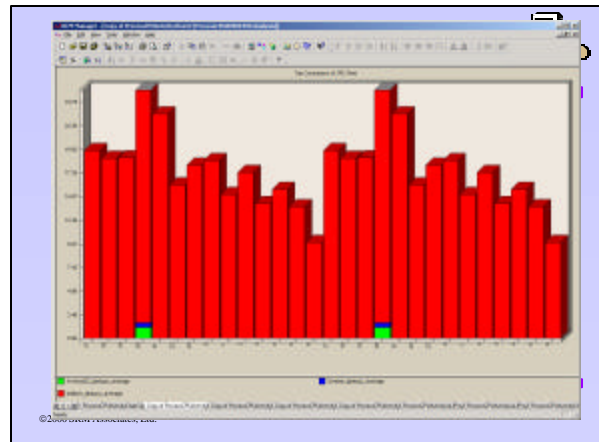
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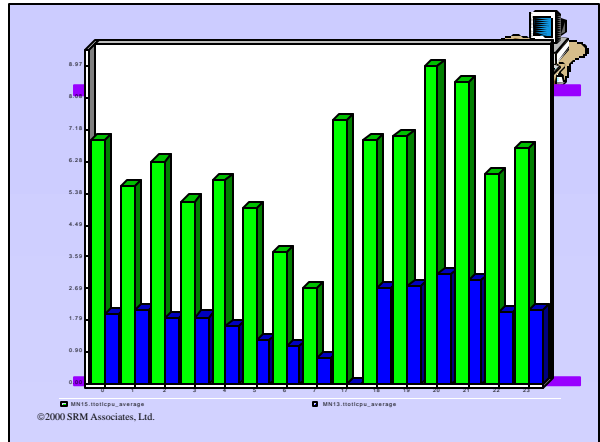
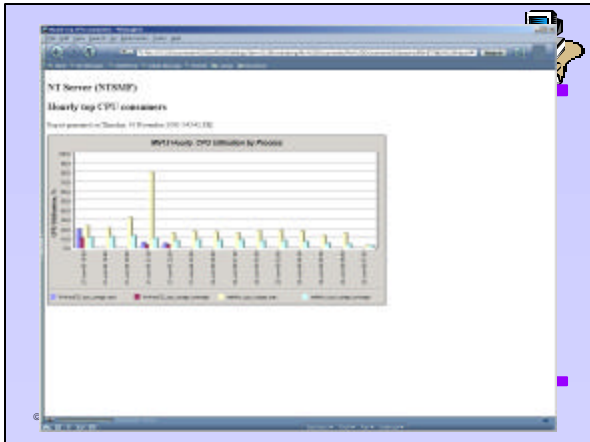
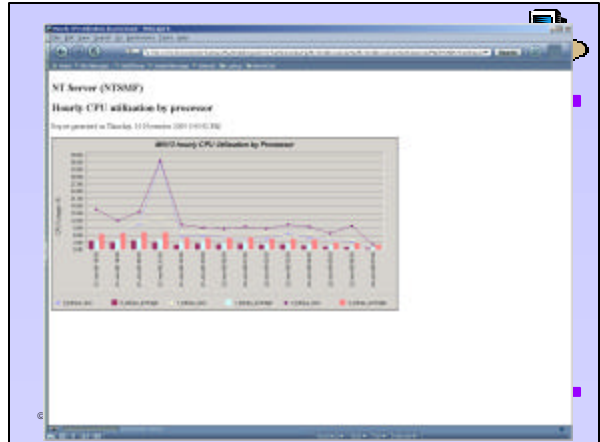
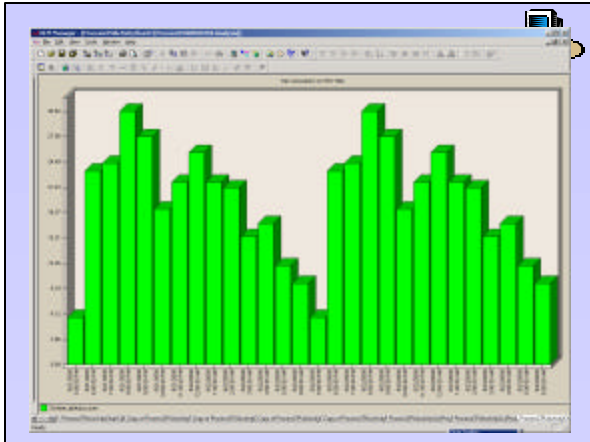
Processor



- Processor: % Processor Time
 - < 50% 80% = Danger
- System: % Total Processor Time
- Processor: Interrupts/sec
 - < 3500 for Pentium
- System: Processor Queue Length
 - < 2

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Processor – Other Metrics



- System:Context Switches/sec
- Process:% Processor Time, % Priv. Time, % User Time, Priority Base
- Thread:% Processor Time, Priority Current

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Memory



- Soft Faults
 - Page/faults/sec
- Hard Faults
 - Pages/sec
- Note: Hard fault = I/O; More RAM yields Soft Faults

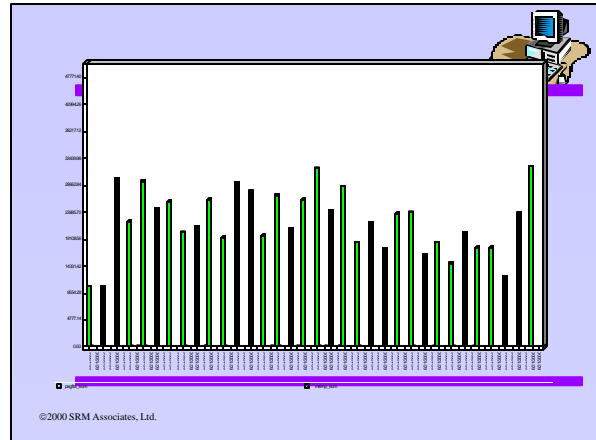
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Memory

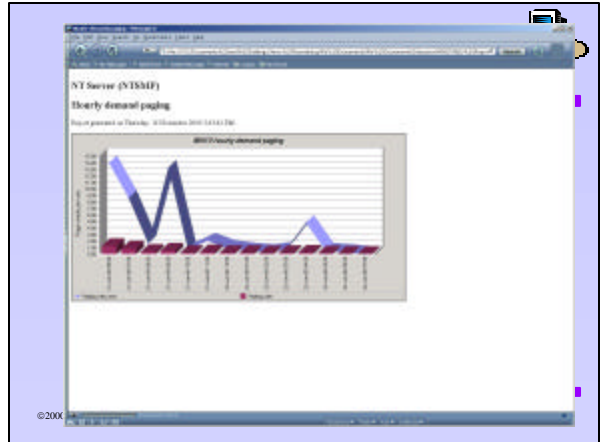
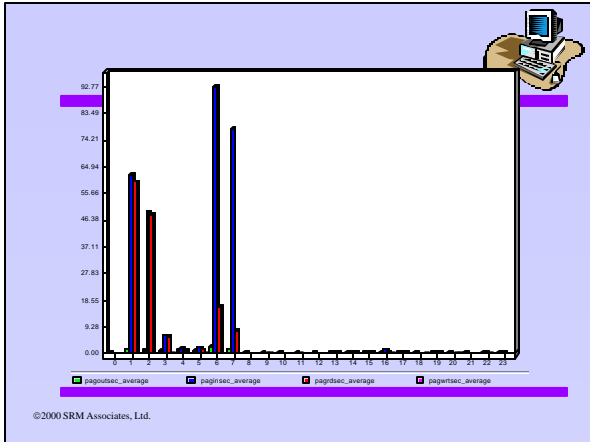


- Examine both memory and paging
- Hard faults $s/b < 20$
- Hard Faults/Total Faults should not exceed 5-10%

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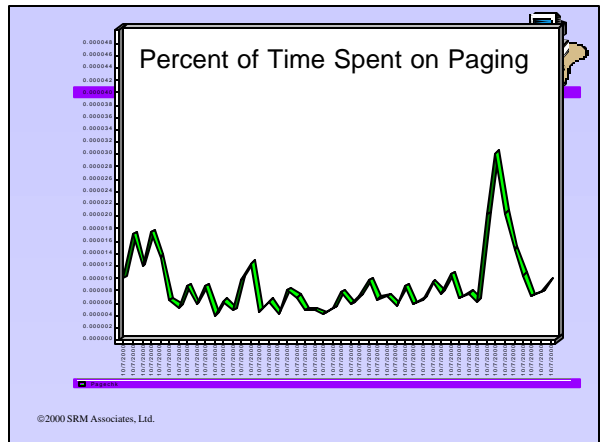
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Paging Standard

- Memory: Pages/sec * PhysicalDisk: Average Disk sec/Transfer = amount of disk time spent on paging activity during the interval.
- Should not exceed 10%
- 20% = thrashing

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Paging



- Server: Pool Non-paged Failures.
 - Indicates that physical memory is too small
- Server: Pool Non-paged peak
 - Reasonable indicator of how much physical memory you need

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Memory – Other Metrics



- Memory: Available Bytes
 - Never below 4Mb; Ideally 10 Mb
- Process: Page Faults/sec, Working Set
- Page Input/Sec: # pages read from disk
- Page Reads: # reads from disk
- Memory: Committed Bytes
 - Amount of memory in use; current memory footprint

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Memory – Other Metrics



- Memory: % committed Bytes in Use
 - Ratio of committed bytes to commit limit
 - Hit commit limit -> resize paging file -> frag
- RAM size S/B 1.5-2 X Avg. Committed bytes
- Also check Paging File: % usage and % usage peak

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I/O



- Physical
 - Actual Device
- Logical
 - Partition
- Need diskperf -y or diskperf -ye

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I/O



- % Disk Time
 - < 55%
- Current Disk Queue Length
 - < 2 (QL - # spindles)
- Avg. Disk Bytes/Transfer
 - Big numbers are good

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I/O – Other Metrics



- Memory:Pages/sec
- Physical Disk:Average Disk Bytes Read, Disk Bytes/sec
- Processor:% Processor Time, Interrupts/sec

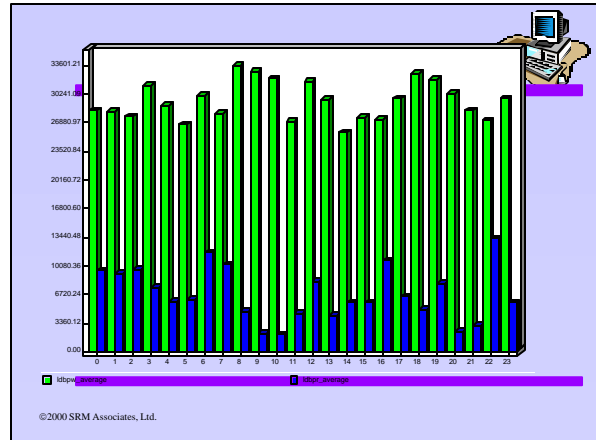
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I/O – Other Metrics



- Physical Disk: Avg. Disk Sec/Transfer
 - S/B < 0.3
- Avg. Queue time = Disk Queue Length * Avg. Disk Sec/Transfer
 - Compare over time and with other disks

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Network



- Need to examine:
 - Amount of network Activity
 - Throughput

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Network



- Complex and configuration dependent
 - Protocols
 - NICs
 - Network Applications
 - Topology
- Maybe multiple protocol stacks
- Hint: monitor Redirector object

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Network



- Redirector:
 - Bytes Total/Sec
 - Current Commands
 - Will increase when there is a delay in placing frames into the network. Should not get much longer than number of NICs in the box.
 - Network Errors/Sec
 - Reads and Writes Denied/Sec
 - Raw Reads and Writes Rejected/Sec

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Network



- If the sum of Server:Bytes Total/sec for all servers approaches the maximum transfer rate of your network, you are approaching saturation and should segment.

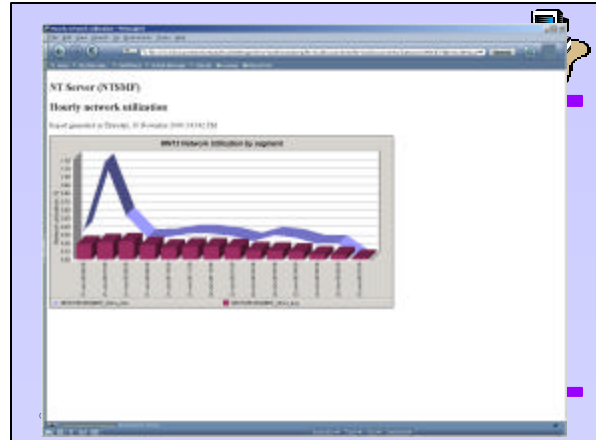
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NIC example



- NIC:
 - Output Queue Length
 - < 2
 - Bytes Total/sec
 - Should not be high if OQL < 2
- If collisions greater than 10%, Network issue

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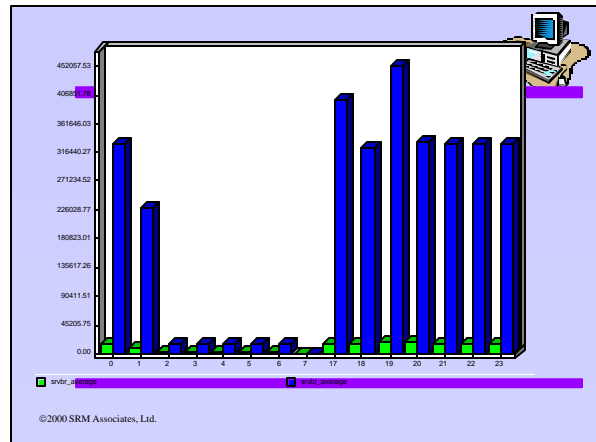


Network – Other Metrics



- Network Segment: % Net Util., Total Bytes Received/sec
- Memory: Pages/sec
- Logical Disk: % Free Space
- Paging File: % Peak Usage
- Physical Disk: % Disk Time, Avg. Q Len.
- Processor: % Processor Time

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Performance



- Concentrate on the area of failure
- Limit the metrics analyzed to key counters
- Have historical data

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Capacity



- Build an historical data base
- Review the report periodically for trend changes
- Model possible effects

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Memory Tuning



- Select the appropriate NT Memory strategy from Control Panel/Network/Services/Server/Properties.
- Optimize virtual memory and the paging file system
- Remove unnecessary processes from the server
- Schedule memory intensive jobs to off hours.
- Last resort – Add RAM

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Disk Tuning



- Distribute file system activity
- One logical disk per physical disk
- Group similar disk work.
- Use RAID appropriately.
- Last resort – Add hardware

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Network Tuning



- Balance network loads
- NIC settings
- Device drivers and BIOS levels
- Last resort – Faster NICs

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CPU Tuning



- * Make sure that the root cause is not within another resource area.
- * Remove CPU overhead
 - Wasteful hardware components
 - Don't implement compression
 - Offload CPU intensive work.
- * Remove faulty Hardware.
- * NT Service Packs
- * Last resort – Upgrade the CPU.

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