

Citrix MetaFrame for Windows Servers- Installation and Tuning Tips

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Many of these tips require manually editing the registry of a Terminal Server or Windows 2000 Server. Use appropriate caution before editing the registry, including having a backup of your system and registry. Using Registry Editor incorrectly can cause serious, system-wide problems that may require you to reinstall Windows NT or Windows 2000 to correct them. Microsoft cannot guarantee that any problems resulting from the use of Registry Editor can be solved. **Use this tool and these tips at your own risk.**

Please direct any comments, updates, clarifications, or additions regarding this document, including the version number and section/reference # (if applicable) to rick.dehlinger@citrix.com. This document is worthless without the contributions of the people who use it. Thanks in advance for your contribution!

Citrix MetaFrame for Windows Servers- Installation and Tuning Tips

Document Change Log

Using version 06222000A as the baseline version, all changes to this document are entered into the change log. They will also be denoted by a highlighted (or grayed) reference number in the document. If you have been a reviewer or user of this document in the past, please scan this log with each new version to quickly pick up on any modifications to past practices and additions since your last review.

Version 4/31/2001

Ref.	Tip	Change
A4	Fast network components.	Clarifications.
A5	Dedicated ICA Master Br.	Clarify MF version.
A5a	XP 'Control' Server	Added.
A9	PLAN for stable printing.	Clarify incl. MF versions.
A10	MF for Apps only.	Clarifications, XP update.
A12	TSE for bad apps.	Added URL for tool.
A13	Win2K bad app tuning.	Added.
A14	Redundancy with numbers	Added.
A15	NLB clustered Nfuse sites	Added.
A16	Plan XP Zone configs.	Added.
A17	Replicated XP data stores	Added.
A18	Use cloning for Change Management	Added.
A19	XP Eval. License at install	Added.
A20	Avoid prolonged XP 'Mixed Mode'	Added.

B7	SP/HF combos for TSE	Updated.
B7a	SP/HF combos for Win2K	Added.
B8	Change drives at install	Clarify MF versions.
B9	Wait to activate 1.8 license	Clarifications.
B9a	Wait to activate XP license	Added.
B10	1.8 SP/HF combos	Updated.
B10a	XP SP/HF combos	Added.
B11	XML service standards	Added.
B12	ODBC with kid gloves	Added.
B13	Win2K recovery console	Added.

C8a	Stop add'l services	Added.
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C10	ICA KeepAlives on TSE	Corrected.
C10a	ICA KeepAlives on Win2K	Added.
C10b	TCP KeepAlives	Added.
C13	SUPERCACHE on 1.8	Clarifications.
C13a	SUPERCACHE on XP	Added.
C21	Hide drive letters	Clarifications.
C23	Tune HCU\CP\Desktop	Correction.
C26	Increase registry size	Added references.
C28	Winstation UserOverrides	Clarifications and correction.
C30	Username/Computername on My Computer	Correction on Win2K.
C31	Disable printer beep.	Correction.
C32	Enable Quick Reboot	Correction.
C34	ICA MB refresh interval	Clarify MF version.
C35	ICA MB election times	Clarify MF version.
C37	Publish specific folders	Added detailed references.
C38	Optimize ICA protocol – 1.8	Clarify MF version.
C38a	Optimize ICA protocol – XP	Added.
C39	Disable ICA ACU	Clarify MF versions.
C39a	Use central ICA ACU DB	Added.
C44	Configure RPC services	Added.
C45	Disable OS2/POSIX	Added.
C46	Remove 'Shut Down' opt.	Added.
C47	Remove Outlook Exp. Icon	Added.
C48	Kill Internet Connect. Wiz.	Added.
C49	Disable Explorer tips.	Added.
C50	Disable right click, Explore	Added.
C51	Backup XP Data Store.	Added.
C52	Tune Crash Dump options.	Added.
C53	Disable Media Sensing	Added.

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D1	Automated reboot cycle.	Clarifications.
D5	Use Win2K GPO's	Added references.

E2a	Pub. Word/Excel w/Options	Added.
E3a	Apply IE 5.5, SP1, plus...	Added.

F1	NTFS cluster size.	Corrections.
F4	MaxWorkItems / MaxMpxCt	Corrections on Win2K.
F5	File handles per user	Corrections on Win2K.
F7	Print driver security	Clarifications.
F10	Increase SizeReqBuf	Clarifications.
F15	Turn off Lazy Writes.	Added.
F16	Modify IOPageLockLimits	Added (from other section).
F17	Change Win2K file assoc.	Added.

- Added MetaFrame version where appropriate. If no version is listed, you can assume that the tip is applicable to the listed OS with either version of MetaFrame installed.
- Un-Verified Tips- Lots of additional info and clarifications here, but more data still needed. Added section header.
- Re-built HP Printer Compatibility page (Appendix A) including contacts for issues in the future. Hallelujah!
- Added Appendix B: Post SP6 Hotfixes for TSE
- Added Appendix C: Post SP1 Hotfixes for Win2K
- Added Appendix D: Post 1.8/SP2 mondo hotfixes for MetaFrame.
- Added a TON more contributors to the contributors' page.

Version 12/04/2000		
Ref.	Tip	Change
D1	Reboot cycle	Remove Win2K references..

Version 10/31/2000		
Ref.	Tip	Change
A2	Load up on processor	Clarifications.
A3	Drive subsystem	Clarifications.
A5	Dedicated master browser	Clarifications.

A9	Plan for stable printing	Remove reference to doc.
A12	Bad app OS of choice	Added.
B7	OS SP/Hotfixes	Update to current levels.
B8	Change drive letters	Clarifications.
B10	MF SP/Hotfixes	Update to current levels.
C1	ERD creation	Add Win2K clarifications.
C3	Local auditing	Add Win2K clarifications.
C4	Event log parameters	Clarifications.
C5	Hardcode NIC settings	Clarifications.
C8	Stop services	Add Win2K clarifications.
C10	ICA Keepalives	Clarifications.
C12	L2 Cache settings	Clarifications and more details.
C13	Enable SUPERCACHE	Correction- please review!
C17	Tune SERVER service	Correction- please review!
C18	Clean up Desktop items	Add Win2K clarifications.
C21	Clean up Explorer items	Add Win2K clarifications.
C24	Turn off sounds	Clarifications.
C29	Clean up login scripts	Clarifications.
C30	Username on My Comp.	Added.
C31	Disable printer beep	Added.
C32	Enable quick reboot	Added.
C33	Disable alerter service	Added.
C34	Reduce ICA Master refresh	Added.
C35	Min. ICA browser election times	Added.
C36	Hardcode TS Licensing	Added.
C37	Publish Explorer windows	Added.
C38	Optimize ICA protocol	Added.
C39	Disable Auto-Client update	Added.
C40	Tune ICA conn. parameters	Added.
C41	Replace help file	Added.
C42	Defrag periodically	Added.
C43	Modify foreground threads	Added.
D1	Reboot cycle	Added 3 rd party reference.
D2	Change management	Added presentation link.
D5	Use Group Policies	Added.
E8	Disable Active Desktop	Clarifications.

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E9	Disable IE sounds	Added.
E10	Hide Visio splash screen	Added.
E11	Slow GSNW logons	Added.
E12	Set GSNW preferred server	Added.
E13	Set GSNW default server	Added.
E14	Set GSNW default script	Added.
E15	Set GSNW drive mappings	Added.
F1	Increase NTFS cluster size	Added reference.
F8	Set PoolTagEntries	Clarifications.
F12	Increase reliab. Over WAN	Added.
F13	Increase Net. performance	Added.
F14	Modify CriticalWorkerThreads	Added.

- Un-Verified Tips- Lots of additional info and clarifications here, but more data still needed.
- Killed HP Printer Compatibility page. HP now maintaining on their website.
- Changed version notation.
- Updated contributor listings.
- Implemented change log.

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Section A: Pre-Installation Tips

Ref.	Item	Description	How?	OS/MF Compat.
1	Use server class hardware.	For performance, reliability, and supportability, do yourself a favor.	Buy server class hardware.	WTS Win2K
2	Load up on Processor and Memory.	You never want a MetaFrame server to be starved for RAM, and the fastest processors you can get are usually worth the money. Studies have shown that processors with >512K of L2 cache don't provide much performance gains- don't waste your money.	Load up, and leave yourself some room for expansion in both areas if possible. Usage scenarios and application mixes change.	WTS Win2K
3	Don't shackle your drive subsystem. FAST drives, SCSI only!	A fast drive subsystem is extremely important in a WTS/MF environment. If RAID is required (for redundancy) use HARDWARE mirroring (not SW mirroring, RAID5 not bad but more \$). If no RAID, use multiple drives (OS, APPS, Pagefile, or OS, APPS/Pagefile)	Do the drives right from time zero. VERY tough to fix without rebuilding (if not impossible). If using HW mirroring, try to use a single array partition if possible. Create at least 2 OS partitions, on separate physical drives where possible. System files on one, Application files on a second, pagefile on third if it is a separate physical drive.	WTS Win2K
4	Use fast network components.	Multiple users on a server = more data on the wire. Don't let this be a bottleneck. It is a good idea to keep the network subsystem simple-avoid multi-homed servers if possible.	Implement something like a full duplex, switched 100MB environment between your MetaFrame servers and resource servers. MF Servers go on the backbone with resource servers.	WTS Win2K
5	In 1.8 load balanced environments, implement a Dedicated ICA Master Browser.	Reliable ICA Browsing is extremely important in any load balanced environment. Especially when the server count reaches/exceeds 5, use a dedicated server for ICA browsing. Ensure that the Master browser on your production segments is always the most current version on your network.	Using a lower power server class machine (Pentium 166 or greater, SCSI drive, 100MB NIC, 64+ MB RAM) hard code it as a dedicated ICA Browser through Citrix Server Administration, ICA Browser tab..	WTS Win2K 1.8
5a	In a multi-server XP environment, implement a dedicated 'Control' server.	In multi-server XP environments, there are quite a few farm roles that make sense to spin off to a dedicated 'XP Control' server. Additionally, in a Win2K environment, this box can be a 'Remote Admin' mode server, leaving the Server Service and IIS to run with the proper thread scheduling.	The following are some of the roles that may make sense to have an XP Control server(s) play: Data Collector, IMA Host (for indirect Data Store configurations), CMC publisher (admins run CMC from/through this box), NFuse web server, central Auto-Client update database, IM Package file server, print driver replication source server.	WTS Win2K XP
6	Put HomeDrive on separate resource server.	For reliability and manageability reasons...	Put them on a hidden NT share, use USRMGR Connect To: to handle first mapping, then USRLOGON.CMD to handle the RootDrive mapping. Set RootDrive manually by running CHKROOT.CMD and set it to your preferred home drive letter.	WTS Win2K
7	Ensure stability in HomeDrive/RootDrive mechanism.	Understand what they are used for, and implement a mechanism that ensures their reliability.	Stabilize/standardize this before installing any applications on the server(s).	WTS Win2K
8	Use roaming profiles in multi-server environments. Stabilize and manage them appropriately.	These enable your user to get the same settings and preferences on multiple servers. There are still some broken things with user profiles though. Better with WTS SP5/SP6, but not perfect. Manage them to ensure reliability and performance.	Put roaming profiles on a hidden share on a reliable file server. See note below for stabilization tips. See KB document- Q161334 - Guide To Windows NT 4.0 Profiles and Policies (Part 1 of 6) for more details on how to use them.	WTS Win2K
9	PLAN for a stable printing environment.	One of the weakest points in a WTS environment is the Printing subsystem. Plan and implement the most reliable mechanism your environment will allow. The weak link is the spooler service running on the Terminal Server.	NT Print queues best. Netware queues are good, but harder to manage. Client printing works, but takes some tweaking on 1.8 to make it stable. XP helps considerably here.	WTS Win2K 1.8/XP
10	Don't use MetaFrame servers for anything but serving sessions of applications.	Standard NT network design concepts apply. Less additional services = better performance, ease of manageability, better reliability. One slight departure from this may be an XP 'Control' server. See A5a for details.	Implement additional servers to handle file, print, authentication, backup, database, etc. services.	WTS Win2K

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11	Install System files and Applications on separate partitions.	For manageability and ease of securing file system, split functions onto separate partitions, even on the same physical drive.		WTS Win2K
12	For bad apps, use TSE instead of Win2K.	NT4, TSE included some bad application tuning flags that could be used to tweak misbehaved applications. Most of those flags are gone in Win2K. If you are having problems tweaking an app on Win2K, try TSE and use the appropriate tuning flags.	See Q186499 for a reference of these flags. Use the CMPTMAN.EXE utility from Citrix to create/tweak them through a GUI. You can get this utility from http://groups.yahoo.com/group/citrixnw/files	TSE
13	Tune bad apps on Win2K.	Win2K does support SOME of the app compatibility flags, though not all. It only supports the following: 0x0000010: return username for computer name 0x00000100: Disable registry mapping for app 0x00000400: Return system windows directory 0x00000800: Limit the reported physical memory	The flags can be set manually like they could in WTS, or you can use the CMPTMAN_W2K.EXE utility from Citrix to create/tweak them through a GUI. You can get this utility (CMPTMAN_W2K.ZIP) from http://groups.yahoo.com/group/citrixnw/files . Note: The utility shows all the possible flags, but Win2K ignores all but the ones listed here.	Win2K
14	Build redundancy with quantities of servers not hardware.	In a MetaFrame environment, your best bet is to build high availability into the farm with quantities of servers, vs. spending money on things like hot-swap PCI, tons of RAID hard drives, multiple power supplies, etc. As long as you manage change appropriately and treat each Silo (group of identical servers) as a single entity, you can save money, increase performance, and provide better availability.	Consider implementing N+1 or 2 MetaFrame servers. In other words, if you need 5 servers to handle the user load, deploy 6 or 7. It gives you high availability (a server drops users can still connect to others) and administrative flexibility (you can drop servers for maintenance during production hours without negative user impact). See 'iForum 2000, Change Management FINAL.zip' available at http://groups.yahoo.com/group/citrixnw/files for details on the Silo concept and some established Change Management practices.	WTS Win2K 1.8/XP
15	Deploy NLB clustered NFuse sites.	If high availability is desired, Win2K AS/IIS5/NLB clustering, along with NFuse 1.51 and Project Columbia, can give you redundancy for your Application Portal.	For an example of one way to accomplish this (submitted by Jason Shave) grab 'Building an NLB Clustered Nfuse Portal.zip' from http://groups.yahoo.com/group/citrixnw/files	WTS Win2K 1.8/XP
16	PLAN your XP Zone configuration.	A default installation of XP will automatically create your XP Zones for you, but often they are not optimally configured. Plan your Zone configuration up front, and make sure you pro-actively configure it through the CMC. This is VERY important for the health of your farm, especially if you have servers in diverse locations tied to a single XP Farm.	For a detailed analysis of the IMA subsystem, including Zones, view the 'XP-IMA Primer Version x.zip' presentation at http://groups.yahoo.com/group/citrixnw/files .	WTS Win2K XP
17	Consider SQL replicated XP Data Stores for large/diverse environments.	The role of the Data Store is of the utmost importance in an XP environment, and there are some instances where it makes sense to distribute the load and IMA traffic across multiple replicated SQL XP Data Stores. Definitely doable using SQL/Oracle replication.	For a detailed analysis of the IMA subsystem, including the role of the Data Store and related IMA traffic, view the 'XP-IMA Primer Version x.zip' presentation at http://groups.yahoo.com/group/citrixnw/files .	WTS Win2K XP
18	Use cloning/unattended installs to manage change.	With MetaFrame XP, Citrix now fully supports cloning of MetaFrame servers, AS LONG AS you follow a few simple guidelines. Additionally, you can now install XP using unattended scripts as well.	For details on both deployment/change management mechanisms, check out the instructions in 'Advanced Concepts for MetaFrame XP.pdf', available at http://groups.yahoo.com/group/citrixnw/files . The XP Admin guide doesn't mention a couple important considerations/steps that are detailed in the AC document.	WTS Win2K XP
19	Install XP eval licenses at installation time.	A bug prevents MetaFrame XP eval licenses from functioning properly if you add them at any time other than when you are installing XP. Also, note that you need multiple licenses to evaluate multi-server features, such as load management.		WTS Win2K XP

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20	Avoid prolonged XP 'interoperability mode'.	MetaFrame XP has a mechanism that allows it to run in 'Interoperability Mode'. If you don't need it, don't use it. If you need it, use it as a temporary transitional technology and go Native ASAP.	For more details on migrating to MetaFrame XP, see 'Migrating to XP Webconf.zip', and "XP Migration Whitepaper.pdf" at http://groups.yahoo.com/group/citrixnw/files . A recorded web conference on the topic can be found at https://webconferencing.evoke.com/tik.php3?P=2822908&S=2774EC4D6649F51A (wrapped URL, REAL Audio stream)	WTS Win2K XP
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Section B: OS/MetaFrame Installation Tips

Ref.	Item	Description	How?	OS/MF Compat.
1	Always use NTFS on all partitions.	No NTFS, no file level permissions or auditing. Since all users on the system have access to your OS files, you want to make sure you can secure them from accidental or malicious tampering.	Use NTFS on all partitions on your MetaFrame server.	WTS Win2K
2	Install as Stand Alone member servers.	Ultimately, you want your MetaFrame servers only providing application services to your customers. Move all other services (File, Print, Authentication, Terminal Services Licensing, Backup, DNS, DHCP, WINS, Database, Mail, etc.) to resource servers.		WTS Win2K
3	Install only required network components and protocols.	More protocols and components = more overhead and complexity. Simplicity is your friend.		WTS Win2K
4	Install only required Additional Components.	If your users don't need it, don't install it. Items you DON'T want to install: Chat and animated screen savers. Both are SERIOUS resource hogs.	During installation at the 'Additional Components' dialog, choose to install only required components.	WTS Win2K
5	Don't install IE during base install.	Installing IE4 at server install time is OK IF you aren't going to use IE5, AND aren't going to remap your server drive letters.	Install IE only after MetaFrame and drive letter remapping has taken place. Use IE5 if possible, primarily because of the modifications that allow much more granular control through system policies. IE4 has an App Compatibility Script, IE5 does not.	WTS
6	Cripple the built in 'Administrator' account.	This is the first place a hacker starts when attempting to break into a server. You cannot disable this user (except with maybe passprop.exe from the NT Resource Kit?) but you can cripple it and use a different account for administration.	Create a new administrative account, then cripple the built in 'Administrator' account (rename, give ugly password). Do all admin with the new user and never use the renamed 'Administrator' again.	WTS Win2K

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7	Install OS Service Pack/Hotfix combinations.	Save a few steps by making sure all necessary OS components and network components are installed before you patch the OS. Try to keep the Service Pack/Hotfix levels the same across all servers in a farm. I need some feedback on these. I have received mixed feedback on the stability of SP6. Please share your experiences with me via e-mail...	Current fix list for WTS (02/01/00)- SP5, if necessary hotfix listed in Q249255 (local drive access broken from Office) Q240414 (desktop links to hidden drives don't work) Q251278 (profiles not deleted upon logoff) Q247071 (Review only- Broken ICA printers with SP5) Q253922 (Users' Automatically Created Printers Visible to Other Users) WTS SP6 is available, but shouldn't be applied unless it is a fresh install, or it has a specific fix you need. If you must have SP6, ensure that Q269214 (new updated version) is installed- fixes errors with the ICA browser among other things. Remove the Key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\HotFix\Q147222 to prevent possible MFAdmin crash. See Appendix B: Post SP6 Hotfixes for TSE for more applicable fixes. Prior to installing a Service Pack on WTS, consider stopping all possible services to ensure all files are updated properly. With no users on, you can safely stop all services but Event Log, RPC, and Terminal Server Service.	WTS
7a	Install OS Service Pack/Hotfix combinations on Win2K	Save a few steps by making sure all necessary OS components and network components are installed before you patch the OS. Try to keep the Service Pack/Hotfix levels the same across all servers in a farm.	For Windows 2000, SP2 should be current, however proceed with it only if you are comfortable with its stability. If you aren't comfortable, stick with SP1 but consider the following: Q287687 – Terminal Services Licensing Enhancements (fixes for TS Licensing) Q271148 – 'MaxMpxCt and MaxCmds Limits in Windows 2000' (ICA sessions hung in CONNQ state) Q289564 – 'Issues When Windows 2000 Loads and Unloads Profile' ('hung' profiles) Q278662 - 'Diskperf.exe may hang with 8 character entry in the registry' (hung XP install on IBM servers)	Win2K
8	Install MetaFrame, changing drive letters (if desired) at installation time ONLY.	Consider the drive letter change permanent- ONLY remap the drives if there is a business reason for it, and you have identified unused letters further up the chain to use without conflicting with mapped network drives.	Keep in mind that simplicity is your friend...	WTS Win2K 1.8/XP
9	Don't activate MetaFrame 1.8 licenses until SERVER is proven production ready.	For most Citrix licenses, you have 35 days to activate. Take advantage of that time to stabilize the server(s), then activate them when they are proven production ready.	Activation is done at http://www.citrix.com/activate when you are ready.	WTS Win2K 1.8
9a	Don't activate XP licenses until the FARM is production ready.	In the XP world, licenses are tied to the FARM instead of the individual server. When building the farm, don't activate the licenses until you are sure you are ready for production.	Activation is done at http://www.citrix.com/activate when you are ready.	WTS Win2K XP
10	Install MetaFrame 1.8 Service Pack/Hotfix combinations.	Try to keep the Service Pack/Hotfix levels the same across all servers in a farm, starting with the Master Browser.	Current fix list for MF 1.8 for WTS- SP2, possibly hotfix ME182T007 (or equivalent). For MF 1.8 for Win2K, SP2, probably hotfix ME182W008 (or equivalent). See 'Appendix D: Citrix MetaFrame 1.8 Post-SP2 Mondo Hotfixes' for more details. Both hotfixes listed here are available from the http://www.citrix.com/download .	WTS Win2K 1.8

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10a	Install MetaFrame XP Service Pack/Hotfix combinations.	Try to keep the Service Pack/Hotfix levels the same across all servers in a farm.	Current fix list for MF XP- none.	WTS Win2K XP
11	Install XML service on ALL MetaFrame servers using a farm standard port number.	In some cases, you have the option NOT to install the XML service, but don't do it. It is required for TCP browsing, and also for Ticketing through NFuse to work. Also, for simplicity/consistency/reliability reasons, standardize the port you use for the XML service across the entire farm. This is a requirement for Ticketing.	For MetaFrame 1.8, you can change the port at a later time with the ctxxmlss.exe command on each server. In XP, this can be done through the CMC.	WTS Win2K 1.8/XP
12	Handle ODBC installation/updates with care.	A high percentage of the early reported problems with XP have been related to improperly configured or installed ODBC drivers. Since the IMA subsystem relies upon ODBC, it is important that they be configured properly BEFORE installing XP, ESPECIALLY if using a Direct Data Store, and ESPECIALLY on WTS.	For information on ODBC drivers, versions, installation, etc. check out 'MetaFrame XP Admin Guide.pdf' at http://groups.yahoo.com/group/citrixnw/links and 'Advanced Concepts for MetaFrame XP.pdf' at http://groups.yahoo.com/group/citrixnw/files	WTS Win2K XP
13	Install Win2K Recovery Console BEFORE setting up Hardware Mirror.	This is an odd one... If you intend to install the Win2K Recovery Console on your server, your best bet is to install it before you establish your hardware mirror.	See Q229077 for more details. The Q references software mirrors, however it reportedly applies to HW mirrors as well.	Win2K

Section C: OS/MetaFrame Tuning Tips

Ref.	Item	Description	How?	OS/MF Compat.
1	Create the ERD AFTER the administrator account modifications above are completed.	Unless you run RDISK with a command line parameter, the only security info that makes it to the ERD is your initial Administrator user and password. Running it after modifications to the Administrative users updates the SAM info.	Run RDISK /S after crippling 'Administrator'. This updates the backup security hive, which is then put on the ERD. Since Win2K creates this as an unlocked copy, be careful to securely store your ERD's.	WTS Win2K
2	Set pagefile properties up early in the install.	Setting this up early ensures contiguous physical space for the pagefile(s), and ensures proper setup.	Total pagefile space should be between 1.5 and 2.5 times physical memory (or more) depending upon the application mix. Locate pagefile on separate physical drive (than System) for best performance. Set Initial and Maximum size to the same number for all pagefiles. You will need a swapfile on the System partition to gather a dump file for troubleshooting, but you can go back and add this if the need arises.	WTS Win2K
3	Turn on Auditing in the local server SAM database.	Even if Audit policies are set at the domain level, they must be set at the local server level to ensure that the entries show up in the event viewer.	WTS: User Manager, select local machine instead of domain, Policies, Audit. Audit all failures and successes for "Logon and Logoff" and 'Restart, Shutdown, and System' Win2K: In the Administrative Tools Local Security Policy applet, choose the Local Policies\Audit Policies folder. Select the Success/Failure events you want to audit. Consider auditing 'logon events' and 'system events'	WTS Win2K
4	Set Event Log parameters.	If the Event Logs in NT fill up, server operation will halt until the Administrator responds to a dialog on the console. The size of each log may also be modified to allow for more history in the files.	In Event Viewer, set the properties on all logs to 'Overwrite as Needed', and increase the size from 512 to something like 2048, depending upon how much history you want.	WTS Win2K
5	Hard code NIC driver settings.	Items like NIC drivers can be buggy in a WTS/MF environment. Don't trust their auto detect settings. Might be worth doing the servers' switch ports too.	For NIC drivers specifically, hard-code media type, duplex setting, and speed. Don't rely upon their ability to auto-detect these settings.	WTS Win2K

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6	Delete unnecessary Terminal Server Connections.	If you aren't going to use them, delete them. They create unnecessary overhead and potential security risks.	In Terminal Server (Connection) Configuration, delete any unnecessary connection types.	WTS Win2K
7	Set permissions on Terminal Server Connections.	The default permissions on Connections are too lax and can pose a security risk. Modify them accordingly.	Appropriate permissions should look similar to: Administrators and System, Full Control Users, User Access	WTS Win2K
8	Stop unnecessary services from running.	Unnecessary services can impact reliability and performance. Where possible, disabling them can have a positive impact on these factors.	Stop and disable these services where applicable: WTS: Telephony Service from (Q241572), License Logging Service, Terminal Server Licensing Service. Win2K: Windows Media Service, unnecessary IIS components.	WTS Win2K
8a	Stop additional unnecessary services from running.	If you aren't using these functions, you may want to consider disabling these services as well.	Messenger (if popup messages aren't needed) Plug and Play (if Plug and Play hardware isn't used) TCP/IP NetBIOS Helper Service (if LMHOSTS isn't used)	WTS Win2K
9	Stop extra/unnecessary processes from running in each session.	Unnecessary processes x many users = unnecessary overhead. Get rid of items not required.	Remove associated entries from HKLM\Software\Microsoft\Windows\Current Version\Run. Examples: LOADWC.EXE (IE WebCheck- rename exe too) ICABAR.EXE (MetaFrame administrator toolbar) NWTRAY.EXE (Netware tray application) HP/Compaq/3COM NIC monitors Some items also in HKLM\SW\MS\WindowsNT\CV\Winlogon\Userinit and HKCU\SW\MS\WindowsNT\CV\Windows\Run and \Load, and Startup folder (all users and each user) IBM Client Access Components (called from userinit)	WTS Win2K
10	Configure ICA KEEPALIVES on TSE.	Because of the default parameters of the TCP/IP protocol stack in NT, sessions may have problems reliably going into a disconnected state when a connection is unexpectedly disrupted. This behavior can be tuned to bring reliability back. With Citrix hotfix 180038, SP1 for 1.8, and SP2 for MF 1.8, Citrix installs and activates ICA Keepalives. Note: If you have already installed SP1 or SP2 for MetaFrame 1.8 for TSE, the hotfix isn't required. With XP ICAKeepAlive functionality is built in but disabled, however you can still enable and tune it by adding the registry keys referenced here.	With the installation of one of the items listed here, ICAKeepAlives are configured with default parameters. Two registry values control the ICA keep-alive feature. Both values can be manually added to the registry: [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Citrix] Add/edit value IcaEnableKeepAlive, data type: REG_DWORD Enter 1 to enable Keep Alives, or 0 to disable them. Add/edit value IcaKeepAliveInterval: REG_DWORD Enter a number in seconds, the default is 60. You may also have to add/modify the TcpMaxDataRetransmissions entry for short disconnect cycles. See Q120642 and Q170359 for more information.	WTS 1.8/XP

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10a	Configure ICA KEEPALIVES on Win2K.	Same story as above, except for MetaFrame 1.8 on Windows 2000, a post SP2 hotfix (ME182W008) is required to enable this functionality. With XP, ICAKeepAlive functionality is built in but disabled, however you can still enable and tune it by adding the registry keys referenced here.	Hotfix ME182W008 is required on MetaFrame 1.8 SP2 to enable this feature. It is controlled by the following registry entry: [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Citrix] Add/edit value IcaEnableKeepAlive, data type: REG_DWORD Enter 1 to enable Keep Alives, or 0 to disable them. Add/edit value IcaKeepAliveInterval: REG_DWORD Enter a number in seconds, the default is 60. You may also have to add/modify the TcpMaxDataRetransmissions entry for short disconnect cycles. See Q120642 and Q170359 for more information.	Win2K 1.8/XP
10b	Configure TCP KeepAlives.	In some environments, you may need a combination of ICA and TCP KeepAlives in order to make the disconnect/reconnect mechanism work appropriately. In environments where the TCP/IP network has high latency, modifying the operation of the NT TCP/IP stack can improve TCP-based ICA sessions. For more information on configurable TCP/IP parameters in Windows, see the Microsoft Knowledge Base article Q120642, or CTX708444: How to Set TCP Keep Alives so TCP/IP Users Go To Disconnected State in the Citrix Knowledge Base.	To ensure that a host server is quickly aware of dropped sessions, the two TCP registry settings listed below can be modified with the following moderately aggressive values: Key: KEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters Value: KeepAliveTime REG_DWORD: 0000ea60 Value: KeepAliveInterval REG_DWORD: 000003e8 Caution: Aggressive parameters may cause TCP/IP-based communications to time out prematurely. These parameters should be adjusted as necessary to prevent this behavior.	WTS Win2K
11	Disable paging of the Windows NT Executive.	Even on a system with a large amount of memory, NT will page out portions of the Executive in order to maximize available memory for apps. Disabling paging can improve OS performance when RAM is available.	Disable paging of exec by setting the following registry key (wrapped for readability): [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management] "DisablePagingExecutive"=dword:00000001	WTS Win2K
12	Hard-code the L2 Cache setting.	For processors that use direct mapped L2 cache (PII and later don't), manually setting this entry can yield some performance improvements. The OS attempts to retrieve the amount of cache from the HAL on the server. If it cannot get a value, it defaults to 256k. See Q228766 and Q183063 for details.	Hardcode appropriate L2 Cache settings (per processor). For 512K, set the following (wrapped for readability): [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management] "SecondLevelDataCache"=dword:00000200	WTS Win2K
13	Enable SUPERCACHE on 1.8.	A post 1.8 performance enhancement was released in a hotfix, but was not enabled by default because of the visible changes it made. Provides better redraw performance, especially with web browsing. This fix is enabled by the installation of MF 1.8 for WTS SP1, and enabled by default with MF 1.8 for Win2K. SP2 for MF 1.8 activates it by default also. See C38 for more ICA optimizations.	With Citrix hotfix 180028 (or SP1) installed, execute the following from the command line: keysync ICAThinwireFlags /Enable:2 A reboot is required. Post SP2 you can modify this behavior with the TWCONFIG utility (see C38).	WTS Win2K 1.8
13a	Enable SUPERCACHE on XP.	With MetaFrame XP, SUPERCACHE (Alternate caching method' in Farm or Server Properties, ICA Display tab of CMC) is enabled by default.	No change necessary for MetaFrame XP.	WTS Win2K XP

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14	Tune or disable Dr. Watson.	Dr. Watson can be helpful to a developer for troubleshooting applications, but untouched in a WTS environment it can wreak havoc.	At least make sure that the HomeDrive/RootDrive process is working smoothly, and that the 'drwatson.cmd' application compatibility script has been ran. Additionally, turn off 'Dump all Thread Contents' and 'Visual Notification'. Optimally, disable Dr. Watson totally. You can clear this registry value to disable it: [HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\AeDebug] "Debugger"=""	WTS Win2K
15	Rename SYNCAPP.EXE.	This is the utility that creates the Briefcase on the user's desktop. Renaming it will stop the Briefcase from being created.		WTS
16	Set ERRORMODE=2.	See Microsoft Q article 124873. Helps with profile stability in particular.	[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Windows] "ErrorMode"=dword:00000002	WTS Win2K
17	Ensure that the SERVER service is tuned properly.	There has been some confusion about this parameter in the past. In general, setting this to "Maximize Throughput for Network Apps" optimizes performance for I/O and WINSOCK intensive applications on systems that aren't memory starved. For systems that are memory starved and/or don't run I/O or WINSOCK intensive apps, "Minimize Memory Used" is the best.	WTS: Modify in Control Panel, Network, Services, Server, Properties. Win2K: Open the properties of the pertinent network connection, then the properties of 'File and Print Sharing for Microsoft Networks'.	WTS Win2K
18	Clean up unnecessary Desktop items.	If you wish to remove some of the 'Standard' items that reside on the desktop, you can either perform some manual cleanup of the key listed to the right, or you can install TweakUI (on WTS) to give you a GUI configurator. Be careful about Network Neighborhood. Heed the warnings provided by TweakUI regarding this item. With Win2K, you can do the same with a group policy.	"HKLM\Software\Microsoft\Windows\CurrentVersion\Explorer\Desktop\NameSpace (Remove unwanted items carefully)	WTS Win2K
19	Set NETPOPUP=0.	In some environments, the NT print spooler notification dialog is seen as a nuisance. This disables that popup.	On MetaFrame servers and print servers set the following registry key: [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Print\Providers] "NetPopup"=dword:00000000	WTS Win2K
20	Increase Idle Connections to handle peak logon periods.	The default of 2 idle connections minimizes memory used, but may not be sufficient to handle peak logon traffic. Increasing the count helps ensure availability during peak logon periods.	[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Terminal Server] "IdleWinStationPoolCount"=dword:0000000x (set x to greater than 2 as necessary).	WTS Win2K
21	Hide unnecessary drive letters from Explorer.	In a WTS/MetaFrame environment, users shouldn't need access to the System or Apps drive. Additionally, the same mechanism can be used to hide other unnecessary drive letters.	WTS: Use the ZAKWINNT.ADM (or similar) system policy template on MetaFrame policy file. Win2K: This can be handled via group policy, even restricting access vs. hiding a drive letter.	WTS Win2K
22	Clean up unnecessary Explorer objects (Dial Up Networking, Web Folders, etc.)	Users don't typically need access to these components, at least not through the Explorer interface. To simplify the user's environment, unnecessary entries can be removed.	Delete appropriate keys from HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Explorer\Mycomputer\NameSpace	WTS

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23	Tune Current_User\Control Panel\Desktop for performance and reliability. (see also C28)	<p>The default options for these entries work, but aren't optimal. AutoEndTasks helps stabilize profiles, CursorBlinkRate helps reduce network traffic, and MenuShowDelay gives users improved user interface responsiveness. SmoothScroll, DragFullWindows, and MinAnimate settings improve Explorer interface response.</p> <p>These entries can also be manually set at the Connection level for all users. See C28 for more details.</p> <p>For more information on AutoEndTasks, see the Microsoft Knowledge Base articles Q123058 and Q191805.</p> <p>Note: Setting CursorBlinkRate to -1 reportedly causes problems with Hyperterminal. Test before setting if you intend to use this program.</p>	<p>Ensure that the following registry entries are modified for each user: [HKEY_CURRENT_USER\Control Panel\Desktop] "AutoEndTasks" (REG_SZ)="1" "WaitToKillAppTimeout" (REG_SZ)="20000" "MenuShowDelay" (REG_SZ)="10" "CursorBlinkRate" (REG_SZ)="-1" (TSE only- Win2K defaults to 1200, it's slowest setting) "SmoothScroll" (REG_DWORD)="00000000" "DragFullWindows" (REG_SZ)="0" [HKEY_CURRENT_USER\Control Panel\Desktop\WindowMetrics] "MinAnimate" (REG_SZ)="1"</p>	WTS Win2K
24	Turn off or disable all unnecessary sounds.	Left as default, the settings will cause unnecessary processing and network traffic. Unless sound is desired, removing sound from the environment improves overall performance and decreases bandwidth consumption.	<p>These settings are stored under [HKEY_CURRENT_USER\AppData\Schemes\Apps], and can be modified with a REG file at logon time.</p> <p>If no audio support is necessary, simply disable 'Audio Mapping' on the ICA connections.</p>	WTS Win2K
25	Stabilize and manage roaming user profiles appropriately.	<p>Still some broken things with user profiles. Better with SP5 and with SP6, but not perfect. Manage them to ensure reliability and performance.</p> <p>For distributed farms on separate networks, consider using %LOGONSERVER%, %%SERVERNAME%, or some other SYSTEM variable in the Terminal Services profile path. For example 'Terminal Server Profile Path' = '\\%SERVERNAME%\share\%username%'. For more details, see Q138083 - Implementing the %SERVERNAME% Environment Variable In Profiles, and Q141714 - How to Use %LOGONSERVER% to Distribute User Profiles.</p>	<p>Put roaming profiles on a hidden share on a reliable file server. To help stabilize the profile mechanism:</p> <ul style="list-style-type: none"> -Use SP5 for WTS (not SP6 yet unless necessary) -Stop and disable the 'Telephony Service' (WTS only) -Set ErrorMode=2 (see more details in C16, from Q124873) -Set AutoEndTasks=1 (see more details above) -Disable roaming profile cache: <p>[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon] "DeleteRoamingCache"=dword:00000001</p> <p>-Control profile hogs like Temporary Internet Files, Application Data, and Temp by keeping them out of the profile with registry modifications where appropriate.</p> <p>For Win2K, consider Q262203 'Roaming Profile May Be Corrupted By Copy Hive Problem'.</p>	WTS Win2K
26	Increase registry file size.	<p>Since the registry of a terminal server loads an additional hive into Hkey_User for each user logged on to a server, the size of the registry can grow beyond expected size. In order to reduce the chance that the registry reaches it's largest size, set it to a larger size manually.</p> <p>For reference, review Q124594 - 'Understanding and Configuring Registry Size Limit (RSL)', and Q126402 - 'PagedPoolSize and NonPagedPoolSize Values in Windows NT'</p>	In Control Panel, System, Performance, Change, increase the maximum size of the registry appropriately. A maximum size of 50 to 120MB is common. For Win2K add another 30 MB or so.	WTS Win2K

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27	Set IgnoreLinkResolver entry to fix shortcuts resolving to UNC paths issue.	Explorer stores not only a drive indicator (N:\Dir\App.exe) but a UNC (\\server\share\app.exe) indicator in each shortcut file. If your copied shortcuts seem to point to their original location instead of to the drive letter shown, change this entry to disable UNC resolution first.	"HKLM\Software\Microsoft\Windows\Current Version\Policies\Explorer" "LinkResolveIgnoreLinkInfo"=1 (REG_DWORD) See Q195887 for full details.	WTS Win2K?
28	For Win2K AND WTS, set Winstation UserOverrides.	Windows 2000 and WTS implement a feature that enables you to set some overrides on some of the entries in Hkey_Current_User. Make sure that you implement these entries on the correctly named connections. For more information, see Q226931- How to Minimize Graphics Use with Terminal Services. Note- in the registry location listed to the right, insert your own connection name in place of ICA-tcp if you have renamed your connections for some reason.	Administrators can use a Terminal Server registry hive to override user settings, such as wallpaper, animation effects, and screen savers. Create a key named UserOverride in the following location. Some recommended entries follow: [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Terminal Server\WinStations\ICA-tcp\UserOverride\Control Panel\Desktop] "AutoEndTasks" (REG_SZ)="1" "CursorBlinkRate" (REG_SZ)="-1" (WTS only- Win2K defaults to 1200, which is the slowest) "DragFullWindows" (REG_SZ)="0" "MenuShowDelay" (REG_SZ)="10" "WaitToKillAppTimeout" (REG_SZ)="20000" "SmoothScroll" (REG_DWORD)="00000000" "Wallpaper" (REG_SZ)="(none)" [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Terminal Server\WinStations\ICA-tcp\UserOverride\Control Panel\Desktop\WindowMetrics] "MinAnimate" (REG_SZ)="1"	WTS Win2K
29	Clean up login scripts, batch files.	A couple tips on login scripts and other batch files: - Use the RUNH.EXE command (run hide, from www.scripthorizon.com) to significantly improve security (stops users killing DOS window on longer login scripts) and apparent login speed over a WAN. - If you're going to use *.reg files to deploy registry changes, consider changing the file association for the 'regfile' file type from regfile=regedit.exe "%1" to regedit.exe -s "%1". This will work regardless of whether disableregistrytools is set or not, and causes the *.reg file to be processed silently.	Do we need to insert a 'How To' entry here?	WTS Win2K
30	Add User and Server name to My Computer icon.	This doesn't yield any performance benefits, but is particularly helpful for the helpdesk. Backup the appropriate CLSID registry key prior to making this change.	WTS: Using REGEDT32, navigate to HKEY_LOCAL_MACHINE\SOFTWARE\Classes\CLSID\{20D04FE0-3AEA-1069-A2D8-08002B30309D} Delete the <NO NAME> : REG_SZ : My Computer entry. Add a value (with no name) of type REG_EXPAND_SZ, then set the string to something like %USERNAME% on %COMPUTERNAME%. Win2K SP1: Using REGEDT32, navigate to HKEY_CLASSES_ROOT\CLSID\{20D04FE0-3AEA-1069-A2D8-08002B30309D}, delete the 'LocalizedString' value, and then recreate the value with the same name but as REG_EXPAND_SZ. Set the string to something like %USERNAME% on %COMPUTERNAME%.	WTS Win2K

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31	Disable printer beep.	One more unnecessary action/process. Disable it to reduce bandwidth/increase performance.	HKLM\System\CurrentControlSet\Control\Print BeepEnabled = 0 (REG_DWORD)	WTS Win2K
32	Enable Quick Reboot on MF servers.	At times it is important to restart a server as quickly as possible. Making this change will speed the process up a bit, enabling the CTRL+SHIFT+ALT+DEL key sequence. It will give you an eventlog error, however, since it isn't a clean reboot. See Q219885 for more details.	HKLM\Software\Microsoft\Windows NT\CurrentVersion\Winlogon EnableQuickReboot = 1 (REG_SZ)	WTS
33	Disable the Alerter service.	If this service isn't being used, it can be disabled (via Control Panel, Services or the registry entry here). This is one more unnecessary process that can be safely eliminated.	Modify the Alerter service through the GUI, or modify the following entry: HKLM\System\CurrentControlSet\Services\Alerter\ Value: Start Data (REG_DWORD): 4	WTS Win2K
34	Reduce the 'Master ICA Browser Refresh Interval'.	In load balanced environments where you are using the 'Advanced' balancing parameters, more accurate load distribution can be achieved by decreasing the refresh interval.	In Citrix Server Administration, select a server in the left pane, then the ICA Browser tab in the right pane. The default is 1800 seconds (30 minutes). Consider reducing this to something like 300 seconds (5 minutes).	WTS Win2K 1.8
35	Minimize ICA browser election times.	In load balanced environments with more than 5 servers, it is important to keep the amount of time when there is no ICA master browser (during an election) to a minimum. The fewer machines you have participating in an election, the faster a new master is elected and starts responding to users.	Plan your environment to have a dedicated master (set to 'Always Attempt to become the ICA Master Browser' through the ICA Browser tab in Citrix Server Admin). Set an appropriate number of servers (enough servers to ensure that one is up at all times) to 'No Preference', set the rest to 'Do not attempt...'	WTS Win2K 1.8
36	Hard code 'Terminal Services Licensing' server when Win2K servers participate in an NT4 domain.	When you are using Win2K without AD, Terminal Services can have problems finding the TS Licensing server. Adding/editing the following key solves that problem. For more info, see Q261110, Q232520, and/or Q239107.	Add/edit the following key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\TermS ervice\Parameters Value: DefaultLicenseServer Data (REG_SZ): <license_server_name> (needs to be resolveable via NETBIOS)	Win2K
37	In a published app environment, publish specific Explorer folders.	In a published application environment (vs. published desktop) it may be necessary to allow users to remotely run an explorer window. A savvy administrator could use this methodology to publish a users' home drive, or the Printers folder for example. On WTS, this can be done relatively securely with little or no modification to the shell environment. In Win2K, however, it is much less secure because of the 'Address' bar. Make sure your environment is secured satisfactorily before using this in either environment. See 'Publish Printers Folder.txt' at http://groups.yahoo.com/group/citrixnw/files for more details on publishing the printers folder specifically.	Create a copy of explorer.exe called something else (like pubExplorer.exe). Publish the new exe with some of the following parameters: PubExplorer.exe [/n]/e][./root,(object)][./select],(sub object)] /n opens a new single-paned window. /e opens Explorer in the standard view at the current folder. /root,(object) opens at the specified root level. /Select, Folder tells Explorer which folder gets the focus. /select,(filename) tells Explorer which file gets the focus. For example, publishing "pubExplorer.exe /e, /root, u:\\" would open an Explorer window set at the root of the U: drive.	WTS Win2K

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38	Optimize the ICA protocol for bandwidth and performance (1.8).	The ICA protocol is very flexible, allowing you to tune certain parameters to make it perform best in your environment. With FR1, Citrix released ThinWire2, the next version of the ThinWire virtual channel. It includes some potent optimizations that may have a significant impact upon bandwidth and performance. With FR1, TW2 is used for connections using greater than 256 color depth.	Here are a few optimization tips, some repeated from above for organization: - Minimize traffic sent over the wire by disabling any unnecessary components.(wallpaper; screen savers; drive, printer, clipboard, audio, COM, and LPT mapping) - Use TW2 at the lowest resolution and color depth (currently 16-bit) - With TWCONFIG (on FR1 servers only), enable discard (bandwidth savings) or disable it (performance increase) - Enable SUPERCACHE - Use the latest ICA Client, enabling persistent caching (to the smallest reasonable object size, typically 4 or 8k), enable compression, enable Queuing of mouse movements and keystrokes, enable SpeedScreen latency reduction.	WTS Win2K 1.8
38a	Optimize the ICA protocol for bandwidth and performance (XP).	Same story as above, although with XP these settings can be made through the CMC instead of from the command line. Also, TW2 is used for all color depths/resolutions, unless the client doesn't support TW2. If the client supports high color/true color, it supports TW2.	Here are a few optimization tips, some repeated from above for organization: - Minimize traffic sent over the wire by disabling any unnecessary components.(wallpaper; screen savers; drive, printer, clipboard, audio, COM, and LPT mapping) - Use TW2 at the lowest resolution and color depth. - Through CMC (Farm or Server properties, ICA Display) enable 'discard redundant graphics operations (default, bandwidth savings) or disable it (performance increase), and enable 'alternate cache method' (SUPERCACHE, enabled by default) - Use the latest ICA Client, enabling persistent caching (to the smallest reasonable object size, typically 4 or 8k), enable compression, enable Queuing of mouse movements and keystrokes, enable SpeedScreen latency reduction.	WTS Win2K XP
39	Disable ICA auto-client update if not currently in use.	If you are not currently using auto-client update, disable it to decrease client connection time.	In the ICA Client Update Configuration tool under Database Properties, disable the database.	WTS Win2K 1.8/XP
39a	Use centralized ICA auto-client update database.	Both versions of MetaFrame allow you to use a shared, centralized ICA ACU database for multiple servers. This allows you to add a new client to the database once and have it potentially be used by all servers in a farm.	In the ICA Client Update Configuration tool under the Database menu, configure the server to point towards a UNC ACU database as necessary.	WTS Win2K 1.8/XP
40	Tune ICA connection parameters to decrease connection time.	In order to decrease the time it takes for a client to connect to a MetaFrame server, set the appropriate properties on the ICA connection. Different environments will configure these differently based upon features needed.	In the Citrix Connection Configuration utility, Connection, Edit Connection, Client Settings button, disable unnecessary Client Mappings and set 'By default, connect only the client's main printer'.	WTS Win2K 1.8/XP
41	Replace the standard help file with the one from ZAK.	The standard Windows.hlp file that ships with WTS poses a possible security risk since users can launch apps from it.	Replace windows.hlp with zak.hlp from the WTSZAK2 (ZAK for TSE).	WTS
42	Periodically defragment System and Pagefile volumes.	In a WTS/TS environment, drive fragmentation can adversely affect system performance. Implement a disk defragmentation policy to keep the systems running at top speed. Win2K has some basic defragmentation tools build in, but consider 3 rd party products from Executive Software (DiskKeeper), RaxCo (PerfectDisk), or SysInternals (PageDefrag and Contig).	Focus your attention regularly on the System partition and on the PageFile(s). The apps partition will typically not get hit too bad because of limited write access. Consider defragging System and PageFile(s) at least once a month, and schedule defrag operations for non-peak usage times.	WTS Win2K

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43	Modify foreground thread timeslices.	Because of the differences in the process quantity on a Terminal Server vs. a normal NT/2000 machine, modifying the server so that foreground processes receive no additional boost can increase application performance. For more information, see www.sysinternals.com/nt5.htm or Chapter 12 of Todd Mathers' 'Windows NT/2000 Thin Client Solutions' (ISBN 1-57870-239-9)	WTS: On the Performance tab of the System applet in Control Panel, move the slider to None instead of Maximum. Win2K: On the Advanced tab of System applet in Control Panel, Performance Options button, set Application response to 'Background services'.	WTS Win2K
44	Configure RPC services.	When opening remote procedure call (RPC) aware applications such as Windows Explorer and Control Panel, delays of several minutes may be the result of incorrect service startup settings.	Verify that the RPC service Startup type is set to Automatic and the RPC Locator service Startup type is set to Manual.	WTS Win2K
45	Disable OS/2 and POSIX subsystems.	If you don't have a need for these, disabling them can free up an incremental amount of server resources. Be sure you aren't using any OS2 or POSIX apps before proceeding however, since they won't run	To disable these subsystems, remove the following keys under HKLM\System\CurrentControlSet\Control\Session Manager\Subsystems: - \OS2 - \POSIX	WTS Win2K
46	Remove the 'Shut Down' option from the Start Menu.	Unlike WTS, Win2K Server, by default, puts the 'Shut Down' option on the Start Menu. Modifying this behavior can save accidental reboots by click happy administrators. Reference Q216658 for more details.	To modify this functionality, use a GPO option or a registry change. The "Disable/Remove the Shut Down command" policy is listed under System Tools/Group Policy/User Configuration/Administrative Templates/Start Menu and Taskbar/ in the Computer Management console.	Win2K
47	Remove Outlook Express from the Quick Launch bar and Start Menu.	This is a little UI clean-up tip. If you don't want users to see this icon, you can effectively remove it at system build time.	The following key should be used for reference only as it depends on the version of Internet Explorer that is installed. Changing the "stubpath" entry and simply inserting the "" will result in the icons not being created when a user first logs on. [HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Active Setup\Installed Components\{44BBA840-CC51-11CF-AAFA-00AA00B6015C}] "Stubpath"=""	Win2K
48	Kill the Internet Connection Wizard.	By default, the ICW will run for all users the first time they log into a server and get a profile. These tips will effectively make the ICW disappear.	Delete the "ASetupICWDesktop" value from "HKEY_USERS\DEFAULT\Software\Microsoft\Windows\CurrentVersion\Runonce" to keep it from running the first time they start IE. You can also modify the following registry entry: Add or Change Key: HKEY_USERS\ .DEFAULT\Software\Microsoft\Internet Connection Wizard Value: Completed REG_DWORD: 0x1 Rename the x:\Program Files\Internet Explorer\Connection Wizard\icwconn1.exe and %systemroot%\WINNT\system32\dlcache\icwconn1.exe to prevent the ICW icon from being created for any new users.	WTS? Win2K

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49	Disable Explorer tips.	In order to keep Explorer from displaying tips at startup, modify the keys listed here.	Add or Change Key: HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\Tips Value: DisplayInitialTipWindow = REG_DWORD: 0x0 Value: Next = REG_DWORD: 0x100 Value: ShowIE4 = REG_DWORD: 0x0 Value: Show = REG_DWORD: 0x0	WTS Win2K
50	Disable right click, Explore on Start Menu.	Even if you implement the setting to Hide Drives (so that icons for specified drives are hidden and therefore un-browsable via Windows Explorer or File Open/Save dialogs), that setting is ignored if a user right-clicks on any Start...Programs menu item/folder and selects "Open" or "Explore" from the popup menu. It opens Windows Explorer with the focus on the folder in which the Start..Programs menu item resides.	To disable this function, Enable the user configuration Group Policy setting for "Disable drag-and-drop context menus on the Start menu", which creates the Registry entry "HKCU\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer\NoChangeStartMenu" (REG_DWORD, value = 1).	Win2K
51	Backup XP JET Data Store.	It is obviously a good practice to periodically backup your XP Data Store, and when you are using 'indirect mode' (JET Data Store residing on a MetaFrame XP server) you can do this without stopping the IMA service.	From the command line on your IMA Host server (server holding the indirect data store, MF20.MDB) run DSMAINT BACKUP <path>. This can be performed while the IMA service is running, and can/should be ran periodically from a scheduled script.	WTS Win2K XP
52	Tune Crash Dump parameters.	If you aren't troubleshooting a blue screening server, tuning these parameters can decrease reboot time considerable in the event a server dumps.	On Win2K, go to My Computer, Properties, Advanced, Startup and Recovery, Write Debug Information. Consider setting it to either no dump or one of the less detailed dumps to decrease reboot time.	WTS Win2K
53	Disable Media Sensing.	With Win2K, the OS tries to detect whether or not you have a cable plugged into the NIC. If there is no link, it disables the interface. Not a good thing on a multi-user server... NOTE: There are some side effects of disabling the "Media Sensing" feature. For example, if you have a machine with two network adapters, and you have the "Media Sensing" feature enabled, if one network adapter does not work, it is unbound, and associated routes are removed so that all traffic goes through the other network adapter (assuming a default gateway is there).	This parameter controls DHCP Media Sense behavior. If you set this value data to 1, DHCP (and even non-DHCP) clients ignore Media Sense events from the interface. By default, Media Sense events trigger the DHCP client to take an action, such as attempting to obtain a lease (when a connect event occurs), or invalidating the interface and routes (when a disconnect event occurs). To disable media sensing, add/edit the following registry key: HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Tcpip\Parameters Value Name: DisableDHCPMediaSense Data Type: REG_DWORD -Boolean Value Data Range: 0, 1 (False, True) Default: 0 (False)	Win2K

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Section D: Process Considerations and Tips

Ref.	Item	Description	How?	OS/MF Compat.
1	Implement an automated reboot cycle performing maintenance at that time.	Terminal servers, unlike other servers in a network environment, run many instances of user mode applications which may leak memory and eventually cause problems. A periodic, scheduled reboot also gives you the opportunity to perform some automated system maintenance, like clearing spool files, roaming profiles, Temp directory contents, compact IMA databases, etc., even if you don't need the reboot for stability reasons. Tools such as AUTOEXNT and DELPROF can help automate the process of clearing out Temp directories and user profiles. WM Software has a great 3 rd party tool to help with this. Check out their ShutdownPlus application.	Setup SCHEDULE service, use reboot script such as the one below. Note: SLEEP.EXE is from the NT Resource Kit: change logon /disable msg * Insert message here. Sleep.exe 300 net stop spooler sleep.exe 300 del %windir%\system32\spool\printers*. * /q shutdown.exe /REBOOT If you decide you need to reboot your Win2K servers (many people do), use the TSSHUTDN.EXE command instead. With XP, you may have to re-enable logins prior to reboot.	WTS
2	Implement some mechanism for change management.	Very important in multi-server environments- ensure that all servers are as identical as possible (software configurations). For details on proven change management practices in a MetaFrame environment, see 'iForum 2000, Change Management Final.zip' at http://groups.yahoo.com/group/citrixnw/files .	Use tools like batch/script files, documented change procedures, automated maintenance tools, Citrix Installation Management, multi-server maintenance tools (Multi-Remote Registry Change for example), and imaging (with a change log) to ensure identical configurations.	WTS Win2K
3	Use a centralized monitoring/reporting tool.	Useful for real-time monitoring as well as reporting, sizing, etc.	Implement a real-time and historical monitoring tool like Citrix Resource Management Services (for MetaFrame 1.8) or Resource Manager (a component of MetaFrame XPe).	WTS Win2K 1.8/XP
4	Utilize system policies wherever possible.	One way to reduce administrative overhead and ensure that your users get a reliable environment is to use system policies to manage the environment. They are confusing at first, but incredibly powerful and useful. For some WTS/TS specific policies, visit www.thethin.net .	Implement standardized system policies, potentially using a local POL file on each server for reliability. Use Manual policy update mode to point to local policy or different shared policy than NTCONFIG.POL. See KB document- Q161334 - Guide To Windows NT 4.0 Profiles and Policies (Part 1 of 6) for more details. Also- Q192794 How to Apply System Policies to Terminal Server.	WTS

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5	Utilize Group Policies wherever possible.	<p>If you thought that NT's system policies could be a handful, get ready for Group Policies in Win2K! They are extremely powerful, but with power comes complexity. Keep them as simple as possible, and avoid nesting them more than 3 deep- you pay for it in increased logon times.</p> <p>For a detailed description of a recommended strategy for handling Group Policies in a MetaFrame environment, see Chapter 16 of Todd Mathers' 'Windows NT/2000 Thin Client Solutions' (ISBN 1-57870-239-9).</p> <p>Another source of information on GPO configuration: TROUBLESHOOTING GROUP POLICY IN WINDOWS 2000 http://www.microsoft.com/Windows2000/library/howitworks/management/gpshoot.asp</p> <p>This white paper explains how IT administrators can troubleshoot Group Policy. It includes sections on using command line tools, accessing and using logs, common troubleshooting scenarios, solving software installation issues, checklists for troubleshooting, and best practices.</p> <p>Finally, this Q article discusses how to lock down a desktop on Win2K TS with a Group Policy, complete with recommended settings. http://support.microsoft.com/support/kb/articles/q278/2/95.asp</p>	<p>Too complex of a process to hit in detail, but here are a few highlights:</p> <ul style="list-style-type: none"> - Put Terminal Servers in their own OU. - Enable Block Policy inheritance on this OU. - Create one policy for the servers, one for the users. - On the policy for the servers, Disable User Configuration settings. - On the policy for the users, Disable Computer Configuration settings. - Enable Loopback Processing Mode with the Replace option. - Avoid nesting policies more than 3 deep if possible. <p>The gpreults.exe utility from the resource kit can be a great troubleshooting tool...</p>	Win2K
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Section E: Application Specific Tuning Tips

Ref.	Item	Description	How?	OS/MF Compat.
1	Implement system policy based Microsoft Office settings (MS Office).	Both Office 97 and 2000 have settings, such as default 'Save As' location, which can be maintained with a system policy.	Use system policy templates in either ZAKWTS2 or the ORK (for Office2K) on your MetaFrame policy file. Office 2000 templates are extensive.	WTS Win2K
2	Turn off Feedback with animation in Excel (MS Office).	When you run Microsoft Excel 97 or 2000, you may experience very slow response when scrolling. See Q235100 for details. Anyone want to share the registry keys to modify for this?	<ol style="list-style-type: none"> 1.Start Excel 97 or 2000. 2.On the Tools menu, click Options. 3.Click the Edit tab, and then clear the Provide feedback with Animation checkbox. 	WTS Win2K
2a	Publish Excel and Word with startup options.	In order to make these apps startup more quickly, you can publish them with the startup options listed here.	<p>To start Word without opening a specific document: Publish "winword.exe /n"</p> <p>To start Word without running any AutoExec macros: Publish "winword.exe /m"</p> <p>To prevent display of the Excel startup screen & a new blank workbook: Publish "excel.exe /e"</p>	WTS Win2K
3	Configure/tune IE5 with System Policies (MS Internet Explorer).	These entries are very strongly recommended. They can be set using the system policy templates that are included in the IE Admin Kit (5.x version). A few recommended items are listed to the right.	<p>Implement the following items, as applicable, using a system policy and IEAK templates:</p> <ul style="list-style-type: none"> - Suppress IE splash screen. - Set IE Temporary Internet Files to per machine vs. per user. - Set IE connection settings to per machine vs. per user. - Hide Connections tab and Temporary file settings. - Pre-set user's home page. <p>Don't use IEAK.ADM from ZAKWTS2- it doesn't work.</p>	WTS Win2K

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3a	Apply IE 5.5, SP1, and Security Update.	To avoid a display flicker problem with IE 5.5, make sure you have IE 5.5 with SP1, and install the latest security update for Internet Explorer 5.5 (dated November 22, 2000). If you cannot run SP1, see Q271246 for a hotfix.		WTS Win2K
4	Stop extra IE processes from running in each session (MS Internet Explorer).	Unnecessary processes x many users = unnecessary overhead. Get rid of items not required. LOADWC.EXE is the main one for IE.	Remove associated entries from HKLM\Software\Microsoft\Windows\Current Version\Run. LOADWC.EXE (WebCheck) Also, rename LOADWC.EXE or it will come back.	WTS
5	Disable Smooth Scrolling in IE 4 and 5.x (MS Internet Explorer).	When enabled, users can experience slow screen redraws. Disabling this improves performance.	Modify the following registry key for all users: [HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\Main] "SmoothScroll"=dword:00000000	WTS Win2K
6	Don't install SysInfo (MS Office 97).	This nice little administrative utility, installed with MS Office, can be a potential security hole. It allows users to run other applications from a command line. Office 9x only. Office2K's MST file removes it for you.	Either don't install this tool at the time of Office installation, or rename and/or secure the exe file.	WTS Win2K
7	Disable background grammar checking in Word (MS Office).	Microsoft's scalability testing has shown that background grammar checking can cut the number of users a WTS/Terminal Services machine can handle in half . Disable it for best performance.	For Office 97: [HKEY_CURRENT_USER\Software\Microsoft\Office\8.0\Word\Options] "AutoGrammar"="0" For Office 2K: [HKEY_CURRENT_USER\Software\Microsoft\Office\9.0\Word\Options] "AutoGrammar"=dword:00000000	WTS Win2K
8	Disable Active Desktop (MS Internet Explorer).	Active Desktop is incompatible with WTS (don't install it), but can be used on Win2K. If not necessary for business functionality, disable it on Win2K. It consumes lots 'o resources.	WTS: Don't install it. It isn't supported on WTS. Win2K: Disable under Terminal Services Configuration, Server Settings.	WTS Win2K
9	Disable IE sounds (MS Internet Explorer).	There are reported instances when IE will peg CPU on a Terminal Server trying to play sounds to a non-existent device. Don't install and/or kill all IE sounds to ensure this doesn't happen.	These settings are stored under [HKEY_CURRENT_USER\AppData\Local\Microsoft\Internet Explorer\Scheme\Apps], and can be modified with a REG file at logon time.	WTS Win2K
10	Hide the Visio 2000 splash screen (Visio 2000).	There have been reported problems where the splash screen will hang connections for an extended period of time. Disabling it saves bandwidth and processing cycles too.	Run visio32.exe with the /nologo option.	WTS Win2K
11	Help slow logons to NetWare servers (GSNW).	Using the Microsoft Netware redirector on a MetaFrame server, some environments will see consistently slow logons. Setting these options should help considerably. See Q215475 and Q242486 for more information.	1) Add/edit the following key: HKLM\SYSTEM\CCS\Services\NwRdr\Parameters Value: Disconnect Data (REG_DWORD): 0 (zero) 2) Add/edit the following key: HKLM\SYSTEM\Current Control Set\Services\NWRDR\Parameters Value: FindServerLessAttempts Data (REG_DWORD) 3 3) Open the Control Panel System applet, and in the environment tab, edit the system environment variable for the PATH and add the string: %SystemRoot%\Fonts	WTS
12	Set a preferred NetWare server (GSNW).	These settings allow you to configure users so that their password will be verified against the specified NetWare Server before it is checked on the logon domain. If the password on the logon domain is different from the user's NetWare password, the user's logon domain password will be updated to match the NetWare password.	Execute NDSPSVR /ENABLE:<server_name> where <server_name> is the name of the NetWare server you want to authenticate against	WTS Win2K

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13	Set Default Sever option for Novell client (GSNW).	This setting will setup the users default server and NDS context IF they have NEVER logged in before. This only applies to "new" users.	<p>To set Default Preferred Server settings, add/edit the following: HKLM\System\CurrentControlSet\Services\NWCWorkstation\Parameters Value: DefaultLocation Data (REG_SZ): <data></p> <p>The data for this value should be the name of your preferred server. Because this is a REG_SZ value type, only one default location may be specified. To specify a default Tree and Context, you must use the following format: *TREE\CONTEXT For example, if your Tree is "Netware" and your context is ou=USA.o=Company, the DefaultLocation should read: DefaultLocation: REG_SZ:*Netware\ou=USA.o=Company</p>	WTS Win2K
14	Set Default Script option (GSNW).	This setting will setup the users default server and NDS context IF they have NEVER logged in before. This only applies to "new" users.	<p>To set Default Scripting options, add/edit the following: HKLM\System\CurrentControlSet\Services\NWCWorkstation\Parameters Value: DefaultScriptOptions Data (REG_DWORD): <data></p> <p>The data will reflect what type (if any) script will be run. The data options are: 0 - no logon scripts will be run 1 - only Netware 3.x logon scripts will be run 3 - both Netware 3.x and Netware 4.x logon scripts will be run</p>	WTS Win2K
15	NetWare and client drive mappings (GSNW)	Since the Novell network logon and Client network mapping processes run synchronously, there could potentially be a conflict over drive letters. Whichever process gets the letter first wins. Set these entries to make sure they don't stomp on each other.	<p>To set the Initial Client drive, add/edit the following key: HKLM\SYSTEM\CurrentControlSet\Control\Citrix Value: InitialClientDrive Data (REG_SZ): <drive:> The data is the drive letter for the first client hard drive, including the colon (ie C:).</p> <p>To set the Initial Netware drive, add/edit the following key: HKLM\SYSTEM\CurrentControlSet\Control\Citrix Value: InitialNetwareDrive Data (REG_SZ): <drive:> The data is the drive letter for the first Netware drive, including the colon (ie F:)</p>	WTS Win2K

Section F: Advanced Tuning Tips

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Ref.	Item	Description	How?	OS/MF Compat.
1	Increase NTFS cluster size.	For an incremental performance boost in the drive subsystem, NTFS partitions can be formatted with a larger cluster size. The default of 512 bytes is smaller than necessary. See Q140365 for more details.	If you allow the WTS installation to create your partitions, it will use the default cluster size of 512 bytes. In order to get a larger cluster size, create the partitions on the drive by mounting the drive on another NT machine and manually formatting your partitions. After complete, move the drive back into the destination server and install the OS on the existing partitions. Some administrators feel that 4K clusters are optimal.	WTS OS/MF Compat.
2	Prevent last access time stamp from being updated on NTFS partitions.	For an incremental performance boost in the drive subsystem, you can turn off this default NTFS behavior.	"HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\FileSystem" Add Value: NfsDisableLastAccessUpdate REG_DWORD: 1	WTS Win2K
3	Disable logging of print events to the System log.	By default NT logs all print events to the System Log. On an active server, this can fill your System log quickly. Setting this registry key will disable this behavior.	"\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Print\Providers" Add Value: Eventlog REG_DWORD: 0	WTS Win2K
4	Modify MaxWorkItems and MaxMpxCt entries.	Don't modify these unless you exhibit some of the problems outlined in "Q232476 Terminal Server Client Connections and Logon Limited by MaxWorkItem and MaxMpxCt Values", or in "Q191370 Slow Network Performance with Terminal Server". A few examples (error messages or event log entries): -System could not log you on because domain <domainname> is not available -You do not have access to logon to this session -Event ID: 1311 Source: NetLogon Description: There are currently no logon servers available to service the logon request. -Error 1722: The RPC server is unavailable. -Error 1723: The RPC server is too busy to complete this operation. -Error 1721: Not enough resources are available to complete this operation.	See the documents listed (can be found on MS online Knowledge Base) for detailed instructions. For Win2K, these entries don't work because of a bug in the redirector. For more info, see Q271148. This is a post SP1 hotfix that corrects this problem. Q221790 also discusses the same problem. Note: - These mods have to be done at the back-end servers NOT the WTS/Win2K systems. - On WTS, the last 2 digits of these hex values have to be non-zero, otherwise you'll kill all the windows 9x systems. For a good example of this, see http://www.thethin.net/maxmpxct.cfm . With Win2K with the above hotfix, the server automatically adjusts if it detects Win9x clients.	WTS Win2K
5	Set file handles to per user vs. per server if needed.	Some applications, like PeopleSoft, require a large number of File Handles per user. Changing this entry incurs a bit more overhead on the server, but gets around the limit of 2048 open files per server, instead limiting it by user. See "Q233082 Windows Terminal Server Clients May Randomly Hang for 35 Seconds or More" and "Q190162 Terminal Server and the 2048 Open File Limitation" for more details.	WTS: [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Rdr\Parameters] "MultipleUsersOnConnection"=dword:00000000 Win2K: Not verified, however I believe that the same value works, but you must create the path/entries.	WTS Win2K
6	Modify ProcessTerminate Timeout.	By default, when a user logs off, CSRSS issues a shutdown notification to all of a user's running processes, then waits 10 seconds for them all to shutdown before allowing WINLOGON to unload the user's profile. If a process takes more than 10 seconds to shutdown, the profile can get 'stuck'. This registry key can be modified to allow more time for all processes to terminate. VERIFY Does this apply to Win2K as well?	See Q234606 for implementation details.	WTS Win2K?

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7	Implement print driver security.	<p>In a WTS environment, use of an improper driver can hang or crash a Terminal Server. In order to control where print drivers come from, you can specify a list of 'trusted locations' where WTS will accept print drivers from. See Q238070 and Q247071 for more details.</p> <p>VERIFY Does this apply to Win2K as well?</p> <p>For additional information that may help with driver troubleshooting on Win2K, see Q270005: "OEM Print Drivers Are Overwritten by Microsoft Drivers That Use Terminal Services Redirect Printing"</p>	<p>HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\Print\Providers\LanMan Print Services\Servers LoadTrustedDrivers = 1</p> <p>HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\Print\Providers\LanMan Print Services\servers TrustedDriverPath = "%systemroot%\system32\spool\drivers\w32x86"; \server\share; \server\share The value data type should be REG_SZ, and you can specify multiple share points separated by a semicolon.</p>	WTS Win2K?
8	Set PoolTag entries.	<p>This feature can be a helpful item to enable for assistance in debugging kernel mode errors, specifically errors caused by pool damage. See Q188831 'How to Enable the Special Pool Feature to Isolate Pool Damage' for details on PoolTag. Also, see Q250453 'Determining Special Pool Tagging Options When Debugging'.</p> <p>Set/use this option ONLY when debugging. The server takes a substantial performance hit when set.</p>	<p>See Q188831 for uses and entries.</p> <p>HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management Value Name: PoolTag Data Type : REG_DWORD Data : Pool tag mask Allocation size mask 0</p>	WTS Win2K
9	Suppress spooler error Messages.	<p>Sometimes the spooler service will refuse to restart after a shutdown, giving a 'system error 12'. Most likely cause- unanswered printer error popup on the console of the server. Disabling these error messages can make the restart more reliable.</p> <p>VERIFY Does this apply to Win2K as well?</p>	<p>HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Spooler Change the value of ErrorControl from 0 (which lets all error messages display) to 1 (to suppress system error messages only) or 2 (to suppress both system error and application error messages).</p>	WTS Win2K?
10	Increase SizeReqBuf.	<p>To improve the performance of apps or activities that do a lot of file copy/move functions, you can modify this registry setting to help drastically improve the performance. See MS Q223140 for more information.</p> <p>If working in a mixed Windows 2000 and TSE environment, additional performance can be gained by modifying the network request buffer size on the TSE servers. Increasing this value to 65536 bytes, from the default of 4356 bytes, significantly improves LAN Manager file writes. For more information, see Microsoft Knowledge Base article Q279282.</p>	<p>HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanServer\Parameters Value Name: SizReqBuf Data Type : REG_DWORD Data : 512 - 65535 (bytes in decimal) Default : 4096</p> <p>Set this to something more like 14596. More buffers equals better performance using more memory. Don't go too ballistic.</p>	WTS/ Win2K
11	Optimize Page Address Pool and System PTE allocations.	<p>For anyone pushing a server over approx. 60 users, look into this one. In short, servers have a hard coded allocation of these 2 resources, and both resources reside in a limited memory address space. Without optimizing these allocations, you may inadvertently run out of one resource or another, effectively topping out your server when you have plenty of processor and memory available.</p>	<p>See "Q247904 - How to Configure the Paged Address Pool and System Page Table Entry Memory Areas" for more info, registry entries, and tuning parameters. Microsoft also has a spreadsheet called "Kernel Tuning Assistant.xls" that can help with the calculations.</p>	WTS Win2K
12	Increase performance/reliability over WAN links and the Internet.	<p>On highly variable performing network links, it is possible to modify the behavior of the TCP protocol stack to make the server more accepting of link inconsistency. For more information, see Citrix article CTX757449, Q120642, and Q170359.</p>	<p>Add/edit the following: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\ Value: TcpMaxDataRetransmissions Data (REG_DWORD): 10</p>	WTS Win2K

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13	Increase network performance parameters.	If people on MetaFrame are accessing remote files, this can improve performance by not having them wait for a thread/buffer to free up. If remote file access (or named pipes, etc.) is not used a lot, there would be no change. This consumes more memory though, but not a lot. The default values aren't necessarily optimized for the high quantity of processes in a Terminal Services environment. See http://www.jsiinc.com/tip0100/rh0125.htm for more details.	Add/Edit the following keys in HKLM\System\CurrentControlSet\Services\LanmanWorkstation\Parameters\ Values: MaxCmds, MaxThreads, MaxCollectionCount Data (REG_DWORD) MaxCmds: 255, MaxThreads:255, MaxCollectionCount: 65535	WTS Win2K															
14	Modify AdditionalCriticalWorkerThreads.	This is the same as above, but other parts of the system use critical worker threads as well. More of these would cause fewer delays when a thread is needed. The file server, lanman redirector, CDM, and some ICA timer threads may use these.	Add/Edit the following keys in HKLM\System\CurrentControlSet\Control\Session manager\executive\ Values: AdditionalCriticalWorkerThreads Data (REG_DWORD): 16	WTS Win2K															
15	Turn off Lazy Writes.	Lazy writes occur when data is cached instead of immediately written to disk. If data is being sent across the network or the server has a caching controller card, disabling lazy writes improves performance.	Network and local lazy writes can be disabled by modifying the following registry settings: Key: KEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Lanman Server\Parameters Value: IRPStackSize REG_DWORD: 0x6 Key: KEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Service\Lanman WorkStation\Parameters Value: UtilizeNtCaching REG_DWORD: 0x0	WTS Win2K															
16	Modify IOPageLockLimits.	The registry setting IoPageLockLimit specifies the limit of the number of bytes that can be locked for I/O operations. Since RAM is being sacrificed for increased disk performance, the optimal setting for this value should be determined through pilot tests. Changing this setting from the default can speed up file system activity. Use the table below as a guide for changing the registry setting: <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>RAM</th> <th>Decimal</th> <th>Hex</th> </tr> </thead> <tbody> <tr> <td>64-128</td> <td>4096</td> <td>1000</td> </tr> <tr> <td>256</td> <td>8192</td> <td>2000</td> </tr> <tr> <td>512</td> <td>16384</td> <td>4000</td> </tr> <tr> <td>1024+</td> <td>65536</td> <td>10000</td> </tr> </tbody> </table>	RAM	Decimal	Hex	64-128	4096	1000	256	8192	2000	512	16384	4000	1024+	65536	10000	The registry setting can be modified as follows: Key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management Value: IoPageLockLimit REG_DWORD Default: 0 (512 KB is used) For additional information on the IoPageLockLimit registry setting, refer to the Microsoft Knowledge Base articles Q121965 and Q102985.	WTS Win2K
RAM	Decimal	Hex																	
64-128	4096	1000																	
256	8192	2000																	
512	16384	4000																	
1024+	65536	10000																	
17	Change file associations on Win2K.	On computers running Windows 2000 Terminal Services, the UI is locked down so that no one can change file type associations (not even administrators). This is done so that you can only edit the entries programmatically or by using MSI-based applications. This ensures that an inadvertent change in the UI does not effect the global file type associations across the computer running Terminal Services and all of its users.	If you need to change an association for some reason, you can enable this functionality by changing the following registry entry: [HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\Explorer] "NoFileAssociate"=dword:00000000	Win2K															

Section G: Un-Verified Tips (I am looking for feedback, documentation, and experiences with these)

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1	Modify IOPageLockLimits.	<p>Note: official Citrix stance has been added to F16. This entry has been left here for historical purposes only...</p> <p>If anyone can find a Q article or some documentation on these I would appreciate sharing!</p> <p>When / Why would you do it? What does it help?</p> <p>Some related information: http://arstechnica.com/tweak/nt/IO-1.html</p>	<p>One opinion of a way to calculate this: Memory of the Server * 128 * 1024 * 2 / 3? Confusing to me...</p> <p>Another opinion: If you've got 256 MB of memory or more, setting this to 8-16K will speed things up marginally on file i/o. Set it much higher and you could slow things down.</p> <p>A third: One VERY trusted source recommends 40000 on a typical MetaFrame server, and swears by huge performance increases.</p> <p>You control this setting by modifying the following key under HKLM\System\CurrentControlSet\Control\Session Manager\Memory Management: "IOPageLockLimit" (REG_DWORD): (default value of 0 = 512KB). Change from Hex to Decimal, change the value in the data field to reflect your preferred allocation size in KB.</p>	TSE Win2K?
2	Tune clipboard polling.	(VERIFY)	(VERIFY)	
3	Turn off lazy writes.	Moved to Section F.		
4	Increase TCP/IP buffer size.	(VERIFY)	(VERIFY)	
5	Reduce the number of seconds for a TCP/IP connection retransmission response.	Reportedly useful if users are not connecting because of latency delays. (VERIFY)	MaxDataRetries	
6	Disable auto-disconnect for LAN.	For instructions on how to accomplish this, see http://www.jsiinc.com/tip0000/rh0019.htm .	(VERIFY)	
7	Stop check disk from running at boot up.	See http://www.jsiinc.com/tip0000/rh0008.htm for more info.	(VERIFY)	
8	Turn off Microsoft opportunistic file locking.	Helpful for DOS apps on NT? See Q129202 and http://www.jsiinc.com/tip1400/rh1447.htm for more info.	HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanServer\Parameters Edit or Add Value name, the following three (3) REG_DWORD values: CachedOpenLimit - set the data value to 0 to prevent the caching of previously open files. EnableOplocks - set the data value to 0 to turn off opportunistic file locking. autodisconnect - set the data value to 0xFFFFFFFF to prevent the client workstation from being disconnected due to a time out.	

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9	Suppress the message 'A domain controller for your domain could not be contacted...' (disabling logon info cache).	<p>NT caches previous users' logon information locally so that they will be able to logon in the event that a logon server is unavailable during subsequent logon attempts. If a domain controller is unavailable and a user's logon information is cached, the user will be prompted with a dialog that says:</p> <p>"A domain controller for your domain could not be contacted. You have been logged on using cached account information. Changes to your profile since you last logged on may not be available."</p> <p>With caching disabled, the user is prompted with this message: "The system cannot log you on now because the domain is not available."</p> <p>See http://is-it-true.org/nt/nt2000/registry/rtips12.shtml (Win2K) and http://is-it-true.org/nt/registry/rtips36.shtml (for WTS) for more info.</p>	<p>Add/edit the following key:</p> <p>WTS: HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon Value Name: ReportDC Data Type: REG_DWORD Data (REG_DWORD): (0 = message enabled, 1 = message disabled)</p> <p>Win2K: HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon Value Name: ReportControllerMissing Data (REG_SZ) TRUE or FALSE</p> <p>Another reported cause of these errors is using a custom desktop folder for policy managed users that resides on a share. Storing this folder on the local server increases administrative efforts, but can help avoid these errors. This method can also increase performance as user load increases on a server.</p>	WTS Win2K
10	Set AlwaysUnloadDLL entry to clear up memory space.	<p>Could use some usage recommendations here. Is this always a good thing? Does it have a positive affect on performance as well as reliability?</p> <p>Talk to me people... :-)</p>	<p>Add/Edit the following key: [HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\AlwaysUnloadDLL] Value Name: Default Data (REG_SZ): 1</p>	WTS Win2K
12	If installing Novell client, install it before MetaFrame XP.	<p>Can anyone corroborate this one? Trying to find some details... Why? What breaks?</p>		
13	Set environment variable for JAVA apps.	<p>On WTS, some JAVA applications require you to manually configure an environment variable in order for them to run. If you are having problems with a JAVA app, give this a shot.</p>	<p>Define the System environment variable JAVA_FONTS as the %SYSTEMROOT%\fonts directory. For example:</p> <p>Variable: JAVA_FONTS Value: C:\WTSRV\FONTS</p>	WTS
14	Tune Office 2000 more tightly.			

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Appendix A: TS/MetaFrame Compatible HP Print Driver Versions

The list of HP printers that are compatible with WTS/TS that used to be part of this document has been added back! Special thanks to Rob Tuft, Rebecca Swanson, Mike Ard, and Steve Deroos of HP for helping us overcome some of the greatest obstacles we face on this platform. You guys rule!

For problems with HP printer drivers in a TS/MetaFrame environment, use the following support e-mail addresses: wts_deskjet@hp.com for DeskJet issues, and wts_laserjet@hp.com for Laserjet issues.

Supported Printers and Driver Version (as of Feb. 15, 2001)

Printer Family	Supported in Terminal Server Environment(s)	Supported Driver Versions	
		PCL	PS
LJ 1100* Family LJ 1100A*	Yes Print Only	1.0.5.029 or 4.3.2.50	N/A
LJ 2100* Family	Yes	4.3.2.50	4.0 (M and TN models only)
LJ 3100 Family	Not Supported	N/A	N/A
LJ 3150 Family*	Yes (Printing Only – single-user terminal server environment only)	197C to 197E	N/A
LJ 3200 Family*	Yes (Printing Only)	4.3.2.54	4.0 (M model only)
LJ 4000 Family	Yes	4.3.2.44	4.0
LJ 4050 Family	Yes	4.2.1.12 and newer versions	4.0
CLJ 4500 Family	Yes	4.3.2.75	4.11
CLJ 4550 Family*	Yes	4.3.2.62	4.50
LJ 5000 Family	Yes	4.3.2.50	4.0
LJ 8000/8100 Fam.	Yes	4.3.2.12	4.0
LJ 8150 Family*	Yes	4.3.2.54	1.0
CLJ 8500 Family*	Yes	1.0	2.0
CLJ 8550 Family*	Yes	4.3.2.20	4.3.2.20
LJ 4 Family	Yes	4.3.2.38	4.0

LJ 5 Family	Yes	4.3.2.38	4.0
LJ 6 Family	Yes	4.3.2.38	4.0

Products listed with the * have limited testing in the terminal server environment. At this time although there are no known issues with these products in this environment, we do want customers to be aware of the limited testing.

Product	Driver Version	Driver Location
DeskJet 990cse/cxi	Available 03/01	http://www.hp.com/cposupport/swindexes/hpdeskj921701_swen.html
DeskJet 970cse/cxi	Available 03/01	http://www.hp.com/cposupport/swindexes/hpdeskj918369_swen.html
DeskJet 895cse/cxi	Available 03/01	http://www.hp.com/cposupport/swindexes/hpdeskj88117_swen.html

For more information or to obtain the full documents in the state they were delivered by HP, please grab "HP Printer Compatibility 2-15-01.zip" from <http://groups.yahoo.com/group/citrixnw/files>. Sorry for the wrapped hyperlinks above... ;-)

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Appendix B: Post SP6 Hotfixes for TSE (thanks Mark Brecto for compiling this list!)

Post SP6 Hotfixes:

Q186241- Dr. Watson May Cause CPU Usage to Spike
Q197159- Dr. Watson Error in Internet Explorer 4.0 When Running After Installation on Terminal Server
Q235602 Client Computers Report Problems Connecting to Server
Q238218- Err Msg: This Operation Has Been Cancelled Due to...
Q240414- Desktop Link to Local Folder Does Not Work After Installing SP5 If NoDrives Policy Is Enabled
Q246467- RAS Server Stops Responding to New PPP Connection Requests
Q247408- Error Message or Spooler Hangs When You Pause or Resume Print Job
Q252299- RAS Service Cannot Receive Calls over the COM Port After Reconnecting Cable
Q254930- TCP Session with Server Never Closes
Q255672- CAPS LOCK Functionality Is Inverted During Terminal Server Client Logon
Q255779- Can Still View System Drive Even Though View Is Disabled by a Policy
Q257272- "Auto Select" Property Set to Letter Instead of A4 for Raster Printers
Q257551- GSNW/CSNW NetWare Banner Page missing Username
Q259622- Command Processor May Not Parse Excessive Arguments Properly
Q259877- "Stop 0x1E" on Terminal Server During Session Shutdown
Q261130- Cached Profile Deleted Even If Central Profile Is Not Updated
Q262203- Roaming User Profile May Be Corrupted by Copy Hive Problem
Q262461- Terminal Server Client Truncates Server Name to 32 Characters
Q262956- "Stop 0x50" in Win32k.sys with Windows NT Terminal Server Edition
Q263691- Environment Variables in TrustedDriverPath Are Not Resolved in Windows NT Server, Terminal Server Edition

Q264991- Terminal Server Does Not Retain "User Must Change Password at Next Logon" Property on User Copy
Q266433- Patch for Numerous Vulnerabilities in the LPC Port System Calls
Q266762- Error Message: STOP 0x00000050 0xe2000000 0x00000000 0x00000000 0x00000002
Q267578- Access Violation in Lsass.exe in Windows NT version 4.0 in a Windows 2000 Domain
Q269049- Registry-Invoked Programs Use Standard Search Path
Q269214- ICA Browser Occasionally Hangs with Windows NT 4.0 Terminal Server Service Pack 6
Q270637- Not Found
Q271518- Error Message Loading Profile If You Log On to Windows 2000 and Windows NT Clients with the Same Roaming Profile
Q272913- CreateRemoteThread May Leak Handle in Windows NT Terminal Server Edition
Q277537- Error Message When You Open a Notepad File on an IBM AS400 Computer
Q281403- CGI Application Cannot Load DLL in a Directory with Extended ASCII Characters
Q281544- Terminal Server Hangs with "Stop 0x82" Error Message
Q282215- Not Found
Q287634- EnhancedSecurityLevel of "1" Causes "Stop 0x1E" When Password Is Changed

Other:

Q277910- Patch Available for "Terminal Server Login Buffer Overflow" Vulnerability
Q279336- Patch Available for Winsock Mutex Vulnerability
Q271246- Screen May Flicker Using Internet Explorer on Terminal Services
Q269239- NetBIOS Vulnerability May Cause Duplicate Name on the Network Conflicts

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Appendix C: Win2K Post SP1 Hotfixes (partial list)

This is only a partial list, mostly snipped from Windows 2000 magazine's 'Thin Client Update'. I know I am missing a ton here, so please help me out by sharing any important ones I am missing.

* HOW TO LOCK DOWN A WIN2K TERMINAL SERVER SESSION

You can use Group Policies to lock down a terminal server session on a Windows 2000-based computer so that even the Administrator's account has restricted access. Microsoft article Q278295 explains how to configure these settings, including the procedure for creating a new organizational unit (OU) for the locked-down accounts (as Microsoft recommends).

<http://support.microsoft.com/support/kb/articles/q278/2/95.asp>

* DESKTOP DOESN'T LOAD FOR ANY USER

If the Win2K Server Terminal Services service account is configured to log on with any account other than the System account (as it should be by default), users won't be able to log on to the terminal server either from the console or from a terminal session. Microsoft article Q287654 describes the symptoms and explains how to resolve the problem.

<http://support.microsoft.com/support/kb/articles/q287/6/54.asp>

* ERROR MESSAGE: THE SYSTEM CAN'T LOG YOU ON (573)

If you use a Not for Resale (NFR) version of Win2K (or installed the retail version starting from NFR floppies) and you get a "the system cannot log you on" error message, you could be out of licenses. Regardless of the client OS or the type of domain you're in (Win2K or Windows NT), NFR Win2K servers will only accept up to 10 connections. See Microsoft article Q286272 to learn how to identify an NFR version you might have mistakenly installed.

<http://support.microsoft.com/support/kb/articles/q286/2/72.asp>

* CAN'T AUTOMATICALLY LOG ON REMOTELY TO TERMINAL SERVER WITH LONG USER NAME OR PASSWORD

Although you can set up an RDP client connection to automatically log on

to a terminal server without presenting users with a logon screen, this capability is limited. According to Microsoft article Q290706, the RDP client can't remotely pass long usernames or long passwords. If you try to make the client do so, you'll get a "the system could not log you on" error message. Retyping the same username and password will work, however. The article identifies this as a known bug.

<http://support.microsoft.com/support/kb/articles/q290/7/06.asp>

* CONTACTING THE MICROSOFT CLEARINGHOUSE

If you need to get in touch with the Microsoft Clearinghouse to get licenses for your Win2K Server Terminal Services server and can't find a telephone number, see Microsoft article Q2911795 for instructions.

<http://support.microsoft.com/support/kb/articles/q291/7/95.asp>

* POST-SP1 ISSUES WITH PROFILE LOADING

Because of a handle leak in the registry (see Microsoft article Q289564 for the exact key), a Terminal Services server might not be able to unload a user profile--or to reload it when the user tries to connect again to the terminal server. See the article for more information about this problem, how to identify it, and how to get a fix.

<http://support.microsoft.com/support/kb/articles/q289/5/64.asp>

* POST-SERVICE PACK FIXES FOR PRINTING-GENERATED BLUESCREENS

When you try to print from an RDP client in a Win2K Terminal Services session, the terminal server can crash with a Stop error message if the spooler tries to display a dialog box to the client desktop but the desktop handle isn't available. Microsoft article Q261322 lists the Stop error and explains how to get a fix for the problem. Another printing-generated blue screen of death involves post-Service Pack 6 (SP6) terminal servers. According to Microsoft article Q282215, using user-mode print drivers will crash the terminal server.

<http://support.microsoft.com/support/kb/articles/q261/3/22.asp>

<http://support.microsoft.com/support/kb/articles/q282/2/15.asp>

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You might want to add the new HotFix for a GINA security vulnerability. The knowledge base article pointed to in the NTBugTraq notice was Q277910.

Win2K Can Leave an Unlicensed Connection Active After Logging Off a NetWare 4.X/5.X Server

When clients connect to a Terminal Services server or to Win2K Professional and connect to a Novell NDS tree through a logon script or a mapped drive using Client Services for NetWare (CSNW), the connection remains on the NetWare server after the client has logged off. When the client logs back on to access the NetWare server, it could reach the license limit on the NetWare server or the concurrent access limit. This behavior doesn't occur when you use NetWare Client32 version 4.71 or later. See Microsoft article Q263546 <<http://support.microsoft.com/support/kb/articles/q263/5/46.asp>> for a fix or workaround.

Java Plug-In Leaves Browser Processes and NTVDMs Running After You Close the Browser

Programs such as Netscape Navigator, Internet Explorer (IE) 5.0, and RealPlayer, as well as 16-bit programs that run Windows NT Virtual DOS Machine (NTVDM), can continue to use process resources after you close the programs. You then have to use Task Manager to quit the process; otherwise, the OS memory will eventually run out of resources and you'll have to restart the computer. According to Microsoft article Q260256 <<http://support.microsoft.com/support/kb/articles/q260/2/56.asp>>, Java Plug-In version 1.2.1 causes the problem, and you should download Java Plug-in 1.2.2 <<http://java.sun.com>>.

Loading Printer Drivers From a Trusted Source

It's important to use the right printer drivers. Citrix MetaFrame XP includes printer-driver management, but if you use an earlier version of MetaFrame or aren't using it at all you have another option: Specify a path to a trusted print server, as Microsoft article Q239536 <<http://support.microsoft.com/support/kb/articles/Q239/5/36.asp>> explains.

Access Violations in Spooler Service When Printing a Long Named Print Job

Microsoft article Q246729

<<http://support.microsoft.com/support/kb/articles/Q246/7/29.asp>> reports that when the spooler service attempts to print a file with a long name, it might intermittently generate Access violation error messages and hang. When this occurs, the system might indicate that the print job didn't finish because the printer ran out of paper or because of another hardware problem. If the file name is longer than 200 bytes and the printer also has a hardware problem, the spooler service might not generate an error message. This behavior can occur even if you are logged on locally.

Post-Service Pack Fixes for BSODs in Win2K and TSE

When you run Win2K Terminal Services with multiple clients, you might receive multiple error messages on blue screens that are related to win32k.sys. See Microsoft article Q281132 (<<http://support.microsoft.com/support/kb/articles/Q281/1/32.asp>>) for the fix for this problem.

Terminal Server Troubleshooting Tips

Two new Microsoft articles provide tips for tuning and troubleshooting terminal servers. Article Q284439

<<http://support.microsoft.com/support/kb/articles/Q284/4/39.asp>> describes how to install the Terminal Services Advanced Client (TSAC) on a terminal server and edit the logon script to enable error code listing, then lists the available error codes.

Microsoft article Q243215

<<http://support.microsoft.com/support/kb/articles/Q243/2/15.asp>> lists tweaks you can make to a terminal server's Registry to affect how it waits for user logons and how it deals with runaway applications, memory usage, and other parameters.

* WIN2K LICENSE SERVER PROBLEMS

As you probably know, in Application Server mode, Win2K Terminal Services requires that you maintain a valid license server to distribute terminal licenses. Before a license server accepts license codes, you must activate it. However, according to Microsoft article Q258045, even after you activate the license server, it might not accept license key packs if the license key is invalid (which is

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understandable if you type the key manually--it's a long number) or if the key is valid but the license database is damaged. The article explains how to rebuild the licensing database.

<http://support.microsoft.com/support/kb/articles/q258/0/45.asp>

* PERFORMANCE DEGRADATION WHEN HEAP IS FRAGMENTED

A heap is one or more pages of memory that Win2K can allocate in chunks to create temporary objects. Each process starts out with its own 1MB heap, and the heap grows if the process needs more memory to create temporary memory blocks. However, an application that frequently allocates or frees memory (directly or indirectly) might experience serious performance degradation because an internal algorithm the system uses to find the free blocks doesn't perform well under these conditions, and the heap becomes fragmented. (This slowdown is similar to the one you experience when you attempt to retrieve a file from a heavily fragmented disk.) Microsoft article Q257357 explains how to get a Win2K fix that resolves this problem.

<http://support.microsoft.com/support/kb/articles/Q257/3/57.asp>

* TERMINAL SERVICES LICENSE SERVER STATUS APPEARS AS UNKNOWN

When you try to activate a Windows 2000 Server Terminal Services Licensing Server, you might receive an error message telling you that the licensing wizard can't connect to the selected license server and that you need to make sure the licensing service is running. According to Microsoft article Q269349

(<http://support.microsoft.com/support/kb/articles/Q269/3/49.asp>), this problem can occur if the user who is currently logged on has a roaming profile and the Terminal Server is configured to delete the roaming profile cache. The problem can also occur if the user who is currently logged on is configured to use a mandatory profile. Microsoft has a hotfix for this problem, which SP1 does not address.

* HOTFIX FOR ROAMING PROFILES PROBLEM

With terminal services, profile corruption can be a problem. If you use roaming profiles and the ntuser.dat file on the server doesn't download to the terminal server, users can still log on, but they won't see any changes they made to their profiles earlier. Microsoft Support Online

article Q262203

(<http://support.microsoft.com/support/kb/articles/q262/2/03.asp>) tells you how to get a hotfix that prevents users from logging on when their centrally stored profiles aren't available. There's a catch, though. After you install the hotfix, a user can't log on if the ntuser.dat file doesn't successfully copy from the profile server to the local computer during logon.

Q222043 – Roaming Profile Folders Do Not Allow Administrative Access

Q269523 – Service Control Manager Named Pipe Impersonation Vulnerability

Q265419 – 'Terminal Services Server Does Not Restart with Restart Command from a Client Session'

Q270037 – 'Policy Restrictions on Drives Cause Unnecessary Error Message at Logon and in File Dialog Box'

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Appendix D: Citrix MetaFrame 1.8 Post-SP2 Mondo Hotfixes

As of April 2001, this is the readme from the most current mondo hotfix for MetaFrame 1.8/SP2 on NT4, TSE. Only request (from Citrix support) and apply this hotfix if you are experiencing a specific problem that it solves! Some of the more critical fixes are in **bold face type** below.

Filename: ME182T007.EXE

For: MetaFrame 1.8 for Windows Terminal Server

Replaces: ME182T001, ME182T002, ME182T006

Language supported: English (US)

NOTE: This hotfix can be applied only to a Windows Terminal Server with MetaFrame 1.8 and Service Pack 2 installed.

Description

This hotfix resolves the following issues:

1. This hotfix adds new APIs to Wfapi.dll. These new APIs are used by SNMP for MetaFrame 1.8.
[From Hotfix ME182T001]
2. The Euro symbol key (AltGr+e) did not work correctly on Linux Clients configured with German or Swiss German keyboard layouts.
[From Hotfix ME182T001]

3. The DOS Client sometimes experienced display corruption when switching a console application to full screen text mode.
[From Hotfix ME182T001]
4. Some Visual Basic applications, when published in seamless mode, showed the wrong icon on the taskbar.
[From Hotfix ME182T001]
5. The Shadow Taskbar Login dialog box supported user names up to 15 characters in length. Users with names longer than 15 characters received an error message when attempting to log on.
[From Hotfix ME182T001]
6. The size of an allocated buffer was increased in CDM.SYS to accommodate a backslash (\) being appended to the network path name.
[From Hotfix ME182T001]
7. Logging out from a local console session on the MetaFrame server on which the SSL Relay service is running caused the SSL Relay service to stop.
[From Hotfix ME182T001]
8. There was an error in the HTML file that is created by Published Application Manager. The href tag for the Netscape plug-in link contained a syntax error. The HTML tag was incorrectly entered as instead of .
[From Hotfix ME182T001]

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9. Installing MetaFrame 1.8 SP/FR1 broke UNIX Integration Services auto-logon, the "-exec " option, and the "-lang " option.

[From Hotfix ME182T001]

10. Additional exception flags are implemented to work around various seamless problems.

Type 4: These windows are to be regarded as IME-related windows with several configuration flags. The registry entries have 4 values as follows:

Type:DWORD,
ClassName:REG_MULTISZ
IMEFlag:DWORD
IMEOwnerDepth:DWORD

Class exceptions for MS-IME are hard coded, but third-party vendor IMEs can specify this flag to fix their problems. Here is the setting for MS-IME98 that is needed if they are not hard coded.

ClassName,	Type,	IMEFlag,	IMEOwnerDepth
MSIMECaret,	4,	3,	0
msime98cnv,	4,	3,	0
msime98mode,	4,	5,	3
msime98cand,	4,	1,	3
msime98ToolTip,	4,	1,	4

Type 8: This is used when applications using non-visible windows and the seamless engine fail to create them. This

may result in the application background being visible. The registry entries have 2 values as follows:

Type:DWORD
ClassName:REG_MULTISZ

Type 16: These windows are not to be checked in terms of their size and location. An example of this is a zero byte window that needs to be created by the seamless engine. The registry entries have 2 values as follows:

Type:DWORD
ClassName:REG_SZ

Type 32: This exception is to maintain the parent child relationship. The symptoms can result in additional items in the taskbar. The HostOwner for these windows is to be taken by the GW_OWNER flag instead of the GWL_HWNDPARENT flag. The registry entries have 2 values as follows:

Type:DWORD,
ClassName:REG_MULTISZ

For example, for Visual Basic applications add the following registry entries (Types 16 and 32):

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Citrix\wfshell\TWI\ThunderRT6FormDC]
"ClassName"="ThunderRT6FormDC"
"Type"=dword:00000030
```

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```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\
Citrix\wfshell\TWI\ThunderRT6Main]
"ClassName"="ThunderRT6Main"
"Type"=dword:00000030
[From Hotfix ME182T001]
```

11. The Redirector had problems tracking transmit and receive queue sizes for redirected client serial ports. This issue was found in tests with a Symbol Technologies hand-held scanner device. A related fix is in the ICA Win32 Client, Build 931.
[From Hotfix ME182T002]

12. Citrix Server Administration sometimes crashed with an access violation after adding certain Microsoft hotfixes.
[From Hotfix ME182T002]

13. Fixes the issue with COM port mapping and applications failing to send data to the client COM port. This sometimes caused applications employing MSCOMM32.OCX for serial port control to report I/O errors.
[From Hotfix ME182T002]

14. Corrects the problem that occurred during Win32 API calls. GetVolumeInformation and WNetGetResourceInformation returned incorrect information when run against an ICA Client drive.
[From Hotfix ME182T002]

15. Japanese only: Corrects the problem where the user's

profile settings for the IME tool bar were not used when logging into a published application. This sometimes caused the Japanese IME tool bar to start in the default position instead of the last position. Customizations to the IME tool bar that are stored in the user's profile sometimes failed.

[From Hotfix ME182T002]

16. Diacritic dead keys did not work on ICA UNIX Clients (Linux platform) configured with Portuguese keyboard layouts.
[From Hotfix ME182T006]

17. Corrects the problem where IME buttons were disabled during published application sessions.

Also corrects the problem where the IME toolbar icon did not appear when it was configured to be located on the taskbar status area (system tray).
[From Hotfix ME182T007]

18. When the New Logons setting in Citrix Server Administration was disabled, the change was not apparent in instances where Citrix Server Administration was already running. You can now press Refresh to view the change.
[From Hotfix ME182T007]

19. After installing Service Pack 2, a MetaFrame 1.8 server could be integrated into any farm. This problem is solved with the Appcfg.exe file included in this hotfix.
[From Hotfix ME182T007]

20. Corrects the following printing-related problems:

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A. Client printers were not being reliably created with the information in the Printer Comment field. Non-fatal errors encountered during printer creation and initialization left the printer connection created but not fully initialized, resulting in orphaned client printers that had to be removed manually.

B. Print properties were not restored from the user profiles for autocreated client printers.

C. The Windows spooler sometimes crashed when multiple logons simultaneously created, queried, initialized, or deleted client printers. Printer permissions and properties were sometimes corrupted during heavy usage.
[From Hotfix ME182T007]

21. Usernames of 20 or more characters in length caused a process exception when they logged off.
[From Hotfix ME182T007]

22. The Web-embedded Win32 Client "session reuse" mechanism was broken (regression from Service Pack 1) without a workaround.
[From Hotfix ME182T007]

23. Published application command line support could not handle double quote characters in the command line.
[From Hotfix ME182T007]

24. Published application extended command line support from ICA Win32 Client 6.01 or later has been retrofitted

to FR1 server to allow full support for the ICA Client Object. This required adding ICA Control Channel support.

[From Hotfix ME182T007]

Installation Instructions for Hotfix ME182T007

1. Copy ME182T007.EXE to an empty directory on your hard disk and execute the command:

```
ME182T007
```

2. Shut down and restart your computer.

Files Updated

```
-----  
00000407.kbd      7,544  01/09/01 12:07p  
00000807.kbd      7,426  01/09/01 12:09p  
appcfg.exe       496,400 01/09/01 01:15p  
cdm.sys          171,888 01/09/01 01:06p  
cdmprov.dll      35,088  01/09/01 01:06p  
chgcdm.exe       84,752  01/09/01 01:14p  
ctxlogof.exe     21,264  01/09/01 01:14p  
ctxlogon.exe     47,888  01/09/01 01:14p  
hotfix.exe       85,776  10/24/00 03:33p  
icactls.dll      14,608  01/10/01 11:02a  
icast.exe        11,024  01/10/01 11:00a  
mfadmin.exe      530,704 01/09/01 01:15p  
printcfg.exe     98,064  01/09/01 01:15p  
seamls20.dll     18,192  01/09/01 01:14p
```

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SeMain20.exe	53,520	01/09/01	01:14p
SSLServerRelay.exe	143,360	01/09/01	01:41p
vdtw30.dll	212,888	01/09/01	01:50p
wfapi.dll	29,456	01/09/01	01:05p
wshadow.exe	115,472	01/09/01	01:15p
wsxica.dll	55,704	01/09/01	01:50p

As of April 2001, this is the readme from the most current mondo hotfix for MetaFrame 1.8/SP2 on Win2K. Only request (from Citrix support) and apply this hotfix if you are experiencing a specific problem that it solves! Some of the more critical fixes are in **bold face type** below.

Filename: ME182W008.EXE
For: MetaFrame 1.8 for Windows 2000
Replaces: ME182W001, ME182W003, ME182W004, ME182W005
Language supported: English (US)

NOTE: This hotfix can be applied only to a Windows 2000 Server with MetaFrame 1.8, Service Pack 2 installed.

Description

This hotfix resolves the following issues:

1. Logging out from a local console session on the MetaFrame server on which the SSL Relay service is running caused the SSL Relay service to stop.
[From Hotfix ME182W001]

2. ICA KeepAlive functionality was not supported for Windows 2000. Follow the steps below to enable or disable ICA Keep Alives:

WARNING! Using Registry Editor incorrectly can cause serious problems that may require you to reinstall your operating system. Use Registry Editor at your own risk.

- A. Run regedt32.
- B. Go to:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Citrix

- C. From the Edit menu, select Add Value and enter the value: **IcaEnableKeepAlive**, data type: **REG_DWORD**
In the DWORD Editor window, enter **1** to enable Keep Alives or **0** to disable them.

[From Hotfix ME182W001]

3. There was an error in the HMTL file that is created by Published Application Manager. The href tag for the Netscape plug-in link contained a syntax error. The HTML tag was incorrectly entered as <ahref> instead of <a href>.
[From Hotfix ME182W001]
4. QSERVER <server> /LOAD always reported zero for the LoadMemory parameter.
[From Hotfix ME182W001]
5. This hotfix adds new APIs to wfapi.dll. These new APIs are used by SNMP for MetaFrame 1.8.
[From Hotfix ME182W001]

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6. For Japanese servers only:

Corrects the problem where the user's profile settings for the IME tool bar were not used when logging into a published application. This sometimes caused the Japanese IME tool bar to start in the default position instead of the last position. Customizations to the IME tool bar that are stored in the user's profile sometimes failed.

[From Hotfix ME182W003]

7. Fixes the problem where some environment variables were missing when using the Pass-through client to launch seamless applications.

[From Hotfix ME182W003]

8. Provides a workaround for some applications that use varying class names in their window instance to use exception window class names. In the case of AutoCad2000i, the main window's class name changes in every instance; for example:

Afx:400000:8:10008:0:10537

Afx:400000:8:10008:0:10539

Afx:400000:8:10008:0:10541

[From Hotfix ME182W003]

9. With MetaFrame 1.8 for Windows 2000 Servers, session sharing sometimes failed if applications were published for group membership and the Active Directory service was used.

[From Hotfix ME182W003]

10. The Winlogon box in seamless mode is cropped and misaligned to the upper left in an ICA session on some lower end model servers.

[From Hotfix ME182W003]

11. The Redirector had problems tracking transmit and receive queue sizes for redirected client serial ports. Writes forwarded to the client must not exceed the size of the client's transmit queue.

A related change to the ICA Win32 Client, which prevents the DTR/DTS signals from being inadvertently reset, is also required to make the scanner's upload/download software function properly.

[From Hotfix ME182W004]

12. The ICA Win32 Client API calls, GetVolumeInformation and WNetGetResourceInformation, returned incorrect information when run against an ICA Client drive.

[From Hotfix ME182W004]

13. Installing Service Pack 2 on MetaFrame 1.8 for Windows 2000 Servers broke UNIX Integration Services autologon, the -exec <command> option, and the -lang <keyboard language> option.

[From Hotfix ME182W005]

14. During boot up, Termsrv.exe sometimes crashed when trying to clean up autocreated printers after an abnormal or remote session shut down.

[From Hotfix ME182W005]

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15. The Web-embedded Win32 Client "session reuse" mechanism was broken (regression from Service Pack 1) without a workaround.

[From Hotfix ME182W008]

16. Published application command line support could not handle double quote characters in the command line.

[From Hotfix ME182W008]

17. Published application extended command line support from ICA Win32 Client 6.01 or later has been retrofitted to FR1 server to allow full support for the ICA Client Object. This required adding ICA Control Channel support.

[From Hotfix ME182W008]

18. Corrects the problem where IME buttons were disabled during published application sessions.

Also corrects the problem where the IME toolbar icon did not appear when it was configured to be located on the taskbar status area (system tray).

[From Hotfix ME182W008]

19. Detection of mouse double clicks can be performed either on the server or with most Citrix Clients. However, Windows 2000 incorrectly processed client-detected double clicks, which led to application crashes and/or sometimes necessitating additional mouse clicks. This fix disables client-detected double clicks.

WARNING! Using Registry Editor incorrectly can cause serious problems that may require you to reinstall your operating system. Use Registry Editor at your own risk.

If you want to re-enable client-detected double clicks after installing this fix, make a registry entry at:

**KEY: HKLM\SYSTEM\CurrentControlSet\Control\Citrix
VALUE: wsxicaAllowClientDoubleClick
TYPE: REG_DWORD**

**If the above registry entry is present and has a non-zero value, client-detected double clicks are enabled. The flag is checked each time a new ICA connection is made.
[From Hotfix ME182W008]**

20. LBAdmin sometimes failed to see both servers in an AS400 when each MetaFrame server had two network interface cards (NICs). This hotfix allows you to disable a NIC for the ibrowser only.

- A. Replace %systemroot%\system32\ibrowser.exe.
- B. Reboot the computer.
- C. Add the following key to the registry:

HKLM\SYSTEM\CurrentControlSet\Services\ICABrowser\Parameters\DisabledTcpAddress:REG_SZ:255.255.255.255

where 255.255.255.255 is the address of the interface to be disabled. This can also be used to "hide" subnets from the browser. The NIC is disabled for the ibrowser and anyone who depends on Brapi.dll.

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[From Hotfix ME182W008]

21. After installing Service Pack 2, a MetaFrame 1.8 server could be integrated into any farm. This problem is solved with the Appcfg.exe file included in this hotfix.

[From Hotfix ME182W008]

22. Corrects the following printing-related problems:

A. Client printers were not being reliably created with the information in the Printer Comment field. Non-fatal errors encountered during printer creation and initialization left the printer connection created but not fully initialized, resulting in orphaned client printers that had to be removed manually.

B. Print properties were not restored from the user profiles for autocreated client printers.

C. The Windows spooler sometimes crashed when multiple logons simultaneously created, queried, initialized, or deleted client printers. Printer permissions and properties were sometimes corrupted during heavy usage.

[From Hotfix ME182W008]

23. Usernames of 20 or more characters in length caused a process exception when they logged off.

[From Hotfix ME182W008]

1. Copy ME182W008.EXE to an empty directory on your hard disk and execute the command:

```
ME182W008
```

2. Shut down and restart your computer.

Files Updated

File Name	Size	Date	Time
appcfg.exe	439,056	01/12/01	07:06p
cdm.sys	156,432	01/12/01	06:12p
cdmprov.dll	43,280	01/12/01	07:06p
cmstart.exe	26,384	01/12/01	07:06p
ctxnotif.dll	52,496	01/12/01	07:06p
hotfix.exe	86,288	01/11/01	06:14p
ibrowser.exe	103,184	01/12/01	07:06p
icactls.dll	11,024	01/12/01	07:06p
icast.exe	7,440	01/12/01	07:06p
seamls20.dll	15,120	01/12/01	07:06p
SSLServerRelay.exe	143,360	01/12/01	07:06p
wdica.sys	81,048	01/12/01	07:09p
wfapi.dll	26,896	01/12/01	07:06p
wfshell.exe	33,040	01/12/01	07:06p
wsxica.dll	49,048	01/12/01	07:09p

Installation Instructions for Hotfix ME182W008

Version: 5/15/2001

Maintained by Rick Dehlinger, SSE-NW
Citrix Systems, Inc.
rick.dehlinger@citrix.com

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Contributions...

I guarantee I am missing a ton of people, and for that I apologize! This is no longer a new addition to this document, but early on I didn't pay as much attention as I should have to who has contributed. If I missed something or someone here, please let me know via e-mail.

Without the help of the people listed below and many others I have missed, this document is worthless. My sincere thank you to all for making this industry we participate in more successful and fruitful for us all! As I say every now and again, you **RULE!**

Regards,

Rick Dehlinger
Senior Systems Engineer
Citrix Systems, Inc.

Special thanks to the following contributors! (Explicit contributions, listed below in alphabetical order by first name)

Adam Ginsberg	David Bennett	John Richardson	Remo Braconi
Andrew Croker	Dean Flaming	Ken Hollins	Rob Harper
Arlo Paranhos	Dion Bigornia	Ken Puckett	Roger Carlsen
Barry Flanagan	Don Hickey	Kesniel Acton	Ronald Kraft
Blaine Crawford	Douglas A. Brown	Lennart Koschella	Scott McPherson
Bobby Doss	Eric Baughman	Mark Breckto	Scott Robertson
Brendan Byrne	Eric Perdue	Mark Mangus	Štefan Idzig
Bruce Huber	Eric W. Johnston	Mark Sayers	Steve Kaplan
Christian Jonsson	Gary Brooke	Michael Burr	Steve Kjenner
Citrix Systems' Development Team	Greg Wright	Michael Gray	Sven Kiesewetter
Citrix Systems' Engineering Team	http://www.Thethin.net (and contributors)	Nick Davies	Ted Vukelich
Citrix Systems' Support Team	Ijaz Rama	Östergren Jonas	Thiago Berto
Danny Rowe	James Wells	Patrick Robinson	Tim Carlier
David Kim	Jason Shave	Paul Bort	Todd Hoover
David Smith	Jeroen Van Eesteren	Paul Wilson	Todd Mathers
David Uhe	Jim Kenzig	Petri Ulmanen	Vinny Sosa
Dave Namou	Jim Wenger	Petri Ulmanen	Vivien Dostin
Daniel Feller	Jo Harder	Rick Mack	
	John Nelson	Rick Ross	
		Richard Garsthagen	