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A NETWORK ADMINSTRATOR’S GUIDE TO USING WINDOWS 2000 AND WINDOWS XP TO ENABLE POWER MANAGEMENT THROUGHOUT AN ORGANIZATION

A Network Administrator’s Guide to Using Windows 2000 and WINDOWS XP to Enable Power Management Throughout An Organization..... 1

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INTRODUCTION

An organization with 1,000 computers can save about \$17,000 a year by enabling power management functions that place a computer monitor into a low-power “sleep” mode during periods of inactivity. The U.S. Environmental Protection Agency’s (EPA’s) ENERGY STAR® program offers two ways to do this:

- Use the capability of Windows 2000 and Windows XP to enable power management throughout your organization when deploying Windows.
- Turn on monitor power management through the network, rather than machine-by-machine, using *EZ GPO* software (Available 3/2003) developed by the EPA or the *EZ Save* software developed by the DOE.

This guide for network administrators explains in detail how Windows 2000 or Windows XP can be used to quickly and easily implement monitor power management organization-wide.

OVERVIEW

Enabling Monitor Power Management During Rollout

If machines are replicated from a template image during the transition to Windows 2000 or XP, enabling the monitor power management setting in the template machine will ensure that all new user logins start out with this energy savings feature enabled. Users can also be prevented from changing monitor power management settings.

Central Control of the Monitor Power Management Registry Setting After Rollout

Due to limitations of Microsoft’s Active Directory toolset (detailed below) and the design of Microsoft’s implementation of power management, monitor power management settings cannot be natively maintained through the use of Group Policy Objects (GPO). What is needed is

separate software designed for the task. There are many different options but the two freely available options are *EZ GPO* and *EZ Save* where *EZ GPO* uses Microsoft Active Directory or Novell Zenworks (or any Client/Server product that centrally modifies client registries) while *EZ Save* works from network shares using any network file server OS that supports login scripts, etc.

METHODS

Modifications to the default user/policy in rollout image (i.e.; “Ghosting”)

If rolling out Windows 2000 or Windows XP through the use of images (i.e.; using Symantec Ghost or similar software), a system administrator can use a “fire-and-forget” option to set monitor power management policies and ensure compliance with them. When a user logs into a machine for the first time—assuming no roaming profiles in use—the default settings for the user comes from the default user account in the system’s “Documents and Settings” folder (C:\Documents and Settings\Default User\ntuser.dat). Under most circumstances, this is the case for power management settings.¹ By using regedt32.exe² (not regedit.exe if using Win2K) and making the necessary edits, all new accounts will now pick up these settings. To do this:

- Open regedt32.exe
- Highlight the HKEY_USERS branch.
- Under the Registry menu, click load hive and navigate to C:\Documents and Settings\Default User\ntuser.dat, or where ever the default user’s profile is stored.
- Load that file into the hive naming the branch PMDefault.
- Manually change the PM settings for the currently logged in user:
 - Right click on the desktop and choose properties from the context menu.
 - Choose the screensaver tab from the available tabs. The power management settings are at the bottom labeled “Energy Saving Features of Monitor.”
 - Click on “Settings...”
 - Select the power scheme you would like to use as the default. This is normally “Home/Office Desk.”
 - Adjust the settings to the desired time out for monitor. Hard disk and System Standby timeouts should be set to never to avoid complications.
 - Click Apply and and OK to commit those changes.
- If regedit is already open switch to it and press F5 to refresh the current view. (Will export old settings otherwise)
- Highlight the key “HKEY_CURRENT_USER\Control Panel\PowerCfg” and select “Export Registry file...” from the Registry menu in the menu bar.
- Export the file making sure that the selected branch option is selected.
- Name the file anything you would like and save it.
- Edit the reg file using a text editor changing the key prefixes (in every key entry) to “HKEY_USERS\PMDefault\Control Panel\PowerCfg.” (Please see the Appendix)
- Merge this reg file with the system by double clicking on it.
- Unload the PMDefault hive by highlighting “HKEY_USERS\PMDefault” and under the Registry menu, click unload hive.

¹ If the last user to login changed their power management settings (with or without a reboot), and a new user logs in next, this new user will pick up those settings. Not sure if this was an intended feature or not.

² Regedit.exe in XP or higher. In Windows 2000 there are two versions of regedit and you need to use the version regedit32.exe.

Group Policy Objects (GPO)

Although implementing MPM through GPOs should be straight forward since MPM uses the registry to store settings, the reality is far different. Using Microsoft's Native GPO feature in Active Directory to manage power management directly is not possible, because there is a limitation in the Administrative Templates Meta language (ADM) used to create the interface for custom Group Policies. Only two types of keys can be changed through the ADM interface to the GPO tree: single value strings and dword (integer) values. Binary keys are the storage of choice for power management settings and this limitation is why an interface for handling power management settings is not provided.

The GPO Application Programming Interface (API) provided by Microsoft and accessible through Visual C++ and Visual Basic *may* have the capability of making the appropriate changes. The file formats of registry files (*.dat), NT4 policy files (*.pol), and group policy files are similar (the same body with identical sized headers but the quantity of that content varies) and a tool created to edit GPOs would simply open and edit the GPO file directly. Additionally, changing this binary key using the same copy for each computer on the network will cause problems on heterogeneous networks with multiple Windows versions, as the binary strings used to store the power management settings are OS and possibly even machine dependent. This is despite being housed in the user portion of the registry and therefore being user based.

It is with this knowledge that EZ GPO (Available 3/2003) was created to help administrators work around this in the most unobtrusive manner possible. Currently, EZ GPO is under development but code samples for the power management portion are available for download at (<http://www.terrano.com/projects/energystar/>) and the initial EZ GPO product release will be open source under a BSD style license.

Basically, how it works is there is a small client install of a single binary application that will be executed from the startup group in the "Start Menu". This will read in the desired PM settings that are set using GPOs in integer and string value format and then, using Microsoft's core API, will make the appropriate changes to PM settings, which will be available immediately thereafter. There is no threat of a race condition since GPOs are applied immediately after authentication whilst the startup group executes well after user services have initialized and are running. It is even possible to execute the client application using an entry in the HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run key, thereby centrally controlling execution of the application. Theoretically it is possible to skip the client install altogether by then executing the client application from a network share but that is not recommended, nor has it been tested.

APPENDIX – TECHNICAL DETAILS BEHIND THE PM REGISTRY KEYS

The examples used in this section are derived from the initial release of Windows 2000. The offsets for the monitor idle timeout settings are still current through Windows XP SP1. Much of this section contributed by Ed Jones of the Department of Energy (DOE).

The base key is HKEY_CURRENT_USER\Control Panel\PowerCfg.

The following key is an index of the last six keys in this regedit file. It tells the system which power management schema to use. By default it is set to 0 for the "Home/Office Desk" schema. This key should always be present. Setting it to 3 chooses the "Always On" schema, effectively disabling power management. As you can see there are no individual keys for monitor shutoff, hard disk spin down, etc. All settings are embedded in the binary string associated with a schema. Also note that by simply changing a key like this one below is insufficient to get power management settings to change. You must use the API located in the Windows SDK under "Core\Power Management" if you would like to make these changes yourself.

```
[HKEY_CURRENT_USER\Control Panel\PowerCfg]
"CurrentPowerPolicy"="0"
```

Ignore this following key.

```
[HKEY_CURRENT_USER\Control Panel\PowerCfg\GlobalPowerPolicy]
"Policies"=hex:01,00,00,00,06,00,00,00,03,00,00,00,00,00,00,06,00,00,00,03,\
00,00,00,00,00,00,00,00,00,00,03,00,00,00,00,00,00,00,02,00,00,00,03,00,\
00,00,00,00,00,00,00,00,00,00,01,00,00,00,00,00,00,00,00,00,00,00,01,00,00,\
00,00,00,00,01,00,00,00,03,00,00,00,00,00,00,00,04,00,00,c0,01,00,00,00,\
02,00,00,00,01,00,00,00,0a,00,00,00,00,00,00,00,00,03,00,00,00,01,00,01,00,01,\
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,02,00,00,00,\
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,03,00,00,00,00,\
00,16,00,00,00
```

Ignore this following key. It is a parent to the schema keys.

```
[HKEY_CURRENT_USER\Control Panel\PowerCfg\PowerPolicies]
```

This is the default PM schema chosen by Windows 2000.

```
[HKEY_CURRENT_USER\Control Panel\PowerCfg\PowerPolicies\0]
"Name"="Home/Office Desk"
"Description"="This scheme is suited to most home or desktop computers that are left plugged in
all the time."
"Policies"=hex:01,00,00,00,00,00,00,00,01,00,00,00,00,00,00,00,00,00,00,00,\
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,32,32,00,00,02,00,00,00,02,00,\
00,00,6c,00,00,00,43,00,3a,00,58,02,00,00,2c,01,00,00,00,00,00,00,58,02,00,\
00,00,00,64,64,64,64,65,00
```

This is an 80 byte binary field. The offset 038h contains the monitor power off value in "seconds" (NB Hex values).

The next two registry entries are related to power management.

[HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\Session Manager\Power\AcPolicy] (Note: Not SessionManager)

```
"AcPolicy"=hex:01,00,00,00,06,00,00,00,03,00,00,00,00,00,00,02,00,00,00,03,\  
00,00,00,00,00,00,02,00,00,00,01,00,00,00,00,00,00,00,01,00,00,00,00,\  
00,00,00,00,00,00,01,00,00,00,00,00,00,00,00,00,00,00,32,00,00,00,02,00,00,\  
00,02,00,00,00,01,00,00,00,00,00,00,00,00,00,00,00,00,03,00,00,00,\  
01,00,00,00,03,00,00,00,02,00,00,00,04,00,00,c0,01,00,00,00,02,00,00,00,01,\  
00,00,00,0a,00,00,00,00,00,00,00,00,03,00,00,00,01,00,01,00,01,00,00,00,00,\  
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,02,00,00,00,00,00,00,00,\  
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,03,00,00,00,00,00,08,07,00,00,\  
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,64,64,32,00,\  
00,00,00,04,00,00,c0,00,00,00,00
```

This is a 232-byte binary field (may or may not require modification). The offset 0c0h contains the monitor power off value in "seconds" (NB Hex values).

[HKEY_LOCAL_MACHINE\System\ControlSet\Control\Session Manager\Power\AcPolicy] (Note: Not SessionManager)

```
"AcPolicy"=hex:01,00,00,00,06,00,00,00,03,00,00,00,00,00,00,02,00,00,00,03,\  
00,00,00,00,00,00,02,00,00,00,01,00,00,00,00,00,00,00,01,00,00,00,00,\  
00,00,00,00,00,00,01,00,00,00,00,00,00,00,00,00,00,00,32,00,00,00,02,00,00,\  
00,02,00,00,00,01,00,00,00,00,00,00,00,00,00,00,00,00,00,00,03,00,00,00,\  
01,00,00,00,03,00,00,00,02,00,00,00,04,00,00,c0,01,00,00,00,02,00,00,00,01,\  
00,00,00,0a,00,00,00,00,00,00,00,00,03,00,00,00,01,00,01,00,01,00,00,00,00,\  
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,02,00,00,00,00,00,00,00,\  
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,03,00,00,00,00,00,08,07,00,00,\  
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,64,64,32,00,\  
00,00,00,04,00,00,c0,00,00,00,00
```

The [AcPolicy] key is used at both locations to get the current AcPolicy data. Also, 232-byte binary fields using offset 0c0h for monitor power in "seconds" (NB Hex values).