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FEDEX'S MONITOR AND PC POWER MANAGEMENT INITIATIVE SAVES $1 MILLION A YEAR

Windows "sleep" features cut energy costs by $49 annually per computer

Note: The mention of any company name or product does not constitute endorsement by EPA or by FedEx.

FedEx estimates it will reduce energy costs by approximately $1 million annually by activating Windows sleep features on nearly 20,000 computers worldwide. And because sleeping PCs and monitors generate less heat, FedEx anticipates additional energy savings from reduced office air conditioning loads.

Power management features—commonly known as "sleep" settings—automatically place monitors and computers into a low power sleep mode after a pre-set period of inactivity.[1] Touching the mouse or keyboard wakes up monitors and PCs within seconds, allowing users to resume work without delay.

Computer power management features don't just save money: they're good for the environment. Because saving energy prevents pollution associated with generating electricity, FedEx's actions will prevent roughly 9,500 tons of carbon dioxide emissions annually—equivalent to planting nearly 2,000 acres of trees.[2]

Technical support from ENERGY STAR—available for free via the ENERGY STAR Low Carbon IT Campaign—helped FedEx overcome several implementation challenges.

Do-it-Yourself Approach

In March 2008, the FedEx Endpoint Security team was sitting through a vendor presentation. The team was already on the lookout for ways to cut IT energy costs, and this particular presentation featured proprietary software that placed PCs into low-power modes when not in use. While the energy savings opportunity was compelling, the prospect of adding yet another systems administration tool to their IT management infrastructure conflicted with another team goal: to reduce complexity. Suddenly it occurred to a FedEx technical analyst that he could probably replicate the energy savings by simply activating built-in Windows sleep features and utilizing FedEx's existing IT administration tools to manage the configuration changes. If it worked, FedEx could save a substantial amount of electricity without purchasing any new software or hardware.

The team immediately set out to test the configuration changes on FedEx's standard desktop software image. FedEx had a relatively open computing environment to allow for creativity and exploration of new ideas, so a variety of applications had to co-exist with sleeping PCs, including

"It was possible to enable computer power management features with no additional hardware or software expenditures, thanks to the support of senior management at FedEx and to technical assistance from the **ENERGY STAR** Low Carbon IT Campaign,"

— Dedrick Bowles,
FedEx Technical Analyst and Project Lead
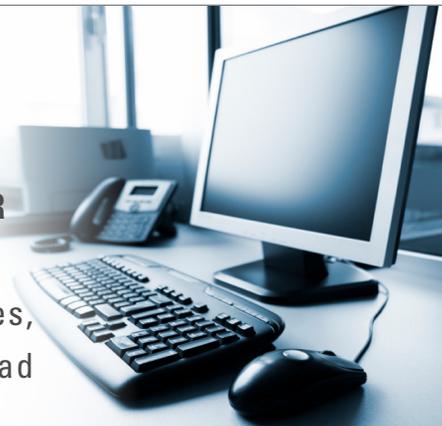
[1] *A typical desktop computer uses 60 to 85 watts when active and only 2-4 watts in sleep mode (system standby or hibernate). A CRT monitor uses about 60 watts and a LCD about 35 watts. Both use only 1-3 watts in sleep mode.*

[2] *Based on EPA estimates.*
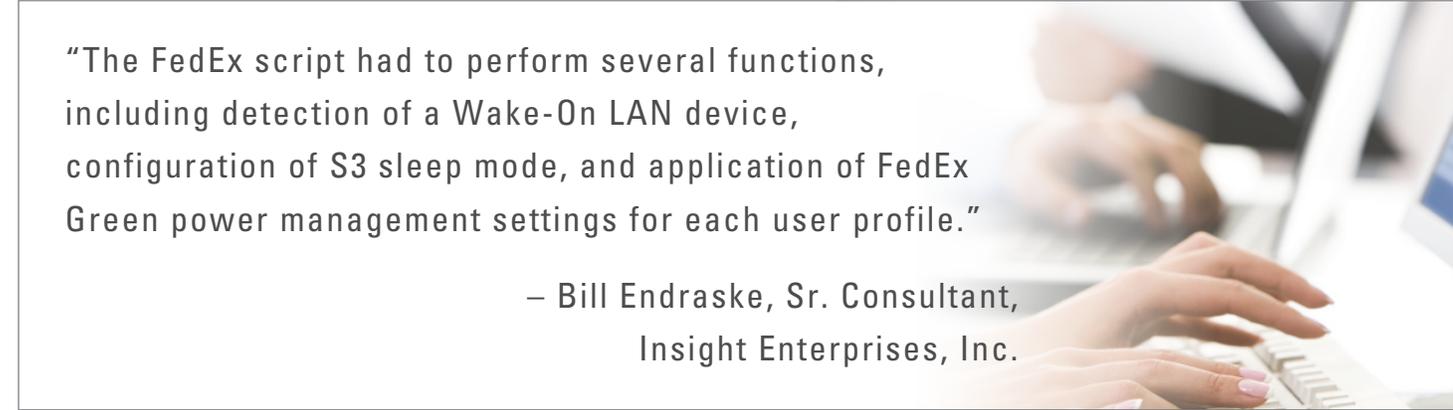
Instant Messaging, antivirus, and their patch management tool. The team needed to ensure, for instance, that they could wake PCs anytime of day or night to apply security patches, and that PCs would download new antivirus definitions immediately when they resumed from system standby mode. After setting monitors to enter sleep mode after 20 minutes of inactivity, and computers to enter system standby after 45 minutes, they concluded that it was possible to achieve impressive energy savings and maintain a safe and secure computing environment—without investing in additional systems administration tools.

Management Buy-In

The FedEx Endpoint Security team cites senior management support as a key factor in the success of their "FedEx Green" IT initiative. To obtain management buy-in, they developed a simple but very revealing analysis. Using an inexpensive plug-in power meter, they documented the difference between the average PC power draw in "on" vs. "standby" modes. Since users had to leave their PCs powered on 24/7 to allow for patches and security updates (standard operating procedure for many IT departments), activating "standby" meant that PCs would automatically enter the low power mode after working hours—and spend roughly 16 hours in this lower power state each day. Extrapolating the expected savings from a handful of PCs to tens of thousands of PCs was simple multiplication. Once the extent of the energy savings potential was understood—approximately $1 million annually—the initiative looked very compelling: estimated implementation costs were only about 10 person-days of staff time, and no software purchases were necessary.

The Solution

The first challenge associated with any enterprise computer power management initiative involves remotely configuring sleep settings on client PCs. FedEx accomplished this with an automated script which incorporated the command line utility powercfg.exe. (Powercfg.exe is included with Microsoft Windows XP Service Pack 2, and can be used to configure

most power options.) Specifically, the team created a script using CA's Unicenter IT Client Management (ITCM) tool to 1) check whether the client PC was running Windows XP; 2) create a new power option profile called "FedEx Green"; and 3) make the new profile "active." They decided not to "lock down" the new settings, meaning that end users could modify their power options, if desired, via the Windows control panel. This interim policy would serve as a safety net following the initial FedEx Green deployment. Once the team confirmed that the setting changes were not interfering with end user productivity, they could opt to enforce them by locking them down at a later date and/or re-applying the policy with CA Unicenter ITCM.

The second challenge associated with an enterprise computer power management initiative is ensuring that sleeping computers can still receive administrative software updates such as Windows security patches and antivirus definitions. Previously, the team asked FedEx employees to leave their PCs powered on at night so important software patches and security updates could be pushed to the machines while they were not being used. As a result, the average desktop PC was burning roughly 85 watts of power all night long—about the same as leaving the lights on all night in every office and cubicle. System standby, on the other hand, dropped PC power consumption down to just 2 - 4 watts. Computers automatically entering system standby would save power during the workday as well, when people left their offices for meetings or lunch.

To facilitate patching of machines that are in system standby, the Unicenter ITCM client agent allows a network administrator to wake up sleeping computers at any time to perform on-demand software updates. Once the patch has been delivered and installed, the machine returns to standby mode.

To ensure that the ITCM client could bring PCs out of sleep mode, the FedEx Green policy script made the following configuration changes to computers running Windows XP: 1)

detect the type of NIC card installed; 2) make the appropriate changes—depending on the type of NIC—to activate Wake-on-LAN; and 3) detect/enable S3 sleep mode. The PCs were also configured to allow mouse and keyboard input to bring them out of standby. Additionally, the team discovered during testing that a handful of computers needed BIOS setting changes or updates to enable Wake-on-LAN. This was successfully accomplished via a manual intervention by their Tech Services Support group to enable the BIOS setting.

Testing & Rollout

FedEx is a truly global organization, operating 24 hours a day, 7 days a week—with computer systems that support around-the-clock operations. As a result, there were some PCs that the FedEx Endpoint Security team didn't want sleeping on the job. After identifying these PCs so they could be excluded from the rollout, they also decided not to implement power management on computers running the older Windows 2000 operating system. They had two reasons: first, the command line utility powercfg.exe does not work on Windows 2000, and second, while other ways to activate computer power management settings were available, FedEx was in the process of retiring its Windows 2000 systems. In the end, FedEx Endpoint Security team focused their efforts on approximately 20,000 Windows XP desktop computers whose users worked a standard 9-5 week—thus simplifying the rollout. To further capitalize on the energy savings potential of this project, a communication campaign was launched encouraging all employees (including those with Windows 2000) to turn off their monitors and personal printers at the end of work day. Savings from this effort is not included in the projected $1 million per year reduction.

The team decided that the new FedEx Green power option profile should put monitors to sleep after 20 minutes of idle time, and PCs into system standby after 45 minutes of idle time. Because the watt meter showed no significant savings from the "turn off hard disks" feature, they set it to "never."

In mid-April, FedEx Endpoint Security team began testing the

sleep settings on 4-5 systems in the IT department that were running FedEx's standard image. Following approximately one month of successful testing, they pushed the settings to the entire Information Security team of roughly 85 users. Next, the team pushed the settings to their entire World Technology Center campus of roughly 3000 computer users. That's when they discovered some rather mysterious behavior: some PCs were not entering sleep mode, despite being properly configured to do so.

PCs Suffer from Insomnia?

FedEx was able to diagnose some of the causes fairly easily. Windows Media Player, for instance, displays a message saying that it cannot enter sleep mode. This was resolved by simply asking users to shut down Windows Media player after using it.

But on some PCs the problem persisted, and a quick Google search for "computer power management" led to EPA's ENERGY STAR website and an email address for technical assistance. Following the advice of an ENERGY STAR technical support contractor, the FedEx team first verified that the PCs were capable of entering sleep mode (by manually placing them into system standby via the Windows control panel). Rebooting the "problem PCs" several times cleared the older, cached power profiles, and the computers began to sleep properly.
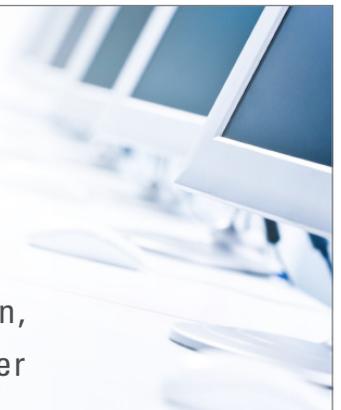
The Last Remaining Hurdles

A few FedEx employees who used Remote Desktop to access their desktops from home had difficulties logging in remotely. Their first connection attempt served to wake the desktop from standby, but this connection request would then time-out, requiring the user to try again. The second attempt was usually successful. Although making two connection attempts was less than ideal, management decided it was acceptable given the energy savings.

Not long after deployment, the team received a call from one of their colleagues who was monitoring network operations

about a curious increase in network traffic. Router log files were filling up with entries, as they discovered, because each PC was notifying the network whenever it entered or resumed from standby. After investigating, FedEx learned that when PCs enter or resume from standby, their NIC cards temporarily lose power, generating up/down link states. Consequently, network monitoring systems were receiving what amounted to a false alarm about network traffic problems, simply because thousands of PCs were entering or resuming from standby. The FedEx Green power option profile was temporarily de-activated on all devices while a solution was devised: by enabling event log filters on some network switches, the team effectively removed these unhelpful entries from their router log files. The FedEx Green power option profile was subsequently re-applied.

Keys to Success

All told, FedEx's computer power management implementation took less than three months to plan, test, troubleshoot, and roll out company-wide—and only about 15 person-days of IT staff time in total. The biggest challenge was not in developing the solution, but rather in overcoming the exceptions—addressing the small number of "problem PCs" that needed BIOS changes or would not initially enter sleep mode. In addition to management support, FedEx cited EPA assistance and recognition as key success factors, along with a ready and willing end user population, thanks to recent mainstream media coverage on energy conservation and green IT.

The Future

FedEx Endpoint Security plans to expand their desktop energy savings project. They intend to push out the FedEx Green power option profile to new PCs as they are brought on-line, and add the profile to their corporate PC image for Windows 7. And since the Endpoint Security team puts the power-saving profile on new PCs as they are deployed, the number of power managed computers will continue to increase as older Windows 2000 PCs are replaced. The team will also "lock down" the FedEx power management profile with a policy change. The policy change will prevent users from disabling sleep settings on their PCs, except in cases where there is a compelling business reason to do so. Within two years, nearly all of FedEx's desktop PCs and monitors will be getting some rest each night.

For More Information

To learn how to activate power management features on your network, please visit www.energystar.gov/lowcarbonit or contact Steve Ryan, US EPA ENERGY STAR Program: 202-343-9123, ryan.steven@epa.gov.