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| Developing Energy Smart Software  Customer Solution Case Study |
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|  |  |  | Win Generic HeaderAdobe Flash Player Gets Energy Smart |

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| Overview  **Country or Region:** Worldwide  **Industry:** Software  Customer Profile  Adobe Systems is one of the world’s largest software companies. Adobe Flash Player is installed on 98 percent of Internet-connected PCs worldwide.  Business Situation  Adobe wanted to ensure that Flash Player software was “Energy Smart” and didn’t prevent Windows PCs from saving energy when possible.  Solution  Adobe prioritized the incorporation of Microsoft’s Energy Smart engineering practices into the 10.1 release of Flash Player.  Benefits   * Flash Player users benefit from the energy savings of the Windows Power Management system. * The environmental impact of Adobe Flash Player software is minimized. |  |  | “Adobe is committed to conserving natural resources. We recognize that the use of our software products has an environmental footprint and we seek opportunities to minimize the impact.”  Michelle Mann, Corporate and Social Responsibility Director, Adobe Systems  *Read more about Adobe green efforts http://www.adobe.com/corporateresponsibility/environmental.html* |
|  |  | According to Millward Brown, Adobe® Flash® Player is installed on 98 percent of Internet-connected PCs worldwide. In response to the growing number of people and organizations that are using Windows Power Management, Adobe released an updated version of Flash Player that honors users’ power management preferences and allows Windows to save power whenever possible.  The Flash Player development team employed software engineering practices that enabled them to deliver their first “Energy Smart” version of Flash Player, which allows users to benefit from Windows Power Management while streaming content. Flash Player 10.1 allows Windows PCs to conserve energy when not in use, and by doing so, helps limit the amount of greenhouse gases created. |
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| Adobe Logo |  |  | Microsoft Logo |
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Situation

The Flash Player team at Adobe recognized the growing demand that users have for energy efficiency capabilities such as PC Power Management, which can save consumers as much as $50 per year in energy costs.[[1]](#footnote-1)

Historically, some PC applications inadvertently prevented Windows Power Management from saving energy. One common resulting issue is what’s called PC Insomnia – a seemingly random condition that prevents PCs from automatically going to sleep when they are idle.

Out of the box and by default, Windows Vista and Windows 7 PCs are configured to automatically sleep, which is a function required for a US EPA Energy Star rating.

Windows 7 was introduced with built-in power diagnostics tools that allow IT administrators and software developers to identify causes of PC Insomnia. These tools helped the Flash Player engineering team identify Flash Player 10 as one potential cause of insomnia on PCs worldwide. Specifically, the Windows 7 command line diagnostic (‘[powercfg /requests’](http://technet.microsoft.com/en-us/library/cc748940(WS.10).aspx)) showed that Flash Player 10 was inadvertently preventing automatic sleep from functioning after playing audio (or video with audio).

The Windows audio component creates an “availability request” to prevent the computer from putting itself to sleep when an application is rendering audio. This function is necessary because users who are listening to audio do not want their PCs to go to sleep during playback.

Power diagnostics showed that Flash Player 10 was not closing the audio channel when a video or audio stream was paused or finished, so the availability request continued to run until the user closed the internet browser or navigated to a new browser page.

The Flash Player team also received reports that laptop screens dimmed when users were watching videos using Flash Player from sites such as YouTube. Windows 7 introduced a battery-saving feature that dims the laptop display within a few minutes if a user does not interact with the PC. It’s quite typical for people not to type or move the mouse when they watch videos on their PCs, and as a result, Windows was dimming and eventually blanking the screen after a few minutes of inactivity (when the user-defined idle period is reached).

The powercfg diagnostics revealed that Flash Player 10 was not making an explicit request to keep the display awake while it was rendering video, which caused the screen to dim or blank while users were watching videos and not using the keyboard or mouse. As a result, it was inconvenient to use short display timeouts to save energy and increase battery life.

The Flash Player team was concerned that Flash Player could have been preventing millions of idle PCs from automatically sleeping for many hours at a time, which could mean those machines were squandering a significant amount of energy. An idle desktop PC can typically consume anywhere from 60 watts to over 120 watts of power. To put this in perspective, a million idle PCs (60 watts idle) that are awake unnecessarily for 2 hours, waste more than 120 MegaWatt hours of electricity. Based on [US eGRID emissions factors](http://cfpub.epa.gov/egridweb/view_us.cfm), this translates to about 79 tons of carbon dioxide -- about the same amount of carbon dioxide emissions produced by 13,000 cars idling for 2 hours.[[2]](#footnote-2)

Solution

The Flash Player engineering team made several distinct changes to Flash Player 10.1 in order to make it “Energy Smart”.

Flash Player 10.1 now explicitly closes the audio channel whenever audio stops playing for a few seconds. This allows the Windows audio stack to clear its availability request, and ensures that automatic sleep will continue to function when the PC is idle.

Flash Player also creates and sets an availability request, using the PowerCreateRequest() and PowerSetRequest() APIs in Windows 7, to prevent the screen from dimming or blanking whenever video is actively rendering in a foreground browser tab. If a video is paused or stopped, or if a web page containing the Flash video is placed in a background browser tab, the availability request is cleared using the Windows 7 PowerClearRequest() API. This request is also cleared when the web page that loads Flash Player is closed.

Flash Player now incorporates operating system version detection, so a legacy API is used to keep the display awake on PCs running Windows Vista or earlier.

Going the extra mile

Windows uses a system timer to determine the orchestration of the routines that must be executed on the system. When the timer is set to a high resolution - for example, with video playback where precise timing and performance is critical - the system can update the screen very frequently. However, this kind of timer setting also uses more energy. Flash Player now also ensures that the system timer resolution reverts back to the system default if a video is paused, or ends, or is placed in a background tab. Allowing Windows to use the default timer resolution whenever possible reduces power use and saves energy (a particular benefit for PCs running on battery power). Flash Player only adjusts the system timer to its maximum resolution when actively rendering video, which ensures both smooth rendering and greater energy efficiency for PCs.

Finally, if a video is rendering in a background tab, Flash Player 10.1 drops the video frame rate down to two frames per second. This function helps save power, and improves the performance of Windows PCs when running computationally-intensive applications for Flash Player in the background.

Benefits

Adobe recognizes the environmental impact of its products, which are run on millions of PCs worldwide. The company is focused on finding ways to improve operations, products and services in ways that reduce energy costs and protect the environment. Adobe’s overall sustainability goals include a commitment to delivering products that help PCs realize their power-saving potential.

By prioritizing and incorporating “Energy Smart” development techniques in Flash Player 10.1 software, Adobe is supporting the efforts of millions of consumers to reduce PC energy use, increase laptop battery life, and save money.

Microsoft Energy Smart Software

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| Software and Services  Windows 7  Windows Server 2008 R2 Enterprise |  |

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Microsoft Windows Power Management can help customers save energy and money, and reduce the environmental impact of PC and server operations. To achieve this goal, applications need to play their part -- and be "Energy Smart".

For more information on Energy Smart software, please visit

[www.microsoft.com/energysmart](http://www.microsoft.com/energysmart)

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1. Windows Vista Power Management press release: <http://www.microsoft.com/presspass/features/2007/mar07/03-21vistapowermgmt.mspx> [↑](#footnote-ref-1)
2. 1 lb. of C02 for every 10 minutes of idling. 2000 lbs. CO2 per ton, 12 lbs. of CO2 for every 2 hours of idling per car. [Source: EDF](http://www.edf.org/page.cfm?tagID=22292) [↑](#footnote-ref-2)