The secondary costs of website design – additional power consumption triggered by use of MySpace

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Abstract

Increasing energy costs and a growing awareness of the side-effects of resource and power usage have resulted in increasing levels of attention being paid to the power consumption of electrical devices, including computers. Modern computers utilise advanced power saving techniques to consume reduced quantities of power when idle. Active applications will trigger CPU use, forcing the processor to enter states that consume more power. This paper examines the influence of `http://www.myspace.com` on the average processor and power utilisation of an otherwise idle machine.

Introduction

The existence of an instruction to inform the processor that no further work needs to be carried out dates back to at least the Intel 4040 microprocessor, which added the HLT instruction to the 4004 instruction set[1]. HLT indicated that the system was idle, causing the processor to execute no further instructions until an interrupt was received.

By the time that the Pentium had been released, the semantics of the HLT instruction had been extended to indicate that the processor should be placed into a lower power state (Debnath et al., 1995), an innovation that had originally been introduced in the Cyrix cx486s. When HLTed, it was now possible to unclock the processor or power down components that did not need to maintain state.

The ACPI specification (`http://www.acpi.info`) introduced the concept of C states, bringing a more fine-grained approach to processor power saving. Several C states are specified, with C0 being a running processor (ie, one executing instructions) and higher numbers indicating greater power savings. C1 corresponds to the HLT instruction, while once C3 is reached the processor has disconnected from the bus and must be explicitly informed of any bus mastering activity in order to maintain cache coherency. Mobile processors now typically support states up to C4, while desktop processors are often limited to C1.

The quantity of power saved in these states can be dramatic. In C4 state, an Intel Core Duo processor can power down the L2 cache and reduce the voltage of the package (Intel, 2007), allowing the power consumption to drop from 35 Watts

[1] along with 13 other new instructions

(in C0) to 1.2 Watts (Van De Ven, 2007). However, in order to take advantage of these power savings, the system must be idle.

Browsing websites remains one of the most popular activities amongst computer users. MySpace (`http://www.myspace.com`) is ranked by Alexa (`http://www.alexa.com`) as the 6th most frequently visited website. eMarketer estimate that as of March 2006 MySpace had at least 51 million unique users per month, each averaging a total of over 180 minutes of time on the site (eMarketer, 2006). MySpace allows users to add content to their page, making it easy for them to define a custom style. Many users take the opportunity to add music, animations and videos to their profile. Presenting these to the viewer requires processor activity, preventing the machine from idling while the user reads content. This paper investigates the increase in power associated with viewing MySpace content, and estimates the total power consumed as a consequence.

Method

10 MySpace profiles were randomly chosen and viewed in Firefox 2.0 with Shockwave Flash 9.0 r115 installed on a Sony SZ1 laptop with an Intel Core Duo T2300 running at 1.66GHz. Each profile was loaded in turn and the average power draw of the system measured using the platform's built-in ACPI power monitoring functionality. This was repeated with the maximum C state limited to C1 in order to more closely mimic the behaviour of a desktop system.

Results

With the C4 state enabled, the average power draw of the idle test system was 16 Watts. The average power draw when viewing the MySpace profiles was 17.6 Watts. A large degree of variation was seen in the results – certain profiles contained no embedded media and drew the same quantity of power as the idle system, while one profile caused a draw of 21.2 Watts. With the system limited to C1, the average power draw of the idle test system was 17.7 Watts. The average power draw when visiting the test profiles was 19.1 Watts. A similar distribution was observed, although the maximum draw of any one profile remained at 21.2 Watts.

Discussion

In both the C1 and C4 setups, the average power draw for the MySpace use case was in the region of 1.4-1.6 Watts greater than that of the idle system. Using the March 2006 figures for MySpace popularity and usage, this would imply an average power draw due to MySpace of approximately 319 kiloWatts. However, the precise number will depend on the types of profile generally visited. The selection of random profiles was hampered by Google's limit of 1000 hits per search term, resulting in the sample set all being drawn from the 1000 profiles with the highest ranking on Google. This may bias the selection towards profiles for bands, which will generally include a media player for providing samples of the band's music. The calculated number may therefore be unfairly high. A counterpoint to this is that the highest values measured were overwhelmingly biased to individual user profiles.

The choice of a mobile device for testing may result in the calculated value being an underestimate. Mobile processors work over a smaller range of power outputs than desktop processors, and so repeating the test with a desktop machine may provide more insight as to the excess power draw in that case.

Comscore provides a more recent estimate of the number of MySpace visitors per month of approximately 72 million. Assuming similar traffic patterns, this would result in the power consumption rising to 450 kiloWatts.

Conclusion

Ignoring power consumption of its own server farm and any routers between the servers and the user, MySpace is likely to be responsible for at least 319 kiloWatts of power consumption divided between its users. Further investigation may result in this estimate being increased significantly.

List of profiles examined

```
http://www.myspace.com/sydneypromotions
http://www.myspace.com/wildsweetorange
http://www.myspace.com/991132m/991132
http://www.myspace.com/warehousecarlh
http://www.myspace.com/kingpinuncut
http://www.myspace.com/15782843
http://www.myspace.com/lowredcenter
http://www.myspace.com/micayomusic
http://www.myspace.com/lookhereitsme
http://www.myspace.com/thesupersuper
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About the author

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