Low-power computing: a tech guide

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We examine a number of low-power desktops, thin clients and notebooks to find out which platforms are most suitable for deployment in developing countries.

Many organisations are working to make computer technology available to the (roughly) 5 billion people in developing countries who currently reside on the PC-free side of the so-called 'digital divide'. For corporations such as Intel and Microsoft, the impetus is clearly a mixture of self-interest and altruism: on the one hand, 5 billion people constitute an enormous and tempting market; on the other, the philanthropic instincts of, for example, Intel's Gordon Moore and Microsoft's Bill Gates are demonstrably genuine. For charities and other not-for-profit organisations, the motivation is simpler: to promote technology as a driver of improved social and economic conditions in developing countries.

This project came about at the suggestion of a charity, Computer Aid International, which collects unwanted PCs from UK businesses, refurbishes them, and then ships them for reuse in education, health and not-for-profit organisations in developing countries. Unfortunately, traditional desktop PCs, as used in western companies, have relatively large power requirements — especially when paired with old-style CRT monitors. At the same time, power supply in developing countries is often unreliable, particularly in rural areas, leaving little choice beyond environmentally questionable (e.g. diesel generators) or expensive-to-purchase (e.g. solar panels) power-generation technologies. It therefore makes sense on many grounds — operational, financial and environmental — to use the most power-efficient computers available.

Computer Aid International provides professionally refurbished computers for reuse in education, health and not-for-profit organisations in developing countries.

There are now a number of low-power computers on the market, ranging from notebooks (which are generally designed from the ground up with power consumption in mind), to small-format desktop PCs, to thin-client solutions that hang a number of minimalist workstations off a central host PC or server. Some of these products are explicitly aimed at developing countries, while others are more focused on the increasing need to conserve power in developed countries. But which type of low-power solution is best? Beyond the manufacturers' claims, there is very little independent information on this question.

In this initial survey, ZDNet UK has gathered eight examples of low-power computers, including high-profile products such as the OLPC XO and Intel's Classmate, and measured their power consumption when performing a representative set of tasks. For the battery-powered notebooks, we also measured rundown and recharge times. In addition to the lab tests, we have made a comprehensive log of each system's hardware and software features, giving extra weight to attributes that are particularly relevant to the developing world. Naturally, we also spent time simply using the computers, exploring their functionality and ergonomics. Finally, looking beyond the systems themselves, we have considered important factors such as the availablilty of documentation and technical support, and of training to help teachers, in particular, make the best use of the technology.

The outcome of this process is a shortlist of low-power solutions comprising at least one mini-desktop, one thin client system and one notebook. Six examples of each product will go on to the second stage of the project: field-testing in Africa, which will be carried out by universities in Kenya, Nigeria and Zimbabwe. The outcome of this trial, which will concentrate as much on 'ecosystem' factors as the technology itself, will be described in a later report.

relatively low-power system, its poor performance means that it takes so long to complete the test that it ends up consuming more power overall than the Lenovo ThinkCentre A61e, which is the most power-hungry of the eight systems on test.

At the other end of the scale, the ASUS Eee and Intel Classmate — both very similarly specified 900MHz notebooks — emerge as the most power-efficient systems, consuming around a quarter of the power racked up by the Aleutia E1. The OLPC XO, although the most power-frugal design on test, was penalised by its slower speed, especially when playing back video, and emerged on a par with the mini-desktop Inveneo Computing Station rather than its notebook brethren.

As mentioned earlier, the NComputing products are very dependent on the host PC/monitor /terminal loading combination, and it's probably fair to say that the figures reported here could be improved upon with a different configuration. Also, a simpler workload test with less emphasis on video playback would show the Aleutia E1 and OLPC XO in a better light.

Conclusion

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The purpose of this exercise was to investigate the power consumption characteristics of a representative collection of nominally 'low-power' computers. These must be suitable for deployment in schools and other organisations operating in rural areas in developing countries. We ended up looking at eight systems: one desktop, two mini-desktops, two thin clients and three notebooks.

Having carried out the workload test described in the preceding pages, and also reviewed each system in the traditional manner, we now need to select the products that will go on for additional field-testing by Computer Aid-affiliated universities in Kenya, Nigeria and Zimbabwe. We have decided, in the interest of further comparative enlightenment, to choose at least one mini-desktop, one thin client and one notebook.

Mini-desktop

Mini-desktop choice: Inveneo Computing Station.

The easiest choice to make is the mini-desktop, which is the Inveneo Computing Station. This is a genuinely low-power system (~20W average power) that performs reasonably well under both Linux and Windows XP, and is specifically designed for use in developing countries — in particular, it can run off a 12V DC solar power supply if necessary. Inveneo also has a network of partners in various African countries who are certified to provide support.

Thin client

Thin client choice: NComputing X300.

Although the NComputing thin clients delivered moderate overall power efficiency in our test, we feel that the PCI-based X300 product would repay further testing in the field. Many organisations in developing countries will already have suitable host PCs and should be able to source monitors, keyboards and mice reasonably cheaply. This means that the X300 will be extremely cost-efficient, given that the product itself costs just £149 for three access terminals and a PCI card. The X300 terminals, which can run from Linux- or Windows-based host PCs, are also durable as they are sealed units with no moving parts, and should be able to cope with testing environmental conditions.

Notebooks

Notebook choices: ASUS Eee, OLPC XO, Intel Classmate.

The ASUS Eee is the only one of the three notebooks we tested that's available on the open market. It also delivered an impressive combination of low power consumption and performance, and has not — to our knowledge — been formally field-tested in rural developing-world conditions. All of this makes the Eee an automatic choice in the notebook category.

The OLPC XO and the Intel Classmate are both high-profile products that are already deployed in various developing countries, and we initally considered leaving it at that. However, since these two notebooks are specifically designed for use in challenging environments, we felt it would be valuable to include them in the African phase of the project as well.

We look forward, then, to bringing you further details on the Inveneo Computing Station, NComputing X300, ASUS Eee, OLPC XO and Intel Classmate in the coming months.

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