WHITE PAPER
OLPC

NComputing®

NComputing or OLPC: Which one makes the grade for education?

NComputing's virtualization solution provides affordable computing access to disadvantaged students.

The Stakes are High

Schools throughout the world strive to prepare their students to compete in the digital economy. Affordable computer access is the key to providing the students with the tools they need for e-learning, computer training, and research skills that will be critical throughout their life. But providing affordable computing has been a financial challenge for all but the wealthiest school systems. And even though the digital divide may be at its widest in emerging countries, the issue of computer affordability is also acute in relatively affluent countries throughout the developed world. Even in the United States, which spends more per capita on schools than any nation, the ratio of students per PC is about 5 to 11

The last few years have witnessed an increasing focus on creating inexpensive, affordable computers for students. New technologies promise to bridge the digital divide by bringing access to students at much lower prices. NComputing's virtual desktop and the One Laptop per Child (OLPC) initiative are both receiving considerable attention worldwide. This brief compares and contrasts the two approaches to help government officials and school administrators choose the appropriate solution for their school systems. The stakes are high—a poorly chosen approach will not only impact budgets, but more importantly, the very ability of the students to join the information economy.

NComputing and OLPC have the same admirable intent—to bring computing to students around the world—but very different philosophies, technologies and economics. These differences have a profound impact on the deployability and sustainability of their respective solutions.

Different Philosophies

The OLPC philosophy is to change the education landscape in developing countries by providing each child a laptop that that they can use for learning, whether at school or home. The money for the laptop would come from the developing country itself or through aid from other countries, NGOs, or private donations. The OLPC website says:

> *Given the resources that developing countries can reasonably allocate to education—sometimes less than $20 per year per pupil, compared to the approximately $7500 per pupil spent annually in the U.S.—even a doubled or redoubled national commitment to traditional education, augmented by external and private funding, would not get the job done. Moreover, experience strongly suggests that an incremental increase of "more of the same"—building schools, hiring teachers, buying books and equipment—is a laudable but insufficient response to the problem of bringing true learning possibilities to the vast numbers of children in the developing world.*

This philosophy implies that poor countries (some of whom spend $20 per student on education) should now take 9 years worth of those education funds and devote them to laptops (the OLPC XO laptop costs US$188)—even when the richest countries have not moved to a 1:1 student-to-computer ratio. This philosophy ignores basic building blocks of education like teachers and books.

NComputing has a very different philosophy. NComputing is a for-profit technology company that knows how to successfully deploy solutions. NComputing leaves the learning and education to the experts. NComputing believes that computing access is vitally important for the information age economy and is a powerful learning tool. But it is only a building block—basics like books, teachers, and classrooms are just as important. When countries adopt the NComputing philosophy, they do not need to shift very limited education budgets away from basic necessities. For developed countries, NComputing helps improve the student-to-computer ratio—but does not force a 1:1 ratio on day 1. Instead, NComputing uses existing, proven computing solutions that have been tried and tested around the world and applies them in a far more economical way.

Different Technologies

The OLPC laptop (XO) was developed by MIT media lab scientists. In order to keep the price under $200, OLPC had to make many technology sacrifices. The $188 XO has a slow processor, a small screen, and limited software. In effect, the laptop is more like an educational toy than the real computers that students will use when they join the working world. For example, the screen size is only 7.5" diagonally (compared to 14" for a typical laptop or 17" for a typical desktop monitor). The processor is low-power single-core processor (com-

pared to high-power dual-core processors in most desktops). The keyboard is small, hard to use, and there are reports of keyboards falling apart within a few months of use. The recently announced replacement for the XO (called the X0-2) will not be available until 2010 and depends on future technology breakthroughs in LCD screen technology to bring the cost down.

By contrast, the NComputing solution takes advantage of existing PC standards. It uses regular PCs, regular keyboards, regular monitors, and most importantly, regular software. By building a product that takes advantage of commercially available hardware and software, NComputing gives students a flexible environment with real world benefits. When the students eventually graduate and join the work world, they will easily transition their computing and software skills.

The NComputing solution is based on a simple fact: today's PCs are so powerful that the vast majority of applications only use a small fraction of the computer's capacity. NComputing's virtualization software and hardware tap this unused capacity so that multiple users can simultaneously share it. Each user's monitor, keyboard, and mouse connect to the shared PC through a small and very durable NComputing access device. The access device itself has no CPU, memory or moving parts like a PC so it is rugged, durable, and easy to deploy and maintain. With the NComputing X300 model, seven users can simultaneously share a single computer, while the company's L-series supports up to 10 users on a basic computer, 30 on a mid-range system, and hundreds on enterprise-class servers. The end-user experience is nearly the same as if that student had a dedicated desktop PC at their desk.

The concept of sharing computer power among multiple users is not new. During the 1960s, when computers were all mainframes and cost millions, time sharing was used by large corporations. Today's desktop PC, with its multiple cores (and more on the way), has the same power as a mainframe from 15 years ago. But only a fraction of today's PC users (e.g., scientists, 3D gamers, engineers) use more than a few percent of the power of these "mainframes on a desk". The other 95% of users can share a PC without compromising on speed, graphics quality and applications versatility by deploying NComputing.

Different Economics

The economics of OLPC are truly daunting. The OLPC business model generally involves a centralized government buying the laptops and donating them to the students. Since the goal is one laptop per child (1:1 computing), the cost of the initiative is often many times larger than the entire school budget for a developing country. Several ministers of education in developing countries have noted that if the most affluent countries in the world have not given laptops to all of their students, why does it make sense to do it in a less affluent country?

> The Indian Ministry of Education dismissed the laptop as "pedagogically suspect". Education Secretary Sudeep Banerjee said: "We cannot visualise a situation for decades when we can go beyond the pilot stage. We need classrooms and teachers more urgently than fancy tools." Banerjee said if money were available it would be better spent on existing education plans.
>
> -- theregister.co.uk

Secretary Banjeree has a point. Assuming that a developing country has 1 million children in its primary and early secondary schools (1st grade through 6th grade), the initial outlay for OLPC would be $188 million. This is the known cost. What other costs need to be considered?

1) New student enrollment:

> Since the laptop would be given to each child, and presumably the children will keep the laptop as they progress from grade to grade, provisions need to be made for the entering students that enroll each year. In the 1 million student example, 167,000 students would enter the system every year. That results in an annual $31 million budget to outfit the new students.

2) Theft, breakage and loss:

> A laptop is the most expensive form-factor to manage due to breakage, theft, maintenance. This is especially the case with providing laptops to young children who are not exactly known to be "gentle" with sensitive equipment. According to research by the advisory firm Gartner, 15 to 20% of laptops fail each year. Assuming that 20% of the OLPC laptops fail, are stolen, or are lost, the cost is $38 million per year.

3) Deployment and Support Cost:

> It is a challenge for even large companies with professional IT staff to deploy a thousand laptops to their own employees over a year. And yet the OLPC model calls on governments to plan, deploy, and manage hundreds of thousands of laptops to children. This will require a small army of personnel—for a million laptops, several thousand government and/or school personnel would be required for deployment, support and maintenance. Assuming 2,000 technicians are required, each earning $5,000 (a conservative number), this results in US$10 million in annual costs.

It would cost the government US$188 million to acquire one million laptops and $79 million per year to maintain them. Over a 5 year period, this is over US$550 million in acquisition and support costs.

Figure 1 - Initial outlay for one million students

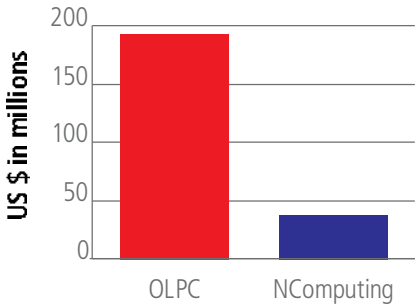
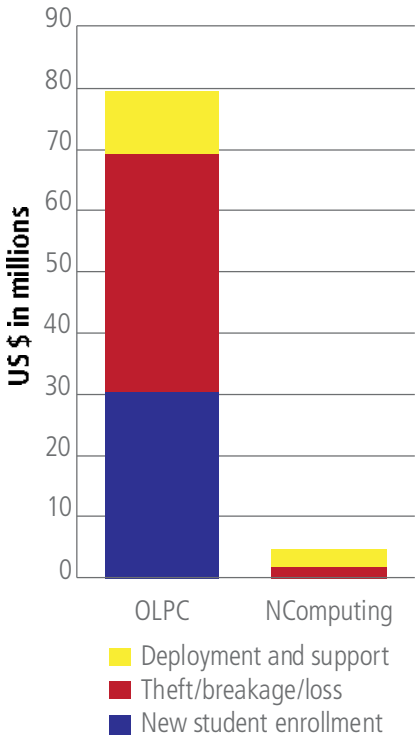


Figure 2 - Annual support costs



The economics of NComputing are quite different. The NComputing solution complements an existing desktop PC sharing it with up to 7 students (or more). Continuing with the million student example, assume that the million students are in 2,000 schools (500 per school). Each school could build a 50-seat computing lab with shared desktop PCs and NComputing virtual desktops.

The initial cost of a 50-seat lab (shared PCs, NComputing virtual desktops, monitors, keyboards, mice, and peripherals) would be less than US$15,000. For all 2,000 schools, it adds up to US$30 million (compared to US$188 million for OLPC). The cost per student would be about $30 (compared to US$188 per student for the OLPC XO).

There are far fewer support costs with the NComputing solution.

1) New students enrolling:

> The NComputing solution is school-based (meaning that the products are set up in schools, as opposed to child-based approach of OLPC). With NComputing, when new students enroll, schools simply use their existing labs. They don't need to buy new computing equipment, which would cost US$31 million per year for OLPC in the current example).

2) Theft, breakage and loss:

> Because the computing labs are inside the schools, they can be locked up and secured. The benefit is a much lower risk of theft, damage, and loss. Assuming a 5% theft/loss/breakage rate, it would cost US$1.5 million per year (compared to $38 million for OLPC).

3) Deployment and Support Cost:

> Deploying and maintaining an NComputing-based solution is considerably easier and less expensive than OLPC laptops because in most countries there is already an ecosystem of trained resellers and dealers for NComputing and shared PC systems that can provide installation and support services at a fraction of the cost. The government does not need to hire thousands of people or create a new bureaucracy. A 50-seat computing lab (with 7 PCs, plus NComputing virtual desktops and peripherals) can be deployed and supported for US$2,000 a year, the cost for 2,000 schools would be US$4 million (compared to the US$10 million per year for OLPC).

The economics of the two models are staggeringly different. The OLPC would cost a government US$188 million to deploy and US$79 million per year to maintain. The NComputing solution would only cost US$30 million and US$5.5 million to maintain. Figures 1 and 2 provide a summary of the economics.

Impact on Deployability and Sustainability

The differences in philosophies, technologies, and economics have a profound impact on the deployability and sustainability of the solution. Table 3 summarizes the technology and business model differences between the two approaches.

Comparison of OLPC and NComputing

	 OLPC (XO Laptop)	 NComputing X300
Price per system	US $188 Minimum order quantity (100,000+)	US $170 (Includes monitor, keyboard, mouse) No minimum order quantity
Students supported	Each student needs one	Several students can share one
Local and manufacturer technical support	No (hidden cost) – OLPC sells directly to governments only who must provide their own support	Yes – NComputing is sold and supported by local dealers and has worldwide technical support staff
Installation and configuration services	No (hidden cost) – must be performed or arranged by the govt./education staff	Yes – available through local NComputing dealer
Transportation logistics	No (hidden cost) – must be performed or arranged by the govt./education staff	Yes – taken care of by local NComputing dealer
Product warranty	30 days (hidden cost)	1 year standard warranty, extendable to multiple years
Product reliability	Unproven – no history.	Highly reliable – years of service history show NComputing failure rate under 0.01%
Operating system	Custom Linux; unproven as of yet	Supports standard Windows and Linux
Supported software	Limited set of custom-built applications	Hundreds of thousands of standard applications
Localization	Must be locally customized for local languages	Supports standard local-language operating systems
Network connectivity	No network plug – requires local wireless network infrastructure (hidden cost)	Standard low-cost Ethernet network plug, host PC can be set up wirelessly as well
Central management software	No	Yes – host software includes administration console
Risk of theft/loss/ breakage	High (hidden cost) - portable nature lends itself to high risk of theft, sale on black market, breakage, and loss	Low – system is fixed and remains in the school and can easily be locked down
Teacher control over use	None – teacher has no means to see what students are doing with the laptop in class	Yes - Management software lets teachers see what students are doing to keep in line
Lifecycle	1-2 years (hidden cost) – portability makes students feel they "own" the laptop.	>5 years – installation stays in the classroom and can be used for multiple years
Power	Battery life in product is lower than advertised per independent tests	Powered via direct connection to host PC (X300 devices require just 1 watt)
Performance	Very limited – low cost, low end processor delivers only limited performance	Full multimedia performance to run wide variety of apps. – scales with host PCs
Relevance	Low - Students learn computing on a limited function custom system	High - Students learn on systems that are exactly like those they will use lifelong

For example:

- The OLPC model requires minimum order quantities in the tens of thousands. Governments must commit substantial funds and commit to large-scale rollouts; otherwise the equipment will sit in warehouses. The NComputing model does not require large quantities to get started. Governments and school systems can purchase NComputing in small numbers (as few as 1 unit) or large numbers, depending on the financial and technical resources. The country's goal may be to get to 1:1 computing, but it does not have to happen on the first day. It can be phased over years if needed, and yet all of the students in a school will immediately benefit—even from small rollouts.
- NComputing leverages an ecosystem of professional computer resellers and servicers around the world that are experts in planning, deploying, and supporting technology. That way the deployment and maintenance of the computing infrastructure is assured. This approach also benefits local IT businesses and creates more local jobs. The OLPC model relies on government personnel.
- In the OLPC model, the government is responsible for repairs—there is no warranty. NComputing offers commercial warranties. When things break, the reseller generally provides the necessary replacements.
- NComputing has deep expertise in computing software and hardware technology. NComputing also has a large development and support organization and experienced management and engineering teams. The company has a proven track record of deploying affordable computing solutions for schools (and businesses) around the world.

Conclusion

OLPC and NComputing have the same mission—to bring computing to school children around the world—but radically different approaches to accomplishing this mission. NComputing has a proven technology that has been deployed by over 15,000 organizations in over 80 countries. Every day, over 600,000 people rely on NComputing for their computing access. While OLPC has received considerable media attention, the reality is that it is an unproven technology with a spotty record. OLPC's shift to a new laptop (X0-2), which will not be available until 2010, further clouds the future of the current X0 laptop. Choosing the right approach is critical to any large-scale computerization project. Governments and school systems are encouraged to conduct the necessary research on both approaches and to choose the right one based on all of the relevant factors.

Additional References:

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