

Proposal to Sustainable CU small grant for Computer Virtualization pilot

APPLICANT

The Energy Program in the CU Environmental Center is currently investigating the potential for reducing energy use and campus departments' computer equipment budgets through desktop virtualization. More description of the need and the proposed technology follow.

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DESCRIPTION OF PROJECT

The Need:

Computer CPUs (Central Processing Unit, the computer “box” or “tower”), like the human brain, use only a portion of their available capacity but still use lots of electricity to power it. The average CPU uses between 100 and 250 watts of energy while use. This majority of this energy is being wasted while not contributing to productivity. Yet on campus we typically have a dedicated CPU “station” (CPU, monitor, keyboard, mouse) for every user. This results in a large amount of energy waste from campus computers.

The technological solution:

“Virtualization” software and equipment allow a single CPU (the “Host CPU”) to provide an operating system and applications to several users (between 11-30 depending on the application) at once, reducing the number of dedicated CPUs needed for these operations and services. It does this through the use of distributed “access devices” and virtualization software installed on the main CPU that allow multiple users – each with his/her own monitor, keyboard and mouse – to share a single CPU. The access devices use 1-2 watts of power (compared to 150-250 for a regular CPU) and are about 25% the cost of a brand new computer CPU. The average CPU on campus is upgraded every 4-5 years.

NComputing is a company that provides a range of virtualization products for various applications and is the provider of the equipment to be funded with the Sustainable CU grant. For more information about the products, please visit the NComputing website: <http://www.ncomputing.com/>

The Benefits

The energy-saving benefits of this switch from individual CPUs to a shared host CPU can be very large. Depending on the specific NComputing products used and number of individual desktops being replaced, the energy savings alone can be several hundred kilowatt-hours and several hundred dollars per year. The access devices use 1-2 watts of power compared to 150-250 for a regular CPU.

Even greater cost savings come from not having to replace multiple CPUs every 4-5 years (between \$1000 and \$2000 each) but rather only having to upgrade one. A secondary cost saving comes from minimizing the amount of CPU maintenance time required on the part of the IT professional overseeing the computers. He or she only needs to maintain (troubleshoot, software upgrades, etc.) one computer rather than multiple computers saving staff time.

Additional environmental benefits that accrue outside of CU's scope is the reduction of toxic electronics waste (“e-waste”). As fewer replacement CPUs are needed there will be less e-waste generated by CU.

Current CU pilot study:

The requested funds would be used to conduct a pilot using NComputing's products in two campus departments. Results from the pilot will be used to provide on campus experience to upper-level IT management and other IT staff, increasing their comfort level with this innovative, yet unfamiliar technology. This pilot will allow a first-hand CU IT employee to experience and testify to the product's effectiveness and suitability in a given set of circumstances. This pilot will also help identify ideal situations and computer-user experiences for this technology.

The IT staff of the CU Grounds department has volunteered to pilot NComputing's L230 series access devices replacing eight of his department's computer workstation CPUs with its own access device.

The CPUs for these workstations are used primarily for low-level tasks such as time clocks and websurfing, yet use up to 2700 kWh per year (\$311 at current energy rates) and produce 2.5 tons of CO₂ per year. Consolidating these CPUs from 9 to 1 will save 2400 kWh (\$264) and reduce 2 tons of CO₂ per year. At a cost of \$209 per access device replacing a CPU, the payback on this for energy savings is just over 6 years. ($\$209 \times 8 / \264 per year). But the real cost savings for the department come from not incurring replacement costs for CPUs every four to five years.

STUDENT INVOLVEMENT

Students in Dr. Lisa Barlow's Sustainability Consulting Class (ENVS3001 Sustainability Consulting) will be conducting a study of the potential for using this virtualization technology across campus. The class group will be looking at the best applications for the technology on campus and the benefits of deploying this, including energy, cost and CO₂ reduction potentials.

DETAILED BUDGET

The request is for \$1900. The requested amount contains a contingency. Any unused funds from the initial request will be returned to the Sustainable CU fund. A breakdown is below.

8 pieces of the L230 Series access device and software license at \$209 each = \$1672

Contingency (if prices go up or for shipping costs, etc.) at 12% = \$228

Total = \$1900

MATCHING FUNDS

Xcel Energy has indicated this project is eligible for its "Custom Efficiency Rebate program" which provides rebates for non-traditional efficiency measures such as computer virtualization. A custom efficiency application for these products is pending approval and the precise amount of the granted rebate is unknown at this time. If Xcel Energy approves a specific rebate amount before the Sustainable CU grants are rewarded I will inform the Environmental Board of this. As it is more likely we will not know the rebate amount until after the grants are awarded I will return to Sustainable CU funds in amount of the rebate. I anticipate the rebate will not exceed 10-15% of the total cost of the equipment, or \$170-\$250.

FEASIBILITY

The desktop virtualization pilot can happen as soon as the equipment is purchased as we already have IT staff person involved who will implement and monitor the project. NComputing products have been used in over 100 countries and hundreds of schools and have received several industry awards. <http://ncomputing.com/Company/ReviewsAwards.aspx>

There is a 3-year hardware warranty on all NComputing Products. Hardware is tested for 2 refresh cycles (Approximately 8-10 yrs) and all software upgrades are currently free, for the foreseeable future.

STUDENT IMPACT

Students will not be involved in the implementation of the pilot, however several students will be involved in a simultaneous research project (ENVS 3001 Sustainability Consulting) which will use the findings from the pilot (and working with higher-level IT staff) to determine the potential for deploying this technology across campus, including best applications for the equipment, costs and benefits of implementation and integrating this equipment into existing CPU replacement timetables.

SUSTAINABILITY

The Environmental and economic benefits of equipment and pilot are outlined above in the section titled "The Benefits". Although there may be some, I am unaware of large-scale social equity benefits of this project at the pilot scale. This technology certainly reduces, in the long-term, the amount of toxic e-waste (electronics waste) generated. E-waste can often be a serious hazard for low-income populations when it is disposed of improperly. As the need for replacement CPUs decreases with broader deployment of this technology across campus, we will be generating less e-waste.

INNOVATION

This technology has been on the market for only a few years and is considered innovative in that it provides a new, elegant and practical solution to a serious problem of energy waste. And while this technology has been used in over 100 countries and hundreds of schools, CU has not investigated its potential yet. It is innovative in its ability to greatly reduce energy costs, computer replacement budgets and e-waste.