Case Study
Desktop PCs for Demanding Environments

THE PC REBORN: ALEUTIA REENGINEERS THE DESKTOP FOR THE DEVELOPING WORLD

Challenge
Providing cost-effective and reliable computer access to classrooms and healthcare clinics in remote locations of the developing world requires navigating numerous obstacles. These include the lack of reliable electrical and communication infrastructure, high temperatures, dust, security, and the difficulties with providing support and locating replacement parts in remote locations.

Solution
Aleutia developed low-power, fanless mini PCs powered by solar and engineered for the rigors and realities of the developing world.

Impact
Solar computer labs in rural areas are helping to transform the quality of education by providing students and teachers with access to modern learning materials and interactive education software. Meanwhile, solar desktop solutions for rural clinics are revolutionizing primary care with the introduction of electronic medical records (EMR) and capabilities for providing accurate data to national healthcare initiatives.
Inspired to innovate

In 2006, Aleutia founder and CEO Michael Rosenberg volunteered to help set up a computer classroom for children in Ghana. There, he discovered that the second-hand desktops and laptops donated to the project were not well suited for the conditions and environments of underdeveloped regions of Africa.

During the dry season, classrooms and clinics throughout many parts of Africa must contend with a great deal of dirt and dust. It’s so pervasive that it’s fairly common to find storage closets full of broken computers with dust-caked cooling fans. Rosenberg’s experience in Ghana inspired him to design a better solution, and he started Aleutia with the mission to design low-power desktop PCs with no fans or other moving parts.

Through subsequent experience deploying their fanless PCs in Kenya, Uganda, Ghana, and 10 other African countries, Aleutia has also designed other innovative solutions for these and many other persistent challenges that they’ve encountered along the way.

Overcoming obstacles

Putting PCs in school classrooms is a crucial step for bridging the digital divide and raising the economic potential in the developing world. In addition to limited funds and dust, engineering computing solutions for rural regions of Africa involves addressing high temperatures, lack of reliable electrical and Internet infrastructure, and a host of other problems that can undermine the effectiveness of efforts.

Rugged fanless desktops

Rosenberg and Aleutia determined early on that desktop PCs are the best form factor for these demanding conditions because standard keyboards, mice, and displays are easier and cheaper to replace with desktops than fixing broken parts on laptops. And since cooling fans are a common point of failure for traditional PCs and laptops in hot, dusty conditions, Aleutia designed their mini PCs so they don’t require them.

The durable, machined-aluminum and copper chassis of Aleutia’s T1 mini PCs passively dissipate the small amount of heat produced by their dual-core Intel® Celeron® processors while ensuring that the internal components are well-protected. Plus, the T1 mini PCs do not contain hard drives or other moving parts—saving electricity and removing other potential causes of malfunctions. All data is stored on an internal SSD or external NAS.
“Our passion is to enable high-impact technology projects in developing countries, and, in off-grid areas that depend on solar power, every watt counts. Intel's relentless drive to push down power consumption while increasing performance with each generation of Intel® Atom™ and Intel® Core™ processors makes life-changing, solar-powered computing solutions possible.”

Mike Rosenberg
Founder and Managing Director of Aleutia

**Simplify solar installation**

Solar power is the key to providing reliable electricity in remote areas. But as Aleutia discovered, the details of sourcing and installing photovoltaic systems create their own set of complexities. To minimize those, Aleutia engineered comprehensive solar solutions that include PV panels, charge controllers, batteries, and all cabling required to rapidly deploy a solar system optimized for powering T1 mini PCs. Their complete Solar Classroom in a Box* and Solar eClinic* solutions fit in the back of a pickup truck and can be installed by a local handyman in a day.

Taking this a step further, Aleutia developed solutions that create preconfigured solar classrooms and clinics constructed from shipping containers. Not only are shipping containers low-cost and available worldwide, they enable Aleutia to preinstall the solar panels and equipment and configure the interiors prior to transporting them by truck to the site. In addition, containers provide a versatile modular foundation that can be customized into different configurations and include windows, insulation, security hardware, and other options.

**Eliminate inverters**

Another key innovation was to avoid power inverters whenever possible. Since photovoltaic cells produce the same DC current that PCs use, there's no need for the AC power inverter typically found in solar installations. Running PCs directly off the solar-charged 12-volt battery array enabled Aleutia to remove both inverters and computer power supplies (which convert AC power back to DC) from the solution—lowering equipment costs and eliminating two potential points of failure.

This also solved another problem that occasionally arose as people took advantage of the newly available electricity to plug kettles or other AC appliances into the solar power system, draining battery power meant for the computers.
Classroom successes

Aleutia’s T1 classroom mini PCs operate on Linux* and come loaded with open source educational software and learning tools. Classrooms can also explore the vast expanse of human knowledge—without the need to connect to the Internet—with all of Wikipedia* loaded onto an attached terabyte drive. This is a tremendous advance over the hand-drawn visual aids such as world maps or periodic tables that instructors would often sketch on blackboards.

In countries and regions with 3G connectivity or other Internet access, the classrooms are also able to participate in distance-learning opportunities, and schools can easily transmit analytics on student achievement, technology use, and other vital data to education ministries.

Aleutia has deployed solar classrooms at more than 230 rural schools in 13 African countries. Each classroom features 10 Aleutia T1 mini PCs with dual-core Intel Celeron processors, an Intel® Core™ i3 processor-based classroom server for teachers, 12-volt LCD monitors, and a low-power projector.

Helping improve healthcare

In addition to similar funding, power infrastructure, and connectivity issues, rural healthcare clinics in the developing world also face a number of additional challenges. Keeping accurate medical records, for instance, is difficult in areas where people have never been issued any sort of formal identification documents. And computer-based diagnostic and tracking tools for medical staff who have little to no experience using computers need to be very intuitive and easy to use.

Aleutia worked with local clinics to develop easy-to-use eClinic* patient registration and diagnostic software that’s optimized to run on their mini PCs. This software enables nurses with no previous computing experience to quickly identify symptoms, provide diagnoses, and offer treatment to patients. Aleutia’s eClinic Cloud* database software offers data visualizations for vast quantities of medical information. This data can be automatically backed up to government systems daily via 3G or GPRS wireless.

In Oyo State, Nigeria, Aleutia also created a system that enables clinics to provide patients with medical ID cards—for many patients, these cards were their first official identification document.

Why Intel

Aleutia uses Intel® processors to power their fanless mini PCs because they offer an ideal combination of performance, low thermal design power (TDP), compatibility with standard Linux OS and open source software, and built-in HD graphics capabilities. The processors enable Aleutia to design rugged, efficient, low-cost desktop PCs that are passively cooled in warm climates without fans, offer schools and clinics a broad selection of software, and deliver reliable performance for these challenging computing environments.

Learn more about today’s desktop computing: intel.com/desktops