

High Tech Maui

Maui First in Nation to Deploy Commercial Wireless 3G Broadband™



Managing Director Steve Berkoff demonstrates the plug-and-play ease of their IPWireless 3G Modem during a product launch at the Maui Research & Technology Center in April 2002.

How different would your life be if you had high-speed connectivity to the internet, your email account and corporate or personal network from anywhere – your car, office, home, the beach, a different city or even offshore on a boat – simply by plugging a pocket-sized wireless modem into your laptop?

By mid-summer 2002, Maui residents and visitors will enjoy the utmost mobility when Maui Sky Fiber, located at the Maui Research & Technology Center (MRTC), makes Maui the first location in the U. S. with highly secure internet services via IPWireless Advanced 3G Broadband™ wireless solutions. Maui Sky Fiber's proprietary software provides businesses, residents and visitors a menu of service levels, for just a day or as long as a year, at speeds ranging from 128kb/s to 6mb/s, which are 10 to 100 times faster than average modem speeds. No wires or cables to run, installation techs to wait for, or additional computer equipment to buy make Maui Sky Fiber's service the wave of the future.

Public safety personnel such as the police, firefighters or airport security will be able to use these devices to search databases of protocol, legal issues and case histories and to record data and images via IP cameras. The modems are ideal for isolated locations that need access or webcams, such as building sites or restricted-access areas, and can operate efficiently on solar powered cells when power is not available. High-speed wireless connectivity will also be useful for life's day-to-day tasks, such as off-site meetings; downloading movies at T1 speeds during road trips to entertain children; or updating the corporate database from a café, park bench, or the beach instead of the office.

Visitors to Maui will have the option to pick up a wireless modem upon check-in at their hotel with service at speeds up to 6mb/s for use at the pool, golf course,

The 4.5 by 3.5 by .075 inch portable 3G Broadband modem can be plugged into USB, Ethernet or RS232 interfaces to receive high speed internet service anywhere with coverage.



and conference room. Due to 128 encryption technology, the service is much more secure than standard AO211 networks, and security can be enhanced based on individual needs.

Rather than re-wiring and installing routers to increase bandwidth, large corporations and resorts can save money and time by purchasing their own NodeB base station, which is an intelligent transmission device that can support 1,400 concurrent wireless modem connections within a 3-mile radius. Each NodeB is easily scalable to add more users as demand allows, even if it's just for a one-week conference. Since the technology uses a multipoint, multichannel distribution system, MMDS-spectrum band instead of the more traditional line-of-sight, the NodeB can be placed indoors or outdoors, without concern for obstruction by trees or buildings. In fact, the iron-rich soils of the centrally located 10,000-foot

Haleakala serve as a gigantic reflective surface, making service on Maui more extensive and reliable than other testing sites in Oahu, Canada and New Zealand.



MentorNet, a national project implemented in Hawaii by Maui Economic Development Board's Women In Technology program, has received the 2001 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. Maui Community College was one of the first community colleges chosen to participate in MentorNet, which rolled out to Kauai and Hawaii Island this year. MentorNet is actively seeking industry members to serve as mentors. To register, visit www.mentornet.net

Maui Economic Development Board will reprise the 1981 "Maui's Economic Future" conference on July 1 & 2, 2002. In its 20th year, MEDB was formed as an outcome of the original MEF and once again will take the pulse of the community as they move into their next 20 years of responsible economic development. www.medb.org

A new addition to the 2002 AMOS Technical Conference will be the introduction of panel discussions. Each year, the panel will consist of a group of experts discussing a theme that is of importance to the conference participants. This year, the panel will discuss small satellites, both from the perspective of the satellite manufacturer and operator, as well as the perspective of the ground-based optical systems that observe those small satellites. The goal is to allow each group to understand the capabilities and requirements of the other group, with the potential for some cooperative efforts.

Maui High Performance Computing Center Forges New Leadership Team

Upon being awarded the contract for operations and management of the Maui High Performance Computing Center to the University of Hawaii, management has put together an internationally renowned team to direct its development and operations that includes Chief Technology Officer Dr. Robert Borchers and Chief Scientist Dr. Bobby Hunt. Together with Executive Director Gene Bal, Hunt and Borchers will keep MHPCC on the cutting edge in their respective arenas while taking the Center to the next level in the supercomputing community.

Dr. Robert Borchers, Chief Technology Officer, left the Directorship of the National Science Foundation Division of Advanced Computational Infrastructure and Research, which he held since 1993, to join MHPCC. His distinguished career includes over 15 years with Lawrence Livermore National Laboratory, more than 20 years at the University of Wisconsin, Madison in various positions related to physics concluding as Vice Chancellor for Academic Affairs; fellowships at AJ Schmidt Foundation, National Science Foundation, Alfred P. Sloan Foundation, American Physical Society, and the J S Guggenheim Memorial Foundation; and is listed in the Who's Who in the United States. He has been integral in the planning of the Supercomputing Conference series since 1987 and is currently the Vice Chair for SuperComputing 2002. He is a fellow of the American Physical Society and a member of the Institute of Electrical and Electronic Engineers and numerous advisory and review committees at universities, AHPCC, and NSF Center for Research on Parallel Computing. His numerous scientific articles, book chapters, etc. have focused on nuclear physics, instrumentation, computing and fusion energy, and technology.

Dr. Bobby Hunt, Chief Scientist, has a long and impressive history teaching Electrical Engineering, Optical Sciences, and Applied Mathematics at the University of Arizona, three disciplines having direct correlation to the program at Maui Space Surveillance Site. In addition to pioneering the development of image processing in 1968 at Los Alamos Scientific Laboratory, he has held positions in SAIC and the Board of Directors of the Imaging Systems Corporation, Sandia Laboratory, and fellowships in NDEA, IEEE, and Optical Society of America; like Dr. Borchers, Dr. Hunt is also in Who's Who in the United States, and his work has been published in 7 books and numerous journals and conference proceedings. As a founding member of the MHPCC R & D consortium in 1994, his first-hand experience provides him a deep understanding of Maui's unique natural and scientific assets.

(continued inside)

SAVING MONEY, SAVING LIVES

Native Hawaiian-Owned Company Lands Major Department of Defense Contract

During Operation Desert Storm, time and pharmaceuticals were often wasted when units ordered urgent medical supplies that were readily available at nearby units. In response, the Department of Defense (DoD) created the Joint Medical Asset Repository (JMAR) Project to provide real-time information of all the DoD's medical assets, including blood products, equipment and pharmaceuticals for the entire fleet of navy ships, military hospitals, warehouses and bases world-wide.

In October 2001, the DoD awarded the JMAR contract to Akimeka, LLC, a Native Hawaiian-owned IM/IT services company at the Maui Research and Technology Park (MRTP), to strengthen the four year-old program. Using its expertise in application development, Akimeka will consolidate over 10,000,000 records from more than 6,000 military organizations and facilities that are using 30 different types of systems into one user-friendly database to enable DoD personnel around the world to efficiently locate required supplies. All data is stored on a classified server at the Maui High Performance Computing Center (MHPCC), one of the world's top supercomputers, located at the Maui Research and Technology Park. Akimeka employs 14 staff for the JMAR project with plans to increase to 20 local engineers and staff by the end of this calendar year.

US Troops deployed around the globe cut expenses and save time by accessing JMAR to find supplies that are already available at their location, allowing them to transport only the remaining necessities instead of excessive supplies, as was often the case during Operation Desert Storm.

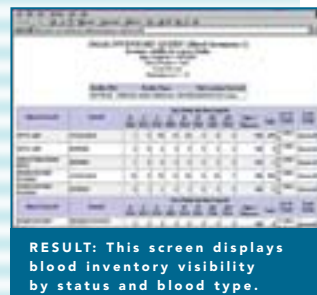
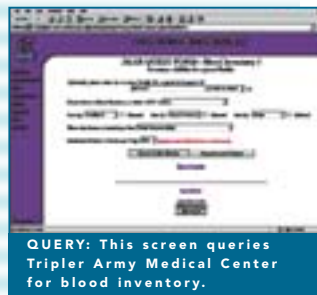
In case of an emergency or catastrophe, JMAR can quickly locate supplies in nearby facilities to assist distribution efforts to affected areas. Since the events of September 11, 2001, the number of users has risen by over 200%, pulling queries for blood, first-aid kits and chemical protection. Recently, a newborn in a military hospital in Germany desperately needed a rare drug in the middle of the night. Utilizing JMAR, the physician saved the baby's life by immediately locating the drug at a nearby facility rather than losing precious time with phone queries to numerous facilities.

Currently, Akimeka is in the initial stages of the Information Assurance Project, conducting R & D for the National Security Agency to develop an application to serve as a secure filter between the DoD's classified and unclassified networks. The first year includes a market analysis of available products, followed by rigorous testing of new applications developed by Akimeka's engineers.

"We are committed to being a good community partner and to providing educational and employment opportunities for Maui's residents," explains founder Vaughn A. Vasconcellos who grew up on Molokai, a rural island in Maui County. Akimeka works closely with the Native Hawaiian Health Care Group to bring needed medical services to Maui County's underprivileged and with the Maui Community College and the Women In Technology Project to develop Maui's workforce. "Our latest vision is to create an Information Technology Center," shares Vasconcellos, "which would bring small and large businesses, universities and non-profits together for networking and joint-venture projects."

"We are committed to being a good community partner and to providing educational and employment opportunities for Maui's residents,"

-Vaughn A. Vasconcellos, Akimeka Founder



New Horizons For

From identifying objects in space, to improving mammograms, protecting local plant species, researching the solar atmosphere and hosting educational seminars, the Maui Scientific Research Center's (MSRC) projects span many disciplines.

"Our vision is to help build a thriving and diversified nucleus of world-class scientists, keep local talent in Hawaii, and focus on research that is related to local and national issues," explains Stuart Jefferies, a founder of MSRC and research professor at the University of New Mexico (UNM). Last September, Jefferies and his colleagues created this vision for Maui and five months later, the Air Force Office of Scientific Research funded \$2,500,000 for research in Advanced Imaging Sciences to the MSRC team. With additional funds from the National Science Foundation and NASA totaling \$1,400,000, MSRC opened its doors as a remote center of UNM in January 2002 at the Maui Research & Technology Center, a program of the State's High Technology Development Corporation.

In collaboration with the Air Force Research Laboratory (AFRL), MSRC is working on the restoration of images that are acquired through turbid media, such as locating and identifying a satellite in space or an aircraft hidden behind clouds. By developing algorithms that use as much prior information about the imaging system as possible, MSRC can mathematically counteract the scattering of light by turbid media to transform a fuzzy, unrecognizable image of a cloud-covered airplane (see Fig. 1) into an identifiable object (see Fig. 2).

Applying this technology to health issues, MSRC is exploring more economical alternatives to conventional mammography that use harmless low-power infrared lasers to accurately detect and diagnose tumors in one painless visit. MSRC hopes their research will help replace current methods that are stressful and painful for many women, which use damaging and controversial x-rays to detect tumors that then require a biopsy to determine if it is cancerous or not.

Later this summer, MSRC will help protect indigenous plant species in the 100,000-acre East Maui Watershed that are under attack from *miconia calvescens*, a highly invasive ornamental tree from South America that has already devoured 70% of Tahiti's native forests, where the locals call it "the green cancer." If *miconia* becomes uncontrollable in Maui, where rain forests and habitat are very similar to Tahiti, many Hawaiian species are likely to be lost within 30-50 years. With the support of the Nature Conservancy and the University of Arizona, MSRC will locate individual plants to help eradication efforts by using hyperspectral imaging to take aerial



MHPCC Leadership Team

(continued from page 1)

What will your role be?

Dr. Borchers: My role is to keep track of the state of the industry, the connectivity, computational power, and networking. I will strive to bring significant intellectual presence in MRTP and MCC by increasing the number of PhDs doing R & D on Maui. This will build a critical mass in Hawaii and on Maui, which, in turn, attracts large-scale research.

Dr. Hunt: Primarily, I will contribute to the direction of the R & D. Looking for open questions that represent the challenges of the future and shaping the research to provide a solution is a scientist's responsibility. MHPCC's future work will, in large part, be dictated by national needs and local interest; but there are existing programs that require work and may deliver opportunities, and pure R & D is my focus.

What makes MHPCC unique?

Dr. Hunt: Merging the interface where the image ends and the computer begins has long interested me. Having found one location where two premier facilities for both the collection of image data and the computational manipulation of that data, offering both sides of the equation, is extremely intriguing. More and more, the imaging done for medicine and space exploration requires a computer, not a camera, and the image does not exist independent of the computer. The formation of the image actually is the sensing of energy from measurements that are analyzed with a computer to create the image from the measurements. It is a complex area that has much impact on the future of imaging. That exploration is a perfect fit for Maui's assets.

What benefits does the University of Hawaii bring?

Dr. Borchers: There are lots of things going right. The UH contract was an important step forward to integrate the many assets in Hawaii, and especially on Maui, for building a critical mass of researchers. The UH faculty is extremely talented and can serve as role models for personnel and in the community. The closeness of the facilities and our ability to leverage the faculty supports R & D. As well, proposals to entities like NSF, NIH and DARPA for funding, written under the auspices of an educational institution such as UH, receive more favorable support.

What other aspects of the economy will this impact?

Dr. Hunt: I have attended, presented, and served on the committees of many conferences over the years. Using the strong relationships I've developed in the industry and the professional societies, I will work to attract scientific and technical groups to Maui. Building awareness of our assets with potential customer groups as well as driving visitor expenditures into the islands' economy would both be served by these efforts.

Research On Maui



During this third expedition, Stuart Jefferies poses at a remote site five miles away from the South Pole with Martin Pomerantz, one of the first researchers to Antarctica in 1958.

"The sun is pivotal in everything we do. Relatively small changes in the sun's behavior can have dramatic effects on the biosphere. For example, flares and coronal mass ejections that spray particles into the Earth's atmosphere can affect all communications relying on satellite, such as cell phones, government networks, commercial flight navigation, cable TV and the stock market."

— Stuart Jefferies, founder of MSRC

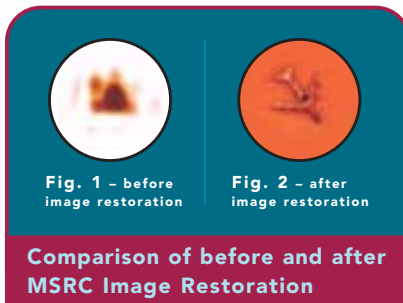
photographs of affected areas with Computed Tomography Imaging Spectrometers, which disperse light over a CCD array camera. Hyperspectral imaging has proven superior for environmental protection projects such as assessing damage from forest fires, researching habitat conditions for endangered species, and monitoring mineral mines for natural resource stewardship and by the Department of Defense for locating chemical or biological weapons, bomb damage assessment of underground structures, and foliage penetration to detect troops and vehicles.

"Our research will help us better understand the sun's extremely dynamic behavior. In turn, this information will help the scientific community to better understand how the sun is affecting the Earth's atmosphere and to really know man's role in affecting our own atmosphere," says Jefferies, who will return to the South Pole for the fifth time this November with colleagues from Oceanit and the University of Rome to conduct helioseismology research, the study of solar oscillations, during Antarctica's Austral Summer when the sun never sets. "We will be monitoring changes in the sun using sound waves that are continuously being produced near the sun's surface, which is the sun singing to us," explains Jefferies. Though these waves have been used for the past 30 years to research the sun's interior, the team will use them to learn more about the sun's atmosphere. Part of Project MOTH, Magneto-Optical filter at Two Heights, the team discern the time it takes for high-frequency sound waves to travel between sodium and potassium solar lines formed at

different heights within the solar atmosphere. MSRC is also supporting research on the sun's interior by improving current procedures for analyzing helioseismic data from the SOHO satellite, which is gathering an overwhelming wealth of information about the sun.

To build on Maui's existing research community, MSRC is inviting interns, post-doctorates, professors and undergraduate and graduate students to study, contribute and work at MSRC. Each month, an internationally renowned researcher will offer seminars and support local research and, in time, unify research on Maui, attract more funding, and provide more job opportunities. Experts slated for the program include Timothy Schultz, the department chair and professor at Michigan Tech University; Bob Plemmons, a Numerical Analysis professor at Wake Forest University; Michael Roggeman, an adaptive optics professor at Michigan Tech University; Roger Angel, an adaptive optics professor at University of Arizona; Todd Turgersen, a computer science professor at Wake Forest University and Sudhaker Prasad, the Director at UNM's Center for Advanced Studies.

MSRC is a collaboration between UNM and Oceanit, a progressive Hawaii-based engineering, science, and research company also based at the Maui Research & Technology Center.



Comparison of before and after MSRC Image Restoration

What types of opportunities does UH bring?

Dr. Borchers: Our goal is to bring significant intellectual presence to MRTC and to MCC/UH. One way we hope to accomplish that is via the Experimental Program to Stimulate Competitive Research (EPSCoR). In 2001, this joint program of the National Science Foundation (NSF) added Hawaii to the list of just 13 states and territories that have historically received lesser amounts of Federal research and development funding. The program promotes the development of the states' science and technology (S&T) resources through partnerships involving a state's universities, industry, and government, and the Federal research and development (R&D) enterprise. \$3,000,000/year will be proposed for research infrastructure resulting in a coordinated state-wide effort to improve academic R&D capabilities in targeted disciplines, enhance training and education for students in science and engineering, and increase efforts to promote transfer of technology from Hawaii's universities to our private and public sectors.

What types of business will be developed?

Dr. Borchers: Along with continued development of information, technology and computer sciences, bioinformatics, the merging of it, computer sciences and biology, will be an area of great growth in the near future. This is a burgeoning field with enormous potential in healthcare and environmental benefits where new hardware and software will be needed, along with support and collaboration from experts in allied fields. Hawaii has unique assets that we hope to exploit; a heterogeneous gene pool due to the inter-racial character of our population, direct access to the marine biology that surrounds the state and an island environment that is rich in biological diversity.

The State Legislature has appropriated \$150,000,000 to begin the construction with a commitment by the UH to match the \$150,000,000 to complete the \$300,000,000 development in three to four years. The DoD is also planning to build the Pacific BioMedical Research Center at the Tripler Army Medical Center campus on Oahu. MHPCC will support the UH, DoD, and the private sector by providing the IT component for the biomedical research and development in Hawaii.

The program is slated to bring 25 research staff into MHPCC with a large percentage of the funding coming into Maui.

What impact on education will it have?

Dr. Borchers: Education in the community has always been a natural outgrowth of our work, and we have initiatives currently in place as we look to expand. For example, we placed an antenna on the roof to create wireless connectivity to study whale movements. The ocean craft have line of sight with most of the Kihei coast and are conducting R & D using our equipment.

Our summer internship program will continue. Astronomy has great educational opportunity and the debut of the Faulkes Telescope on Haleakala is imminent and eagerly awaited. The purely educational mission of that telescope will have ties to our students and to tourism.

We'd also like to collaborate with the telescopes being built on the Big Island to analyze the data.

Are you interested in the incubation/phase-in program at Maui Research & Technology Center, a project of the State's High Technology Development Corporation (HTDC)? Contact Steve Perkins, Program Manager, at steve@mrtc.org or (808) 875-2432.

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<http://www.hightechmaui.com>

Paradise

SCIENCE BEHIND

The Kapalua Golf Academy Digital Analysis Lab

On Maui's verdant west side, the world-renowned Kapalua Resort has elevated golf lessons to a technology high at the Kapalua Golf Academy.

In addition to the more traditional features such as grass teeing areas, practice putting greens, greenside and fairway bunkers, target greens and a specialty short game area, the Kapalua Golf Academy features the "V1 Digital Coaching System" with IEEE FireWire interface, one of the fastest peripheral standards ever developed, and an operating capability of up to 400 Mbps, and 30 times more bandwidth than USB.

This high-performance technology communicates fast enough to transfer digital video and audio in real time for a unique one-on-one digital video analysis instruction experience.


Digital recording allows a switch from one camera to a second and a view of both cameras in a split screen so the first swing and the improved swing can be viewed side by side. It can view and record a swing coming in from a videotape previously recorded; compare a student's before and after swing and play them back in sync; compare a student's swing to a pro's swing; compare the student live on one



side and recorded on the other side; and overlay a live image of the student on top of a recorded image of that student or of a professional such as Tiger Woods.

The V1 technology records a swing in digital format, stores it on the hard disk and assigns it a tab for instant recall with a single click, and plays it back for analysis. The preview option allows instant viewing, efficient storage and instant retrieval for identification and recall. The editing function trims, moves or deletes any swing or group of swings. Intuitive and flexible playback control of both the direction and speed of the video allows slow motion, freeze frame, slider and jump options. Drawing and writing on top of the video helps to point out key features during the playback of the swing.

Special digital effects include four simultaneous screens, flopping of images, zoom and brightness control. Additional tools show posture angles, display swing tempo, overlay of a swing plane on top of a student's swing and intelligent club path tracing which allow the cause/effect relationships of the swing to be easily conveyed to the student.

This digital video analysis facility is poised above the Kapalua Village Course, showcasing a stunning panoramic view of the famed surfing spot of Honolua Bay, visible over gray-green geometrically sown fields of pineapple. The contrast of the surfers to the state of the art digital facility is mesmerizing. The best of both worlds. 



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<http://www.hightechmaui.com>

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