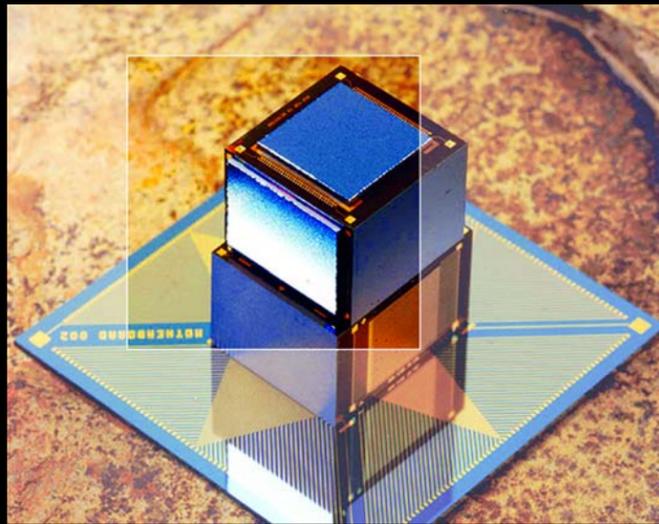


## Computing



*The whole of science is nothing more than  
a refinement of everyday thinking.*

*—Albert Einstein*



# ESO

**A** growing utility company operates a mixed fleet of more than 1,000 vehicles stocked with different sets of supplies and equipment. Its labor force contains both union employees and non-union contractors who operate with different rules and costs. The company needs to supply thousands of customers daily with new installations, maintenance, and repair. Here is a product that could help simplify this complex logistical situation.

**How It Helps:** Energy Service Optimization (ESO) software can help a company manage a mobile workforce more efficiently. It can reduce costs and improve efficiencies by 25 percent or more. It also can increase available resources, and improve response time, customer service, and customer satisfaction. This product can take into account more variables than competing tools and is easily customized to meet the special needs of customers. A flexible, modular solution, it provides the necessary tools to solve specific problems without overwhelming the user. The algorithms themselves originally were econometric and are therefore well-suited to the needs of the business world.

**How It Works:** To create the algorithms that drive the ESO software, researchers refined econometric models. Econometric models address the allocation of scarce resources, taking into account supply and demand, and are commonly used to set economic policy or make decisions on pricing, inventory, and production. As applied to service delivery, the software balances scarce resources and considers many critical factors—routing, appointment times, employee compensation plans, resource availability, skills, inventory, tasks, and customer preferences—to determine which staff member would best meet the demands of a given service call. This leads to more efficient staff deployment and service fulfillment.



**How Much It Will Cost:** The price for ESO software ranges from \$50 to \$200 per month per managed resource, and \$1,000 to \$4,000 per managed resource for a perpetual license. A managed resource is typically a field technician.

**When It Will Be Ready:** The software is now available. Leading companies in broadband, utilities, manufactured goods, and technology, such as Southern Union Gas, Time Warner Cable, BancTec, and John Deere, are using ESO software to optimize the economic performance of their service supply chain management operations.

**Who Is Working On It:** This product was developed by PointServe, Inc. Dr. G. Edward Powell founded PointServe in 1996 with the vision of applying economic optimization technology to service supply chain management. Today, PointServe is a full-service software company that offers management solutions and tools that increase capacity, improve customer service, and reduce costs. The company remains privately held and has received more than \$50 million in private investment. PointServe has approximately 40 employees and occupies about 10,000 square feet of office space in Austin, Texas, and several thousand square feet of data center space in Dallas, Texas. For more information, contact G. Edward Powell of PointServe at (512) 617-5300 or epowell@pointserve.com. The company Web site is [www.pointserve.com](http://www.pointserve.com).



**MDA Origins**

In 1988, Dr. Powell was a member of the technical staff at the Massachusetts Institute of Technology's Lincoln Laboratory, where he developed advanced forecasting, modeling, and simulation algorithms for autonomous satellite navigation. The algorithms were designed to allow BMDO's Midcourse Space Experiment satellite to control its own resources while optimizing observing time. These algorithms now represent the core of PointServe's ESO software solutions.





A building manager oversees hundreds of security cameras and electronic doorways. Unbeknownst to him, the flow of data to and from a critical network node stops. Fifteen minutes later, 10 cameras and 20 doorways shut down. Here is a product that could instantly alert the manager when a failure occurs.

## NodeWizard®

**How It Helps:** NodeWizard software monitors critical elements of a distributed network, allowing operators to identify problems and initiate repairs before any loss of service occurs. Unlike competing products, the software manages not just voice networks and high-speed data networks but also video networks. It can manage as many as eight networks, and each network can include as many as 256 nodes. A user-friendly graphical interface provides information to the network operator in a concise, easy-to-understand format containing topology, tabular, and shelf views of the network. Color-coded network summary information and simple drill-down navigation tools provide fast access to critical status information. And, with just a few mouse clicks, the operator can execute remote commands for provisioning and cross-connect configuration.



**How It Works:** The NodeWizard Element Manager software is a network management and communication tool that allows remote monitoring and control of a system's fiber-optic nodes. The software consists of a Windows®-based application that interfaces to one or more networks via a serial RS-232 or an Ethernet network link. Using fuzzy cognitive mapping (FCM) technology, it polls equipment transponder units in each node of a managed network. The status values are stored in a database on the NodeWizard server. Comparisons to alarm thresholds automatically trigger alarm notifications to the various displays. An alarm summary table provides an overview of all acknowledged and unacknowledged alarms, color-coded by severity. Alarms also can be sent via the Internet to higher-level network management systems using a simple network management protocol agent.



**How Much It Will Cost:** The cost of this software depends on the desired system architecture and the number of nodes to be managed.

**When It Will Be Ready:** The software is available now. Clients include a South American mining operation, which uses the system to monitor mining equipment and cameras. The system also would work well in industries such as telecommunication and cable television, in which companies must manage a network of devices scattered across many locations. In addition, the technology could help cable companies monitor the infrastructure needed to deliver movies-on-demand to subscribers' homes.

**Who Is Working On It:** IPITEK, the result of a merger in 1999 between TACAN Corporation and Tetra Tech Data Systems, developed this product. IPITEK produces optical networking solutions for broadband, digital transport, and network communications. Its products, aimed largely at communications companies, include fiber-optic systems and components, as well as other broadband communications products and advanced sensor equipment. The company also produces optical transceivers and components. IPITEK employs 175 people and occupies about 100,000 square feet of office space and lab/development facilities. For more information, contact Dr. James H. Bechtel of IPITEK at (760) 438-1010 or [jbechtel@ipitek.com](mailto:jbechtel@ipitek.com). The company Web site is [www.ipitek.com](http://www.ipitek.com).



**MDA Origins**

Through SBIR Phase I and II contracts between 1996 and 1998, BMDO funded the development of FCM technology through TACAN. FCMs have significant advantages over conventional expert systems for battle control and especially for digital network management. FCMs permit the synthesis of knowledge acquired from different sources and also allow adaptive refinement through supervised or unsupervised learning.





**A** brilliant orange butterfly lands on a child's hat. Using a video camera, his father captures the moment his son sees it—priceless. He wants to make a print of the moment to share with family and friends but the video footage is too grainy. Here is a product that can extract high-quality still images from video.

## Video Pics™

**How It Helps:** Operating on either a Macintosh® or Windows®-based computer, Video Pics software can extract clear, high-quality pictures from any video source, such as a camcorder, the Internet, or television. The software's algorithms are considerably faster and more flexible than methods based on traditional signal processing. Video Pics also can salvage otherwise unusable video images with its ability to zoom and motion-stabilize the video without any loss of detail. The only comparable product is offered by a Massachusetts Institute of Technology spin-off company, but it requires special hardware for use.

**How It Works:** The software uses proprietary algorithms to mimic how the human eye and brain operate together to process images. When people stare, their eyes capture several overlapping frames of an image and their brains construct a single, high-quality image based on these frames. Similarly, Video Pics software takes overlapping frames of video and produces a high-quality, still image with the sharpness and clarity of 35mm camera photos. The technology can increase the image's resolution so a shot can be reframed and magnified. Its still images can be used to produce 3,200 x 2,400 dpi printed images. Jitter, noise, and compression artifacts also are removed. Brightness can be adjusted without reducing image quality.



**How Much It Will Cost:** The price of the Video Pics software is \$199 for both Macintosh and Windows-based computers.

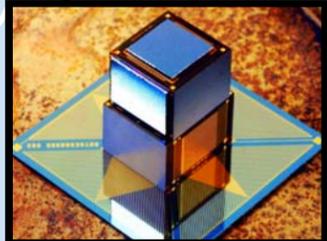
**When It Will Be Ready:** The software is available now. It has been sold to police and security forces for forensic applications, but has been most successful in the consumer market. The video editing applications are being targeted to professionals, and consumer software is aimed at facilitating e-commerce photo finishing of video frames.

**Who Is Working On It:** Irvine Sensors Corporation (ISC) developed this technology, and its subsidiary, RedHawk Vision, is commercializing it. RedHawk designs, develops, and produces imaging technologies and software. Founded in 1999, the company has since become affiliated with multiple software developers and established a forensic services unit for tapping the law enforcement market. RedHawk employs nine people and occupies 3,500 square feet of office space in Costa Mesa, California. For more information, contact John Carson of ISC at (714) 549-8211 or [jcarson@irvine-sensors.com](mailto:jcarson@irvine-sensors.com). RedHawk Vision's Web site is [www.redhawkvision.com](http://www.redhawkvision.com).



**MDA Origins**

Video Pics software stems from research performed for BMDO's SBIR program. In 1997 and 1998 under SBIR Phase I and II contracts, ISC investigated a new level of wiring density that could approach the interconnectivity of neurons in the human brain. This led to the development of a new algorithm that emulates the way a brain acquires and retrieves information. BMDO is interested in this technology to improve the speed and accuracy of sensing, discrimination, and systems control functions of ballistic missile defense systems.

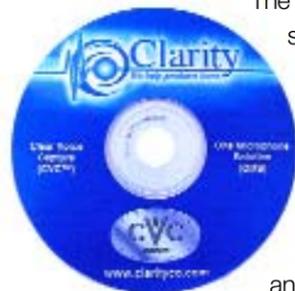




**A**utomobile manufacturers are giving voice to vehicle controls. But noise from other vehicles, the wind, the radio, and even the windshield wipers can degrade the quality of voice signals and the equipment's ability to process commands. Here is a product that could improve speech recognition in noisy automobiles.

## Clear Voice Capture™

**How It Helps:** Clear Voice Capture (CVC) software extracts voice signals of interest from noisy environments, improving the accuracy and performance of advanced voice interface systems.



The software emulates the 95 percent voice-recognition accuracy demonstrated in controlled laboratory experiments. Current technology can boast only a 65 percent voice recognition accuracy in a noisy vehicle. CVC software also improves voice quality, especially in noisy environments. For communications networks, it optimizes bandwidth by eliminating noise before transmission. It also improves battery life by as much as 20 percent in voice-recognition-based mobile devices such as personal digital assistants, cell phones, and Internet appliances. Implementation costs are low.

**How It Works:** CVC software reverses current noise-canceling solutions, which eliminate the low and high frequencies, leaving a mid-level frequency that includes voices and other noise clutter. CVC instead captures and isolates the voice sound using two microphones and mathematical algorithms. The software compares the voice data from each microphone, filters out sounds that do not match, enhances the voice signals, and sends them to a receiver. Voice then can be clearly transmitted to a voice-controlled instrument panel in a car so the driver's command can be understood.



**How Much It Will Cost:** The price of the commercial software license ranges from \$0.50 to \$5, based on quantity. A development/evaluation kit costs \$149.

**When It Will Be Ready:** The software is available now. It is being used in hands-free car kits, cell phones, microphones, wearable personal communications systems, hearing aids, and motor homes to improve the quality and accuracy of voice-based interfaces in demanding, noise-filled environments. Companies using CVC in their products include GE, Peiker, Texas Instruments, RTI, Hitachi, THB, and OnStar RiverPark. Many of these companies also co-market CVC technology to their customers. An audio-visual enhancement that could further increase speech recognition accuracy also is being developed.

**Who Is Working On It:** Clarity, LLC, has licensed and is commercializing the CVC technology. Founded in 1993, Clarity specializes in developing proprietary software products that improve the quality and performance of voice-based products. The company currently employs 21 people and is headquartered in Troy, Michigan, with offices in Campbell, California. Clarity is a spinoff of IC Tech, Inc., the developer and licensor of the technology. For more information, contact Dr. Gail Erten of IC Tech at (517) 349-9000 or erten@ic-tech.com. IC Tech and Clarity's Web sites are [www.ic-tech.com](http://www.ic-tech.com) and [www.clarityco.com](http://www.clarityco.com), respectively.




**MDA Origins**

IC Tech developed the mathematical algorithms for CVC under BMDO SBIR Phase I and II contracts in 1997. This technology originally was designed to increase the robustness and sophistication of microphones used in battle management, command, control, and communications systems. For example, it could be used to eliminate digitized noise before transmission, thereby optimizing bandwidth in communications networks.

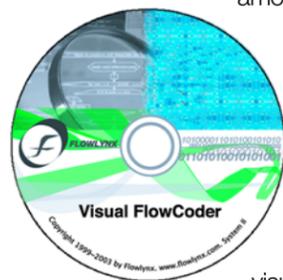




**I**n 1999, a major candy maker suffered a 12 percent loss in its revenues—approximately \$200 million—due to a software glitch. This problem could have been averted through systematic, consistent, and regular peer review and inspection of the software code during its development. But few software developers today conduct this sort of review because it increases development time and cost. Here is a product that could make code review and inspection easier and less costly.

## Visual FlowCoder™

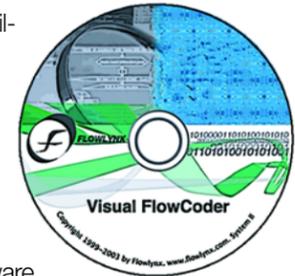
**How It Helps:** Visual FlowCoder software is designed for programmers and their managers. It automatically builds a graphical code inspection system that can reduce overall project cost and time by 50 to 80 percent. In addition, developers can reduce the number of defects in shipped software by up to 50 percent. Another advantage is that Visual FlowCoder can help detect computer viruses and back doors, improving system security. The software visually documents the code so anyone can understand it. It also supports any amount of code written in any programming language.



**How It Works:** The product is made of various "intelligent" software agents (small programs dedicated to executing specific tasks) that scan the code on a server. These agents provide useful feedback about potential defects, track the state of a software project, and even automate the porting of code between languages. Using data gathered by the agents, the software creates a visual summary where procedures, functions, and other routines are flowcharted based on the algorithmic flow of the code. This flowcharting tool allows programmers and managers to easily review the functional flow of the code and inspect it in a collaborative environment.

**How Much It Will Cost:** For one-seat minimal support, the price of the software is about \$2,000. For a 25-seat enterprise server and tools plus additional training, the cost is approximately \$60,000. Extended software training and implementation are available at \$1,800 per day.

**When It Will Be Ready:** Visual FlowCoder software is available now for Windows® 95, 98, 2000, and NT, as well as Unix/Linux. There are more than 50 licensed commercial and government users, including Chase Manhattan Bank, Lockheed Martin, NASA, and Raytheon.



**Who Is Working On It:** This product was developed by FlowLynx, Inc., which was founded in 1992 as Ublige Software and Robotics Corporation to develop advanced artificial intelligence hardware and software. In 1998, Ublige was renamed FlowLynx to reflect a new emphasis on flowcharting technology. Today, the company provides a full range of software development services, and its main competence is state-of-the-art re-engineering and management tools for the software development life cycle. It employs four people and occupies about 3,000 square feet of office space in Huntsville, Alabama. For more information, contact Luis Lopez of FlowLynx at (714) 389-9493 or luis@flowlynx.com. The company Web site is [www.flowlynx.com](http://www.flowlynx.com).



**MDA Origins**

Visual FlowCoder software was developed through BMDO SBIR research conducted by Ublige from 1997 to 1999. Under a 1997 Phase I contract, the company determined the feasibility of building intelligent software agents that could analyze source code and map the flow of a large software system. Under a 1998 Phase II contract, it developed prototype software, including new tools enabling users to visualize the flowcoding process. BMDO invested in this technology to improve the quality and maintenance of critical software used in ballistic missile defense applications.

