

CES boosts auto integration

Consumer desires to bring the entertainment, information, and convenience of their daily lives into their automobiles are changing the way the automotive and aftermarket industries do business. The integration and compatibility of the in-



Volkswagen is working with Google and nVidia to create more realistic, 3-D, in-car navigation.



XM Satellite Radio's Advanced Services concept vehicle integrates in-car video, voice command, weather alerts, and a parking space locator.

creasing number of consumer electronics devices being brought into vehicles is a hot new battleground in the design of new vehicles and their systems. Engineers from aftermarket and OEM companies are looking to develop the next killer application designed to compete for consumer's attention, which is driving trade shows such as the International Consumer Electronics Show (CES) to focus more on the automotive community. This year's event, held this past January in Las Vegas, continued the trend of greater automotive activity, primarily in the areas of navigation and entertainment.

Volkswagen of America and **Google** led the charge for vehicle navigation innovation. Working with chipmaker **nVidia**, they are looking to create a system and display that adds three-dimensional aspects beyond anything currently available. Occupants will be able to recognize where they are in relation to the surrounding topography, especially in urban areas, that is depicted with accurate depth and size relationships.

Volkswagen's Electronic Research Laboratory (ERL) in Palo Alto, CA, together with Google and nVidia, is working on other advancements including automatic personalized content updates for vehicle navigation. Highlights of Volkswagen's prototype vehicle include a vehicle-centric touchscreen interface to Google Earth with advanced graphics, accurate 3-D maps, and real-time traffic updates and routing. The open system uses the Web to maintain a dynamic database of current information on points of interest (restaurants, fuel stations, etc.) that can be overlaid onto the system's 3-D map. The increasing accuracy of GPS, dead-reckoning, and laser-radar imaging, as well as ever-improving car-to-infrastructure communication, means the technology could be available in showrooms sooner than expected, say the partners.

Another interesting concept vehicle shown by **XM Satellite Radio** features in-car video, voice command, weather alerts, parking space locator, and other innovations. The Advanced Services vehicle is based on a 2006 **Lexus LX 470** showcasing in-car video by XM partner **On2 Technologies**. Video content can be either streamed live or stored for later playback. The solution uses On2 VP7 video-compression technology to ensure the best quality video at low data rates.

VoiceBox Technologies helped XM develop advanced voice-recognition technologies to allow control of the XM radio. VoiceBox's Navigator Platform enables conversational control of media and navigation of digital content from a mobile device or IP network. The platform's speech-recognition algorithms are designed to determine the context and in-



Visteon will provide Nintendo Game Boy Advance integration to its next-generation Dockable Family Entertainment System.

tent from conversational speech, enabling consumers to speak in free-form language. The platform runs on various embedded, desktop, and server systems for applications such as music and media, navigation and driving directions, directory and hands-free dialing, and control over digital devices.

For instance, the driver can ask to hear a certain kind of music, such as jazz, and VoiceBox will ask which of XM's five jazz channels the driver would like to hear and change the channel without the driver's hands ever leaving the steering wheel. The technology is part of a new multi-year partnership between XM and VoiceBox to deliver a voice-enabled XM Radio platform to automakers and the aftermarket.

Other Advanced Services vehicle technologies include WeatherLink, which delivers advanced warning of weather-related driving conditions in real time. Developed with **WxWorx**, it uses the same technology behind XM's WX Satellite Weather service for marine and aviation.

In conjunction with **Nu-Metrics** and **InfoGation**, XM demonstrated its ParkingLink capability concept, which works with the car's navigation system to find available parking spots. The system shows the number of spaces available at designated parking facilities on the vehicle's navigation map, using color-keyed icons to indicate the percentage availability of each facility.

Delphi has also been busy on the satellite radio front. It has won a substantial portion of the satellite receiver business

for **Hyundai** Motor America, supplying XM Satellite Radio-capable receivers for the Santa Fe, Azera, and Elantra. This will help enable Hyundai to be the first automaker to add standard satellite radio to its full vehicle lineup.

Delphi will be the technology provider for **ONDAS Media SA**, which expects to launch in Europe a subscription-based 150-channel satellite radio service in 2009 as well as digital telematics and data services. Delphi will design and manufacture satellite terminals, OEM receivers, and portable electronics equipment capable of receiving the satellite audio, video, and data information from ONDAS.

The rapid acceptance of digital music and entertainment in the car has created "a tremendous need for robust and media-rich software systems to power this new generation of in-car radios and entertainment systems," said Andrew Poliak, Automotive Alliances Manager for **QNX Software Systems**. So the company worked with **All Media Guide** (AMG) to demonstrate technology that helps to link the digital entertainment to the automobile through digital and hard-drive radios.

Using the QNX Neutrino real-time operating system, AMG's Lasso embedded software can search the table of contents files contained in a CD or digital music file. Through the QNX Photon microGUI windowing system, Lasso can then display data ranging from artist, song title, and musical genre to lists of similar albums and Web links for cover art. The demonstration is built on the **Freescale** MPC5200 processor.

Tier 1s are already using the combination of QNX's operating system and AMG's media-recognition capabilities. In addition to managing user-playback information, new in-car systems will build playlists based on criteria defined by the consumer, or by recognizing music patterns and preferences. These capabilities were demonstrated at the Delphi booth during CES.

To keep up with consumer electronics applications as they evolve, **Texas Instruments** (TI) announced high-speed encoding (HSE) application software and hardware based on its Aureus platform of audio digital signal processors (DSPs). The new functionality will enable advanced capabilities for automotive applications such as "jukeboxes" and navigation systems.

High-speed encoding is a key differentiating feature for automotive as well as audio equipment. The TI solution quickly rips and stores content from a CD, while simultaneously playing it back. This creates new product features including automatic storage of content on a jukebox anytime a new CD is inserted. For instance, a 60-min audio CD can be ripped to storage in about 3 min using the ATRAC-3 encoder. System cost savings are enabled through software support of new interfaces to the Aureus DSPs. The direct interaction of Aureus DSPs with other system components, such as a CD loader or HDD, eliminates the need for an external microcontroller unit (MCU) to manage these interfaces, resulting in an overall smaller box and lower system cost.

Research conducted by **Visteon** indicates that video gaming ranks as one of the most desirable in-car entertainment alternatives (along with DVD movies and audio compact discs). So the company will provide **Nintendo** Game Boy Advance integration to its next-generation Dockable Family Entertainment System for in-car video and gaming for virtually any passenger vehicle. The Visteon system includes a low-profile docking platform installed within the vehicle's headliner and integrates with existing audio equipment. Its 2.5-lb (1.1-kg) flip-down media player, which features a 10.2-in screen, can be undocked for use outside the vehicle. The new system comes with a unique wireless game controller and also allows users to compete with one another by plugging a handheld

Game Boy Advance unit into the media player's game link cable.

Digital radio seems to finally be catching on, providing the companies developing the technology much needed good news. Many HD Radio receiver products were shown by **iBiquity Digital** and its partners. The recently announced formation of the HD Digital Radio Alliance should help build consumer interest. "There are more than 600 AM and FM

stations broadcasting digital HD Radio signals today, and we expect that number to double next year," said Robert Struble, President and CEO of iBiquity Digital.

HD Radio technology transmits digital audio and data alongside existing AM and FM analog signals, allowing listeners with HD Radio-compatible receivers to enjoy CD-quality sound, while virtually eliminating the static and hiss often associated with analog radio. Beyond deliver-

ing enhanced sound, the technology provides a platform for advanced new services, including scrolling text on receiver displays (artist names, song titles, weather forecasts, etc.); delivery of real-time traffic updates to vehicles; and multicasting—a feature that allows FM stations to broadcast up to eight digital streams of programming over a single frequency and in addition to existing analog signals.

Kevin Jost

Quality for programming survival

Offshoring of high-paying jobs to low-cost countries has been going on since the start of the industrial revolution. The latest casualty would appear to be the embedded programming industry, which is under attack from the aggressive training of software development skills in emerging markets. A programmer in India, China, or Russia now costs about one-quarter of what an American, European, or Japanese programmer costs. It would appear that

there is little to prevent all programming jobs being sent offshore.

But some individuals and companies have not given up hope that there is still a future for programmers in the Western world. There is a gradually emerging trend in manufacturing indicating that sound investment in technology and automation can produce significantly higher quality than hordes of low-cost workers, and the goods are produced close to the

end markets, saving considerable transportation costs and time. Production speed is often significantly improved, and the latest knowledge and technical skills are maintained internally.

In the software industry, transportation is rarely an issue due to instantaneous electronic communications around the world. But quality is a very big issue, together with intellectual property, and **Green Hills Software** offers a solution

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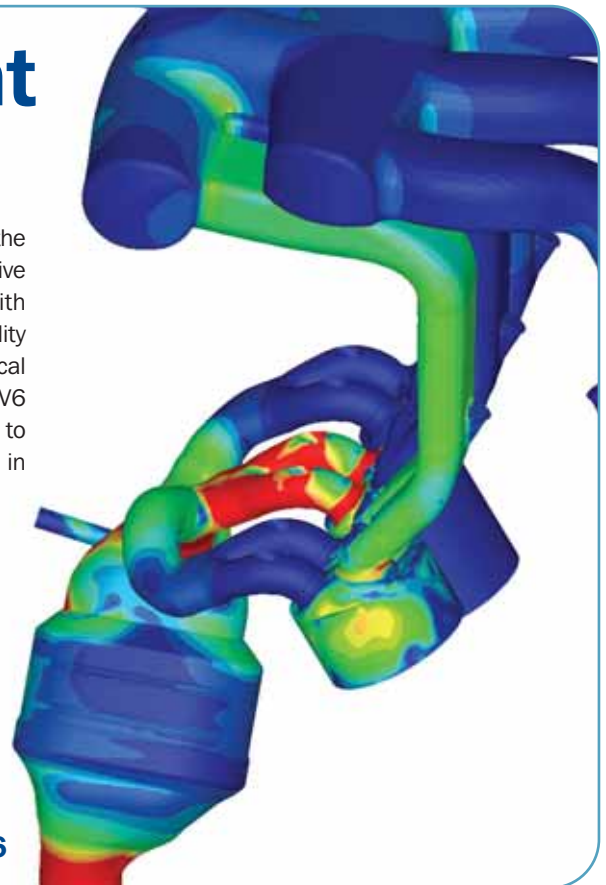
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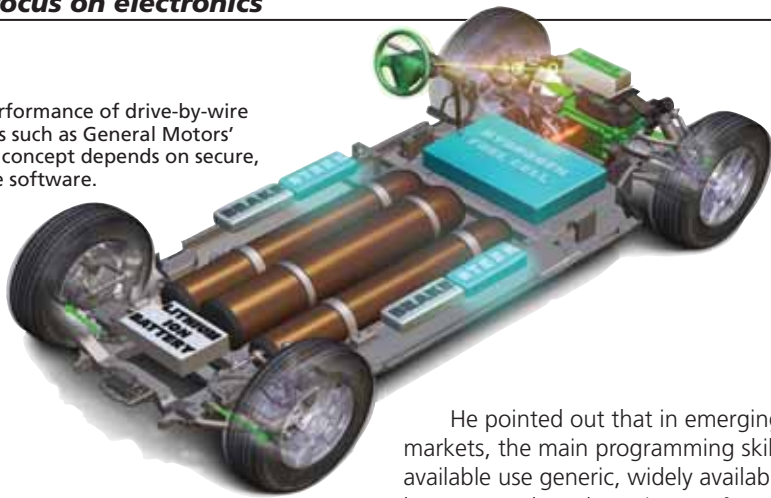
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The performance of drive-by-wire vehicles such as General Motors' Sequel concept depends on secure, reliable software.



for companies who want to distinguish themselves in their own markets.

"There are two business strategies for making money—[focus on] quantity or quality," said Dan O'Dowd, Founder and CEO of Green Hills Software. "You can make a low-cost product that basically works and sell it in large volume. Or you can do something that nobody else does at high quality and charge a higher price."

Trying to compete in the high-volume, low-cost programming market with emerging-market companies is not practical, as demonstrated over the last few years by companies such as **Sun**, **HP**, and **IBM**, who have all opened software development facilities overseas in countries such as India, China, Russia, and Brazil. Green Hills has built its business on high-quality products, and it encourages American, European, and Japanese businesses to follow its lead.

"To be able to maintain a high-paying programming job, you must be able to do something that a third-world programmer can't do," said O'Dowd.

He pointed out that in emerging markets, the main programming skills available use generic, widely available, low-cost tools such as Linux, **Microsoft** Windows, and Visual C++. Even promoters of Windows and Linux say it is impossible to write programs that do not fail or cannot be broken into. But at **Boeing**, **Airbus**, and **Lockheed**, thousands of programmers use Green Hills tools to write huge programs that actually fly aircraft such as the 787, A380, and F-35. Software controls the flight systems under directions from the pilot, as the latest aircraft designs have no mechanical connection between the pilot and the flight controls. No crash has ever been traced to a software failure.

The **National Security Agency** and **Department of Defense** have used MULTI and INTEGRITY tools from Green Hills to develop many top secret cryptographic and weapons systems that no one can break into, creating immunity from attack through methods such as viruses, worms, Trojan horses, and spyware. For the latest military technology—the unmanned combat aircraft—security is absolutely vital. And it is only possible using software that has been developed

from the ground up to be secure.

Other benefits of using the Green Hills suite of software include a single operating system that can run on processors from PDAs to multiprocessor servers; coding techniques that either improve run-time performance or allow equivalent performance on lower-cost processors; and reduced development time getting new features to market.

Programming on aerospace and defense projects by necessity must stay in this country, but the advantages of using the same tools extend to many other industries. Every product benefits from reliability. And with the wider availability of Internet connections into everyday life, secure applications are vital. For example, as more features in automobiles become drive-by-wire, the last thing a driver wants is for a hacker to get into the system. There is a very large potential market for companies that want to develop high-quality products to employ superior programmers and keep their technology secrets in house.

"Investing in new technology is our one advantage over third-world countries," said O'Dowd. "Their advantage is low costs, so it doesn't make sense for them to invest in premium tools. We can afford to invest more to make our workers more productive."

And as well as keeping jobs, the intellectual property and corporate knowledge is kept in this country to build on in the future.

David Alexander

International focus on electronics reliability



Developers of the Robustness Validation standard come from all over the world.

Electronics have become central to automotive design, prompting an international agreement that will help automakers better predict component failures. **SAE International**, **Japan SAE**, and **ZVEI**, the German Electrical and Electronic Manufacturers' Association, are working with **Automotive Electronics Council** (AEC) members to develop the Robustness Validation standard that will form the basis of risk analysis for semiconductors.

When it is completed, developers feel the international standard will have broad impact on the industry, providing an up-to-date specification to replace procedures developed at the start of the digital revolution.

"This new procedure will become the successor to the present AECQ100 qualification procedure, which dates back to the 1970s, but technology has changed," said Helmut Keller, Chairman of the Robustness Validation Committee. He noted that representatives from many countries are involved in this global effort, operating under the auspices of the four societies.

The Robustness Validation standard should aid in discovering the physical limits of semiconductors, increasing the quality and reliability of automotive electronic systems, and lowering warranty costs. That should ensure broad usage once it is completed. "Robustness validation aimed at promoting improvement in reliability,

reduction in development costs, and reduction of development times is a topic of enormous interest to those working in the automotive electronic component field in Japan," said a JSAE spokesman.

Bob Knoell, founding member of the AEC, noted that augmenting the existing AEC-Q specs with the Robustness Validation standard will create documentation that can be used together "to provide the desired improvements in quality and reliability assurance."

To date, most reliability data come from simply burning a part in until it fails. The consortium plans to develop guidelines for testing parts to see when and how chips fail when used in different environments such as under hood or inside the cabin.

Many observers feel it is necessary to keep electronics from becoming a problem area. "I think we have to go this way to keep reliability of products on a stable level," said Roger Rickey, Secretary of SAE Electronics Reliability Subcommittee.

In practice, the standard will give designers information on various devices, detailing the length of lifetime in a given environment, with information about why failures occur. That gives engineers more options.

"If you want to prevent failures, you have to know their root cause. When you know the likelihood of failure, you can design around the part so it won't fail, or you may decide to use something else," said Caroline E. Michaels, SAE Staff Engineer.

A ZVEI white paper written by Andreas Preussger, Director at **Infineon Technologies** AG, details the reasons that older quality and reliability testing has become insufficient, while also describing alternative solutions. The document notes that the qualification methodology called Robustness Validation includes risk and opportunity assessment or knowledge-based qualification, failure-mechanism-specific qualification, and application-specific qualification.

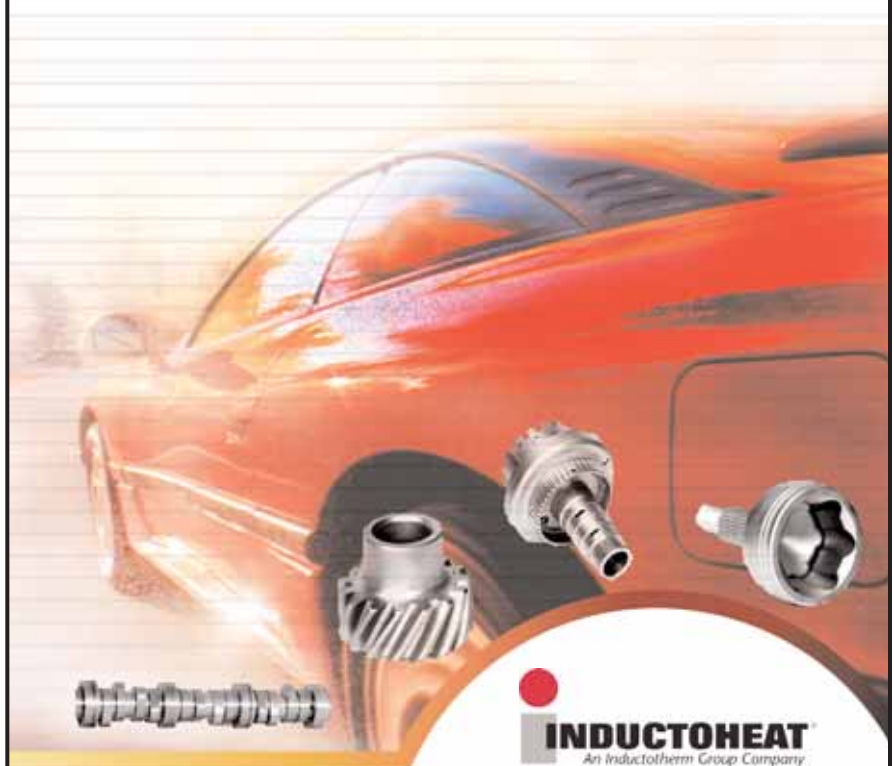
The ZVEI document notes that the research work and testing "intentionally drives electronic structures to end-of-life and thus highlights where the cliffs are. That knowledge gives directions for what a technology can be used, to which load of safe operation it can be stressed before certain failure levels are reached but not exceeded, yet, or where additional robustness has to be built-in."

"Responsible risk management is becoming a crucial topic," Preussger added. "Reliability problems have to be known before products are designed. Robustness validation is one of the key strategies to overcome the problems and challenges that might arise with the new technologies and next-generation products."

The standards group, which began meeting last fall, will present its goals and reasons for developing the standard at the SAE World Congress in Detroit in April. They will also describe some preliminary work and provide estimates for delivery dates of different aspects of the standard.

Terry Costlow

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