Java—Few Auto Applications, Yet

Way back in 2000, when telematics was all the rage, top electrical engineers from Toyota, GM, Ford, DaimlerChrysler, BMW and Honda all told me that they would probably employ Java application programming interfaces in production vehicles by 2007 or sooner. With model year 2005 underway, only two carmakers so far have production applications where Java is a factor: BMW, with a navigation and infotainment system on 1, 5, and 6 series vehicles, and Hyundai, with a Java telematics platform on Hyundai and Kia vehicles that accesses the Mozen telematics service in South Korea. The BMW Java-based navigation and infotainment platform comes from Siemens VDO Automotive, Volkswagen and Porsche are expected to introduce infotainment systems from Siemens VDO with Java in the near future. Siemens VDO first introduced a Java-based software platform called Top Level Architecture in 2001. The TLA-based system developed for BMW makes use of a Java virtual machine with more than 6,000 Java classes, plus various pieces of native code. (Class is the basic unit of object-orientation in Java, the object's blueprint.)

Siemens VDO demonstrated the system on a BMW 6 at the JavaOne conference in June 2004. Roland Busch, CEO of the Infotainment Solutions division at Siemens VDO Automotive, pointed out that the TLA Java platform can easily accommodate a feature where the driver could use his cell phone "to avoid the oven effect when you enter your car." Describing another potential application he said, "In a server-based scenario, we can imagine a new way of sightseeing. From your travel agency you will be able to buy a package that includes a car rental and a● AUTOSAR Benefits to Carmakers

- Application software modules, basic software and the electronics control units could be designed independently with confidence that assembled elements will work together.
- ECUs and software could be reused—no need to reengineer what already works.
- Standard software architecture will lead to greater productivity and quality.
- Distributed computing: A software module could be run from any capable ECU that's connected to a vehicle network. Minimizes the number of ECUs per vehicle.
- ECUs and basic software will be less expensive.
- With many features and networking, software is getting complex and difficult to control. AUTOSAR would bring order to the complexity.
- AUTOSAR specifications will lead to a seamless tool chain.
- Instead of working on what is transparent to drivers, carmakers could devote themselves to developing software that distinguishes their cars from the competition.
Yano Research Forecasts Japanese Vehicle Security Market

In a report published in March 2004, Yano Research Institute (Tokyo, Japan) estimated the Japanese market for car theft alarms and engine immobilizers will reach ¥24 billion ($216 million) this year. According to Yano Research, engine immobilizers will become mandatory beginning in 2008 and will be installed in every new vehicle sold in Japan by 2010, boosting the market for vehicle security equipment to ¥71.8 billion ($645 million) by the end of the decade. The 145-page report is available (in Japanese language only) for ¥165,000 ($1,482). Telephone 81 3 5371 6901 or e-mail customer service@yano.co.jp for more information.

Suppliers’ Benefits Not So Well Defined

While the main beneficiaries of AUTOSAR are the carmakers, whose hardware and software engineering costs would be greatly reduced, suppliers can also benefit. Since ECU’s and basic infrastructure software can be used by more than just one carmaker, suppliers would gain economies of scale.

But dramatically lowering the cost to develop and produce high-quality electronics systems won’t necessarily be a boon to automotive electronics and software suppliers. Not only will the price of standard ECU’s and software come down, but as ECU’s and software are increasingly reused, fewer customized versions of software and hardware will be needed. However, citing their belief that 90% or more of all new automotive features will involve electronics or electrical parts, AUTOSAR planners suggest there will be plenty of development work for suppliers to do in the coming years.

Suppliers should anticipate increased competition, including pressure from new entrants in automotive. As long as AUTOSAR standards are followed, any credible supplier can go after new business. Competitive pressures will intensify, leading to the likely commoditization of ECUs and basic infrastructure software. Those who don’t develop a strategy to deal with the likely effects of AUTOSAR could be squeezed out of the market.

Global Backing May Speed Adoption

Much of the impetus for AUTOSAR came from Mercedes and BMW engineers. Because their cars are so loaded with electronics functions, many of which are interrelated by connections to multiple data networks, the German carmakers needed to better manage the complexity of their E/E systems. That complexity has correlated with poor E/E quality in recent years. AUTOSAR’s standard architecture will bring order to complex E/E systems, and should improve the quality and reliability of sophisticated networked vehicle systems.

When the consortium was first announced to the public in July 2003, there were six core partners, all German: BMW, DaimlerChrysler, Volkswagen, Siemens VDO, Continental and Bosch. Since then Ford, PSA, Peugeot Citroen and Toyota have joined as core partners. Core partners make technical contributions and exercise technical and administrative control over the work. Operating on a consensus basis, each core partner has veto power. Twenty-seven premium members have also chosen to participate in AUTOSAR including Delphi, Denso, Honda, Infineon, Mazda, NEC, Nissans, Renesas, Valeo, Visteon and Volvo.

JASPAR

On September 8, 2004, the Japan Automotive Software Platform and Architecture (JASPAR) collaboration was established to help create and promote standards for software architecture and onboard communications networks. JASPAR intends to contribute technical support to both AUTOSAR and FlexRay. Nissan and Toyota signed on as founding members. In early October, Honda announced its intention to join the consortium. Additional members are expected to join including carmakers, and companies that make electronics parts, semiconductors, wire harnesses, development tools and software.

While JASPAR officials publicly state their support for AUTOSAR, JASPAR will give weight to a Japanese point of view as decisions about AUTOSAR are negotiated. Currently AUTOSAR has nine voting core members, five of whom are German and only one that is Japanese, Toyota. Nissan and Honda have non-voting, premium memberships in AUTOSAR.
AUTOSAR has definitely won global participation. Premium members lead and participate in working groups, make technical contributions and have access to current information.

General Motors has told The Hansen Report that it will join AUTOSAR as a core partner, having overcome some legal and tax hurdles that had been obstacles in the past. AUTOSAR has been unwilling to comment on the status of GM’s pending membership. GM has been developing its own common electrical architecture and would be an important contributor to the partnership.

Software reusability is not a new concept to the auto industry. Six years ago, the Automotive Multimedia Interface Collaboration (AM-I-C) began promoting the same concept. AM-I-C was supported by many of the same companies who are now part of AUTOSAR but lost the support of the German carmakers after two years of legal wrangling, overly complicated decision-making processes and little progress in creating standards. AM-I-C’s budget has been scaled back dramatically to just $350,000 by 2006.

While AM-I-C has done a lot of good work, some of which will eventually be applied to Bluetooth, multimedia and telematics systems, carmakers have not yet actually applied AM-I-C specifications to production vehicles.

In contrast, BMW and Honda have already promised to put AUTOSAR specifications into production vehicles by 2008. We asked Dr. H. Heinecke how AUTOSAR expects to get specs into production so fast. “When each partner or member joined we made it clear what assets [and expertise] each company must bring and what projects they will work on,” he said. “We must make certain that we have the right people for the right tasks.”

The project plan was written in May 2003. By September 2004 the AUTOSAR concept and first specification was created and its feasibility accepted. The partnership expects to test and verify AUTOSAR specs in an automotive application by August 2006. AUTOSAR membership comprises not only carmakers and tier-one suppliers, but also software development tool makers, standard software houses and semiconductor suppliers.

It’s not certain that AUTOSAR will meet its tight schedule. Electronics development, especially the development of standard specifications, always takes significantly longer than expected. Even less certain is how quickly an AUTOSAR standard will take hold in the market. AUTOSAR will not change the market dynamics unless it is widely adopted, and that could take a decade or longer. Carmakers aren’t likely to specify AUTOSAR ECUs until vehicle complexity and market economics push them to. AUTOSAR-compliant ECUs and software will initially be more expensive because they must satisfy a range of applications. The AUTOSAR standard won’t be widely adopted until those components are less expensive than the customized, stripped-down ECUs and software that carmakers buy today.

Continued from page 2

downloadable trip. The GPS navigation system will guide you along a scenic route and play back multimedia descriptions of points of interest as you drive.” Drivers could also download horn tones from the Internet much the same way they download ring tones to their cell phones. According to Siemens VDO, in the future, car owners could add backseat entertainment to a system in much the same way a personal computer owner installs a new peripheral device. Third parties could easily develop such applications, as long as the Java language is used. Siemens VDO is a Sun Microsystems Java licensee.

According to Lew Whitacre, a technical analyst with IBM, an IBM J9 Java virtual machine has been in production since the end of 2003 in a Hyundai embedded telematics platform that delivers services provided by M ozen. Established by LG Telecom and Hyundai Motors, M ozen telematics services are available in the Hyundai EF Sonata and Grandeur XG vehicles. Hyundai plans to expand the number of telematics-equipped models by the end of 2004.

A ny Java virtual machine needs to run on an operating system, and one real-time OS developer making headway in the automotive sector is QNX. A co ording to Andrew Poliak, automotive segment manager for QNX, H yundai is currently using the QNX RTOS in its embedded telematics platform. QNX is also working closely with H yundai M obis, a major player in Korean telematics. Korean tier-one supplier L G E lectronics will use QNX’s N eutrino RTOS in a next generation telematics system for GM in North America, according to a QNX press release.

In 2000 OnStar and Sun Microsystems were working hard to develop Java A PI s (application programming interfaces) that could be used in the embedded OnStar platform to broaden the range of services that could be offered, including downloadable applications.

Java Not Going Away

The promise of Java, “Write once, run anywhere,” meant that with the right Java A PI , automotive developers were not tied to a particular microprocessor or operating system. Java could be mixed with native languages. Carmakers would benefit from plentiful Java development tools and from a large community of software programmers well-versed in the Java language. But the promise of Java in automotive dimmed along with the promise of telematics. Both are taking much longer to gain traction than most industry watchers anticipated.

QNX’s Mr. Poliak believes the driving force behind more widespread adoption of Java will come from the carmakers, and he definitely sees a renewed interest in the
The Company Profile...Lear Corp.

**Thumbnail Sketch**

- **2003 Sales**: $15,746.7 million
- **2003 Electronic and Electrical Sales**: $2,185.6 million
- **Major Products**: Seating, interiors and electrical distribution systems
- **Top Customers**: In 2003 General Motors accounted for 36% of sales; Ford, 24%; DaimlerChrysler, 11%
- **R&D**: 1.1% of sales
- **2003 Net Margin**: 2.4%
- **2003 Net Cash from Consolidated Operations**: $586.3 million
- **Working Capital**: Minus $591 million, as of July 3, 2004
- **Stockholders' Equity**: $2,433.7 million, as of July 3, 2004
- **Market Capitalization**: $3.8 billion (24% of 2003 sales), as of July 8, 2004
- **Employees**: 111,022 as of December 31, 2003
- **Sales per Employee**: $141,834

**Background**

The corporate motto “Advance Relentlessly” aptly describes Lear’s transition from a small Detroit seat frame supplier, founded in 1917 as American Metal Products, to a global supplier of complete vehicle interiors ranked 129 on the Fortune 500 list today. With 111,000 employees at 289 facilities in 34 countries, Lear supplies auto parts for over 300 models worldwide.

American Metal Products was acquired in 1966 by Lear Siegler, a conglomerate of automotive and aerospace companies. The seat frame businesses prospered, but not the aerospace segment. Lear Siegler was bought out in 1986 by the investment firm Forstmann Little. The following year the investors sold the Lear Seating business to its management, among them Ken Way, who after 37 years with Lear, retired as chairman in 2002. Lear went public on the New York Stock Exchange in 1994.

Lear sales have grown from $4.7 billion in 1995 to $15.7 billion in 2003, a growth rate of 16.3% per year. Net income increased 19.5% per year during that period, from $91.6 million to $380.5 million.

Sixty percent of Lear’s sales growth since 1994 has come from acquisitions, the rest from organic growth. Since 1994 Lear has made 18 major acquisitions, including the May 1999 purchase of United Technologies Automotive, a company that produced sales of $3 billion in 1998: 56% from electrical distribution systems (wiring harnesses, mostly), 19% from interior trim products, 12% from motors, 7% from switches and 7% from remote keyless entry systems and body controllers. Lear sold the motors business shortly after completing the acquisition.

Today Lear’s electronic and electronics sales come primarily from wiring harnesses. Lear claims a 14% share of the North American market for electrical distribution systems, ranked third behind Delphi and Yazaki. Lear also claims a number-three ranking and a 14% share of the electrical distribution systems market in Western Europe.

Lear acquired junction-box-, terminal- and connector-maker Grote & Hartmann on July 5, 2004 for $160 million, which includes $86 million in assumed debt. Based in Wuppertal, Germany, Grote & Hartmann produced sales of €225 million ($276 million) in 2003 and was well-positioned to serve Volkswagen and Mercedes. “Grote & Hartmann serves European OEMs, which give us an opportunity to strengthen our position in the region,” said Len Tedesco, Lear vice president in charge of North American electronics engineering. “It also enhances our ability to manufacture terminals and connectors in high volume while keeping costs in line.”

Indicative of its lean operations outlook, since 1999 the number of Lear employees has shrunk 2.1% per year to 111,022 at year-end 2003. Likewise, the number of Lear facilities has been scaled down from 330 in 1999 to 289 at year-end 2003.

Seventy-one percent of Lear sales in 2003 were to Detroit carmakers, who risk losing more of the market to Japanese competitors. Production cuts by the Big Three this year could easily slow Lear’s growth. A corning to company literature, Lear intends to grow its market share in Europe and aggressively expand its pres-
growth, strong cash flow in each operating segment and a high return on invested capital. For the trailing 12-month period ending in Q-4, 2003, Lear showed a 10.6% return on invested capital. Lear defines ROIC as income before restructuring charges, amortization, interest, other expense and income taxes multiplied by (1 minus effective tax rate) divided by average invested capital. In 2003, return on assets was just 4.4%, based on year-end assets of $8,571 million.

With current liabilities significantly exceeding current assets, Lear's balance sheet showed a working capital deficit of $591.1 million as of July 3, 2004, the end of the second quarter. Lear says that its net debt to capital ratio improved to 45.8% at year-end 2003, its lowest level in 10 years. Lear defines net debt as total debt plus utilization of their ABS (asset-backed securitization) facility, less cash and cash equivalents.

Standard & Poor's gives Lear a BBB-/Stable credit rating. BBB- is the lowest rating before non-investment or junk bond rating. Stable indicates the rating is unlikely to change.

In 2003, Lear spent just 1.1% of sales on R&D compared with competitor Johnson Controls Inc., which spent 4.1% of sales on R&D in 2003.

Electronic and Electrical Business Rely on Growth

Following its May 1999 acquisition of UT Automotive, Lear organized the electrical and electronics part of that business into the Lear Electrical and Electronics Division, or LEED. One year after the acquisition, Ken Way, chairman and CEO of Lear at the time, was very high on electronics. In a May 2000 press release he said, “Our electronics business continues to be one of Lear’s fastest-growing areas and to support this growth we’ve increased R&D spending, expanded our technical staff and invested to upgrade the LEED Product Development Center in Dearborn, Michigan.” Unfortunately those investments didn’t produce any growth; E/E sales declined from $2.2 billion in 2000 to $1.9 billion in 2001 and only recovered to $2.2 billion in 2003.

Wiring harnesses and junction boxes accounted for 80% of LEED sales in 2000; electronics accounted for just 10%. Lear would not provide a sales breakdown of its E/E sales for 2003. Today Lear’s primary E/E products are still wiring harnesses and junction boxes. The company also makes connectors, terminals, switches, remote keyless entry systems, body controllers, audio amplifiers and TV tuners. Electrical and electronics produced 14% of total Lear sales last year, compared with 16% of total sales in 2000.

While Lear will continue to report combined sales for its electrical and electronics products, the company in July 2004 placed the business entity under the control of Lou Salvatore, president in charge of Lear’s Ford account and the interiors unit. A couple of weeks later Len Tedesco came to Lear, reporting to Mr. Salvatore. Previously Mr. Tedesco held several positions with Ford in powertrain electronics and later was Visteon’s global director of vehicle electronics.

continued on following page
Despite Lear’s merging the electrical and electronics division with the interiors business, Mr. Tedesco believes that electronics will prosper at Lear if the company focuses more closely on microprocessor control solutions. While Lear has concentrated most of its efforts on wiring and junction boxes, it has continued developing body controllers, immobilizers and remote keyless entry systems. “Those are all microprocessor-based solutions, which is where we think our growth is going to be in the future,” said Mr. Tedesco.

Lear sees its electrical distribution system business as crucial to winning more electronics business. “It’s a definite advantage because it gets us involved with the overall architecture of the vehicle,” said Mr. Tedesco. Interior trim suppliers Visteon, Collins & Aikman, Johnson Controls, Intier and Faurecia don’t have substantial wiring harness businesses. According to Lear, electronics and electrical parts account for roughly 28% of the total interiors market, a market that Lear has not yet taken full advantage of. Today Lear supplies more than 40 different electronic modules to eight major customers including GM, Ford, BMW and Honda from plants in the U.S., Germany and Spain. Most of Lear’s electronics are produced in-house.

One aspect of Lear that is not at all evident in its publications and public pronouncements is its software capability. “Many people have the perception that we don’t do software and that Lear is just a wiring company. We are far from that,” said Mr. Tedesco. He noted that Lear employs over 300 software engineers worldwide, including operations in India and the Philippines. Additionally, Lear outsources some software engineering through Wipro Technologies and Infotech.

Lear has qualified as a CMM (Capability Maturity Model) level 2 software supplier and has recently committed to achieving CMMI (Integration) level 2 by 2005. “CMMI widens the scope beyond just software and says you are a complete, high-quality electronics supplier,” explained Mr. Tedesco.

Despite Lear’s interest in electronics it will not exhibit at Convergence 2004 in Detroit, the world’s premier conference on automotive electronics.

Lear considers Freescale Semiconductor, STMicroelectronics and Microchip as strategic semiconductor partners. Lear also works closely with Beru of Ludwigsburg, Germany, on tire pressure monitor systems development. The two companies announced a joint development agreement in 2001. Lear has contracts to supply tire pressure monitors to Ford, GM, DaimlerChrysler and Hyundai.

**Smart Junction Boxes**

Smart junction boxes combine into one compartment power management components, such as relays and fuses, and electronics body controller functions, such as wiper and horn, as well as the antitheft immobilizer unit—all run by one microcontroller. In the spring of 2000, Lear announced that it had won a contract from Ford to develop a complete electronic and electrical distribution system. From that work, Lear won its first three contracts to build smart junction boxes. Mike Fawaz, director of central engineering, explained: “We went into Ford with proposals for a complete architecture utilizing smart junction boxes, and we got four awards out of it: the 2004 Taurus/ Sable, which started in the 2004 model year, the 2004 Ranger, the Ford GT and the Mazda Tribute/Ford Escape, which was introduced in the 2004½ model year.”

To minimize wiring, each vehicle could ultimately end up with three smart junction boxes: one in the rear of the vehicle, one in the center and another in a door or instrument panel. Lear has been shipping three junction boxes per vehicle for a Saab model since last year. Lear has additional smart junction boxes in production in Europe and more in development. Increasingly, as the price of semiconductors declines, solid-state relays will take the place of electromechanical relays in junction boxes. “That is now happening very, very quickly,” asserted Mr. Tedesco, who supports the transition to solid-state devices. “It works from a cost point of view, assembly is easier; there is...
ample, audio and climate control field supplies, Lear believes that the space the
other new electronics products, mostly not-
hable field-sensing touch switches for the center stack, OccuSense™ airbag occupant
deployed and how the seatbelt should be

New Electronics Products
Lear has been developing a number of other new electronics products, mostly not-

Field Sensing and the Center Stack
Among the new electronics products that Lear is developing, it can be placed in the seat under the foam and measure the amount the seat foam compresses. The output of the Hall sensor grid creates a seat-deflection pattern that is indicative of what's in the seat and how it is positioned. Neural networks implemented as part of the software algorithm help determine how the airbag and seatbelt pretensioner should be actuated. OccuSense could be made ready for production in two years following an order. U.S. Federal Motor Vehicle Safety Standard 208 mandates occupant sensing systems for all new light vehicles, with phase-in beginning in model year 2004.

ClearView Laser Night Vision
Lear has developed a prototype night-vision system that washes the scene ahead with visible laser light, independent of the headlamps. Compared with night-vision systems in use today that employ infrared cameras and no active lighting, "Laser light gives a much clearer video image of the scene as you drive at night," said Mr. Fawaz. "With the laser illumination you can identify objects hundreds of yards ahead of the vehicle." The prototype system uses a charge couple display (CCD) camera, but could ultimately employ a CMOS camera, which is less costly.

Universal Garage Door Opener
Lear is also developing a universal garage door opener that could be a cost-alternative to interior and seat system maker Johnson Controls' popular HomeLink Universal Transceiver unit. HomeLink is JCI's biggest-selling electronics product. With this development, Lear would be leveraging its experience with radio frequency transmitter and receiver products, for example, remote keyless entry fobs, tire pressure monitors and engine immobilizers.

OccuSense
OccuSense determines the weight, position and classification of front seat passengers or objects to determine if, and in some cases how, the airbag should be deployed and how the seatbelt should be pretensioned. OccuSense is Lear’s second most promising electronics development. The system consists of a grid of 17 to 22 analog Hall sensor and magnet assemblies that are built by Lear into the seat’s springs. There is one magnet per sensor in a movable assembly in relation to the fixed Hall all-effect sensor. The sensor assemblies are placed in the seat under the foam and measure the amount the seat foam compresses. The output of the Hall sensor grid creates a seat-deflection pattern that is indicative of what’s in the seat and how it is positioned. Neural networks implemented as part of the software algorithm help determine how the airbag and seatbelt pretensioner should be actuated. OccuSense could be made ready for production in two years following an order. U.S. Federal Motor Vehicle Safety Standard 208 mandates occupant sensing systems for all new light vehicles, with phase-in beginning in model year 2004.

ClearView Laser Night Vision
Lear has developed a prototype night-vision system that washes the scene ahead with visible laser light, independent of the headlamps. Compared with night-vision systems in use today that employ infrared cameras and no active lighting, “Laser light gives a much clearer video image of the scene as you drive at night,” said M. Fawaz. “With the laser illumination you can identify objects hundreds of yards ahead of the vehicle.” The prototype system uses a charge couple display (CCD) camera, but could ultimately employ a CMOS camera, which is less costly.

Universal Garage Door Opener
Lear is also developing a universal garage door opener that could be a cost alternative to interior and seat system maker Johnson Controls’ popular HomeLink Universal Transceiver unit. HomeLink is JCI’s biggest-selling electronics product. With this development, Lear would be leveraging its experience with radio frequency transmitter and receiver products, for example, remote keyless entry fobs, tire pressure monitors and engine immobilizers.

OccuSense
OccuSense determines the weight, position and classification of front seat passengers or objects to determine if, and in some cases how, the airbag should be deployed and how the seatbelt should be pretensioned. OccuSense is Lear’s second most promising electronics development. The system consists of a grid of 17 to 22 analog Hall sensor and magnet assemblies that are built by Lear into the seat’s springs. There is one magnet per sensor in a movable assembly in relation to the fixed Hall all-effect sensor. The sensor assemblies are placed in the seat under the foam and measure the amount the seat foam compresses. The output of the Hall sensor grid creates a seat-deflection pattern that is indicative of what’s in the seat and how it is positioned. Neural networks implemented as part of the software algorithm help determine how the airbag and seatbelt pretensioner should be actuated. OccuSense could be made ready for production in two years following an order. U.S. Federal Motor Vehicle Safety Standard 208 mandates occupant sensing systems for all new light vehicles, with phase-in beginning in model year 2004.

ClearView Laser Night Vision
Lear has developed a prototype night-vision system that washes the scene ahead with visible laser light, independent of the headlamps. Compared with night-vision systems in use today that employ infrared cameras and no active lighting, “Laser light gives a much clearer video image of the scene as you drive at night,” said M. Fawaz. “With the laser illumination you can identify objects hundreds of yards ahead of the vehicle.” The prototype system uses a charge couple display (CCD) camera, but could ultimately employ a CMOS camera, which is less costly.

Universal Garage Door Opener
Lear is also developing a universal garage door opener that could be a cost alternative to interior and seat system maker Johnson Controls’ popular HomeLink Universal Transceiver unit. HomeLink is JCI’s biggest-selling electronics product. With this development, Lear would be leveraging its experience with radio frequency transmitter and receiver products, for example, remote keyless entry fobs, tire pressure monitors and engine immobilizers.

OccuSense
OccuSense determines the weight, position and classification of front seat passengers or objects to determine if, and in some cases how, the airbag should be deployed and how the seatbelt should be pretensioned. OccuSense is Lear’s second most promising electronics development. The system consists of a grid of 17 to 22 analog Hall sensor and magnet assemblies that are built by Lear into the seat’s springs. There is one magnet per sensor in a movable assembly in relation to the fixed Hall all-effect sensor. The sensor assemblies are placed in the seat under the foam and measure the amount the seat foam compresses. The output of the Hall sensor grid creates a seat-deflection pattern that is indicative of what’s in the seat and how it is positioned. Neural networks implemented as part of the software algorithm help determine how the airbag and seatbelt pretensioner should be actuated. OccuSense could be made ready for production in two years following an order. U.S. Federal Motor Vehicle Safety Standard 208 mandates occupant sensing systems for all new light vehicles, with phase-in beginning in model year 2004.
Siemens Navigation in Production Vehicles


In 2000, has since stopped investing specifically in the automotive industry. Instead, we've been targeting the mobile and digital television markets, while keeping an eye toward other opportunities that might evolve,” said Bill Sheppard, Sun Microsystems industry marketing manager. A according to CNET News, to date 350 million Java-powered mobile handsets have been shipped, worldwide.

Sun developed a product called Java Embedded Server, which was an implementation of OSGi 2.0, but the product is no longer being supported. Dependent on Java, OSGi is an open platform that standardizes the delivery of wireless and network services to home, mobile and vehicle environments. IBM offers its own implementation of the OSGi spec, called SMF (Systems Management Facility).

Perhaps the greatest benefit of embedded Java is that applications written in the Java language can be reused on any embedded computing platform that has a Java virtual machine. Since software reuse is a key objective of AUTOSAR standards, we asked AUTOSAR spokesman Harold Hinecke of BMW whether Java is being considered for AUTOSAR. “At the moment we are concentrating on C and C++ to implement programs but Java will be under consideration,” he said. It’s unlikely that Java would be applied to any vehicle systems beyond high-end infotainment or multimedia products. Please see the feature article on page one for more about AUTOSAR.

### Total Market for In-Vehicle Display-Based Entertainment Systems by Region (OE and Aftermarket)

<table>
<thead>
<tr>
<th>Region</th>
<th>2003</th>
<th>2004</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV</td>
<td>0.397</td>
<td>0.496</td>
<td>0.945</td>
</tr>
<tr>
<td>Passenger DVD</td>
<td>0.468</td>
<td>0.926</td>
<td>2.654</td>
</tr>
<tr>
<td>Total</td>
<td>0.865</td>
<td>1.422</td>
<td>3.599</td>
</tr>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV</td>
<td>0.248</td>
<td>0.323</td>
<td>0.738</td>
</tr>
<tr>
<td>Passenger DVD</td>
<td>0.064</td>
<td>0.118</td>
<td>0.652</td>
</tr>
<tr>
<td>Total</td>
<td>0.312</td>
<td>0.441</td>
<td>1.390</td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV</td>
<td>1.152</td>
<td>1.267</td>
<td>2.245</td>
</tr>
<tr>
<td>Passenger DVD</td>
<td>0.036</td>
<td>0.091</td>
<td>1.900</td>
</tr>
<tr>
<td>Total</td>
<td>1.188</td>
<td>1.358</td>
<td>4.145</td>
</tr>
<tr>
<td>World Total</td>
<td>2.365</td>
<td>3.221</td>
<td>9.134</td>
</tr>
</tbody>
</table>

Data: Strategy Analytics In-Vehicle Telematics & Multimedia Service; www.strategyanalytics.com