Top German EE's Discuss Future Auto Electronics

German Carmakers Lead the Way

The Germans have pioneered much of the automotive electronics that eventually find adoption by carmakers worldwide. From safety systems such as ABS and electronic stability control, to vehicle networks CAN, MOST, LIN and FlexRay, to the OSEK and AUTOSAR software architectures—BMW, Mercedes and Volkswagen have been instrumental in getting innovative products and technology on the road.

During last month’s Frankfurt Motor Show, we interviewed three of Germany’s electrical engineering bosses about the state of our industry today and about some of the new technologies showing promise for the future. Stephan Wolfsried is in charge of both electrical engineering and chassis development at Mercedes. Volkmar Tanneberger is director of electrical engineering at Volkswagen, and Ermir Frickenstein heads E/E engineering and the driver environment at BMW.

Active Safety

Electronic stability control has been a huge success. We asked the engineers what other new features are showing similar promise. Increasingly, says Mr. Frickenstein, BMW’s Dynamic Stability Control will be cross-linked with steering— for active safety features such as lane keeping assistance and active steering, which automatically varies the steering ratio to fit conditions— and with the brakes for automatic emergency braking assistance.

Mr. Wolfsried is also enthusiastic about driver assistance systems; he sees them as “the next big step” for M ercedes. “Next we will be able to foresee critical situations with a combination of camera and radar sensors reliably enough to avoid accidents. I’m a fan of radar, which is more reliable under bad weather conditions,” he said.

Likewise, M r. Tanneberger is keen on automatic emergency braking, but as a high-volume car producer, Volkswagen is considering combining video sensing with laser sensing, instead of radar. Tests of laser’s ability to see in bad weather have been promising. “Laser might work even in snow, and it can be fitted behind the windshield, which reduces the complexity of our cars,” noted M r. Tanneberger. Laser adaptive cruise control could find production at Volkswagen in the 2009 to 2010 time-frame, with automatic braking possibly coming as early as 2011.

Stop-Start Finding Wide Adoption

As carmakers work to make their cars more fuel efficient, starter alternators are becoming widely used; engines can be automatically turned off as the car stops and instantly restarted when the accelerator is depressed. BMW, which offers the stop-start function on its three- and five-door 1 Series and on the 3 Series convertible, plans to offer it, along with recuperative braking, over the entire fleet.

M ercedes introduced stop-start several months ago on the Smart and by M arch 2008 will offer the feature on its A and B cars. Eventually all M ercedes cars will have the fuel-saving feature. Volkswagen is also working on stop-start and anticipates that it will be made available across its entire product line, with the first offering coming out in a few years.

Supercapacitors

BMW and M ercedes see benefits in using supercapacitors, and not only in hybrid vehicles. “They can be charged and recharged very often, they have a good weight-to-performance ratio, not only for hybrid vehicles but also for conventional vehicles when the stop-start and brake recuperation functions are employed,” said.
German EEs... Continued from page 1

said M r. W olfsried. A ccording to M r. Fricksen, B MW will use supercaps in production by 2010.

Volkswagen’s Touchscreen H M I
Starting with the 2008 Touareg, Volkswagen is standardizing on a capacitive touchscreen user interface, not the M MI (multimedia interface) used by A udi. A udi’s M MI multifunction controller incorporates a cluster of soft and hard switches surrounding a large rotate-and-push-to-select knob. “We wanted a system that can be used even on our low-end vehicles, where you can’t use the M MI, because those cars don’t have arm rests,” said M r. T anneberger. The touchscreen interface comes with the infotainment package, which in the past has been optional by well over 50% of Touareg customers. Volkswagen is interested in finding a high-volume, low-cost supplier of touchscreen displays that can be seen in bright light and don’t show markings from fingerprints.

Ethernet and T C P/IP
B MW is investigating a new communications link for fast reprogramming of embedded ECUs using Gigabit Ethernet and T C P/IP standards, targeting 2008 or 2009 for start-of-production. M ercedes is also considering T C P/IP. “We at M ercedes are also thinking about using [those standards] for reprogramming our cars,” declared M r. W olfsried. “It’s a major protocol with enough bandwidth.” A s it is doing with FlexRay, M ercedes will launch T C P/IP in each new car platform as it is brought to market.

Volkswagen’s M r. Tanneberger, at the suggestion of B MW, is also considering Ethernet and T C P/IP, but is not yet convinced that it is the way to go. “Not only does it involve a very large investment by our service partners in new tools, but what about software security? Ethernet is well-known all over the world, and you will find a lot of hackers who are able to create software on the basis of Ethernet.”

M OST U se Is Down at M ercedes
W hile M ercedes’ M r. W olfsried is thinking favorably about Ethernet for reprogramming ECUs, he doesn’t see it as a replacement for M OST, the high-speed network used by some carmakers to link multimedia components. “W hile we are satisfied with M OST, M ercedes has decreased its use significantly,” he noted. “W e only use M OST when we connect separate ECUs to the head unit: a digital audio amplifier, satellite radio receiver or T V. To reduce costs, M OST was replaced by integrating everything—tuner, audio gateway, voice control, and telephone—into the head unit.”

Industry C onsolidation
In the mid-1980s, Siemens entered the automotive electronics market at the encouragement of M ercedes, Volkswagen and others who wanted a strong competitor to Bosch. In A ugust 2007, Siemens sold off its automotive electronics entity, Siemens V DO , to C ontinental for $11.4 billion, leaving the industry with one fewer major supplier.

But our trio of electrical engineers doesn’t seem at all worried about the merger with C ontinental. “I f we identify a lack of competition in a certain business field, we will develop other suppliers in order to regain necessary market conditions,” declared B MW’s M r. Fricksen.

G erman Industry C ooperation
G erman carmakers, often along with their tier-ones, semiconductor suppliers and software houses, have a history of close cooperation in areas where the O EM s don’t compete. T he chief electrical/electronics engineers from B MW, A udi, Volkswagen, and M ercedes-Benz meet at least once a year, and there are a number of different working groups that also meet. “W e identify areas of cooperation on a case-by-case basis, informally,” said M r. W olfsried. T here is no fixed leader. W hoever has the most to gain takes charge.

Some of the topics under discussion by the group or being considered for discussion are H M I, energy management, battery technology, electric power steering and the possible standardization of electrical relays used in stop-start applications.

CE4A (Consumer Electronics for A utomotive)
A udi, B MW, Daimler and Volkswagen have launched a common initiative to make it easier to control and display portable devices using the vehicle’s control and display elements, while ensuring that devices brought into the vehicle work as intended. By speaking with one voice, C E4A hopes to be able to influence consumer device manufacturers so they will account for automotive requirements. W ithin C E4A, a number of expert groups will be formed to cover various aspects of the device connectivity and usability issues: telephone, media player, personal information management, navigation, D igital Living N etwork A liance, standard connector and digital rights management. Part of C E4A’s charter is the creation of a common reference platform against which portable devices can be tested and possibly a centralized test facility.

C E4A will not lead to a standard automotive gateway; rather, it will lean on standards already established in the consumer electronics industry. “T here will be standardization of interfaces like U SB and iPod, but that’s all. I don’t see a common device,” said M r. W olfsried. M r. T anneberger agrees that standards don’t make sense because it is presently an area where the carmakers compete. “A t this time we [carmakers] differentiate between each other concerning integration of consumer electronics.”

THE HANSEN REPORT
ON AUTOMOTIVE ELECTRONICS

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FY 2007 Sales: $3.55 billion
Change from 2006: up 9.3%
FY 2007 Operating Margin: 10.9%
Outlook for 2008: $4.1 billion in sales, up 15.5% over the prior year with an operating margin of at least 9.7%, which is down from last year.

Harman’s stock price tumbled on September 21, 2007, after Kohlberg Kravis Roberts and Co. (KKR) and Goldman Sachs Capital Partners (GSCP) walked away from their $8 billion leveraged buyout of the company. The stock closed at $80 per share on September 24, down 33% from the $120 buyout price. KKR and GSCP informed Harman that they believe a material adverse change in Harman’s business occurred, that Harman breached the merger agreement and that the buyers are not obligated to complete the merger.

While Harman strongly disagrees with the view that material adverse changes took place, in a September 24 statement it did report that “the fourth quarter of fiscal 2007 and the first quarter of fiscal 2008 were affected by increased R&D costs, primarily related to recent automotive platform awards.”

No one is saying exactly why KKR and GSCP pulled the plug on the deal. According to investors who follow Harman, R&D and capital spending increases are likely factors. Harman spent $356.7 million on R&D in fiscal 2007, which was up 18% over the prior year. And capital spending in fiscal 2007 was up 33% to $175 million. A nother factor affecting the deal’s outlook was the increasing cost of borrowed funds resulting from the mortgage lending crisis.

Some investors who follow Harman have also questioned the future of Harman’s relationship with the company that has been its largest customer. DaimlerChrysler accounted for 25% of Harman’s sales in FY 2007. Most of that business was with the Mercedes-Benz division, and according to our contacts there, the relationship between Mercedes and Harman is definitely in flux.

Harman picked up a majority of Mercedes’ infotainment business in 2003, when Bosch’s Blaupunkt division was unable to deliver radio navigation systems on time because of software problems applying M icrosoft Windows CE. Harman was one of only a couple of available alternatives to Bosch and quickly stepped in. But lately the competitive landscape at Mercedes has changed—Mitsubishi Electric, Panasonic and Alpine are now also very much in the picture.

According to M ercedes, Harman did a good job on the S-Class but had some problems with the mid-version of the new C-Class, which M ercedes had to postpone for six months. That particular version of the C-Class is sold to business fleets and rental companies, so its delay wasn’t too costly.

A cording to top engineers at M ercedes, Harman’s QNX division announced that it will provide free access to the source code for its QNX N eutrino real time operating system. Not only can developers view the code, but they can improve, modify or extend that code for their own purposes or for the community at large. Unlike the Linux open source operating system, commercial deployment of QNX N eutrino runtime components will still require commercial developers to pay royalties.

QNX is one of three operating systems that Volkswagen is considering as its standard infotainment platform. From the end of 2010, Volkswagen will use just one operating system, regardless of who is supplying the audio or navigation system. Volkswagen does not want to be tied to just one infotainment supplier, so if open access to QNX leads to its adoption by other infotainment system suppliers, that will improve the likelihood that QNX will be Volkswagen’s choice.

“QNX has had the disadvantage that it is owned by Harman,” said Volkmar Tanneberger, director of E/E development at Volkswagen. Also in the running at Volkswagen are the Linux operating system and the W indows A utomotive platform from M icrosoft.

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M ercedes’ top electrical engineer, Stephan Wolfsried, doesn’t believe QNX’s decision to publish N eutrino source code will lead other infotainment suppliers to adopt it. “A s long as QNX is owned by Harman, they have some influence in all users. M y fear is they could also use that to leverage their interest as an audio supplier.”

The Hansen Report on Automotive Electronics, Portsmouth, NH USA www.hansenreport.com
Telelogic

The Company Profile...

Telelogic Sales by Year

2002 to 2006 CAGR: 8.0%
in SEK million ($ millions)

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Telelogic Automotive Sales by Year

2002 to 2006 CAGR: 8.0%
in SEK million ($ millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales</th>
</tr>
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<tbody>
<tr>
<td>2002</td>
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<tr>
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<td>77.4 (11.2)</td>
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Key Telelogic Products—All Markets

- **DOORS**: requirements management
- **Focal Point**: decision support and product/portfolio management
- **Rhapsody**: model-driven development of embedded or real-time systems
- **Synergy**: change and configuration management
- **System Architect**: enterprise architecture and business process modeling
- **Tau**: model-driven development for enterprise IT
- **Statemate**: complex systems design

Background

Because software is the essential ingredient in automotive electronics, our industry relies on companies such as Telelogic for tools to support and enable the productive development of quality software.

Telelogic is a global supplier of software solutions that optimize, align and automate its customers’ business and development processes. The company was founded in 1983 as a research and development arm of Swedish Telecom; it became an independent company in 1992. Saab Combitech was the majority stakeholder from 1995 until 1998, when a group of private investors acquired Telelogic. The company has been publicly traded since March 1999 on the Stockholm Stock Exchange under the symbol TLOG.

Telelogic now has operations in 22 countries with more than 8,000 customers worldwide, primarily in the aerospace, defense, telecommunications and electronics industries. The automotive industry accounted for just 7% of Telelogic’s sales in 2006. In that year, the company’s five largest automotive customers in order of sales were Siemens VDO, Daimler-Chrysler, Delphi, Volkswagen and Toyota.

According to Renate Stuecka, senior director of business development for central Europe, what most distinguishes Telelogic from its competitors is its broad portfolio of software tools, which support all organizations within the enterprise. “We help our customers make sure their business strategies are in line with their IT infrastructure, with their product development processes and with production, that all the different activities are aligned to pursue the same objective.” Ms. Stuecka is also responsible for partners and alliances, communications and product positioning. She has a degree in computer science from the University of Dortmund.

In 2005 Telelogic set a goal to increase sales by five times within five years, through organic growth and acquisitions. That translates to an average growth rate of nearly 38% per year, but at the end of the first half of 2007, the company is on pace to increase sales by only 11% over the prior year. Telelogic’s business is focused on the world’s three major industrial regions: the United States, Europe and Japan/Korea.
When it comes to technologies like ours, software development tools. “Generally, try has done much of the pioneering with vehicles they build, the German auto industry applications. has the largest number of installed seats in the automotive industry marketing. “Next are the U.S. companies, followed by the Japanese, who tend to wait and see the lessons learned by the others before they adopt.” the European companies, specifically the Germans, have been the earliest adopters,” noted Richard Boldt, senior director responsible for the Rhapsody product and automotive industry marketing. “Next are the U.S. companies, followed by the Japanese, who tend to wait and see the lessons learned by the others before they adopt.”

Distinctions Claimed by Telelogic

- Telelogic’s DOORS is the world’s number-one requirements management tool
- World’s number-two share of software and systems modeling tools market
- World’s number-four share of change and configuration management tool market

Between 1999 and 2004 Telelogic completed 14 acquisitions, including some that strengthened its position in the automotive market. Real-time development tool vendor Verilog was added in 1999, and Continuus, the California-based developer of Synergy configuration management software, in 2000. With the QSS buyout in 2000, Telelogic acquired DOORS, a requirements management tool. The 2006 acquisition of I-Logix brought with it a large automotive customer base of Statemate users, and the UML-based modeling tool, Rhapsody. Statemate, a state-based modeling tool, has been in use by automotive OEMs and suppliers for more than ten years.

The three Telelogic products that have found the most traction in the automotive industry are DOORS requirements management software, Rhapsody modeling software, and Synergy configuration management software. Of the three, DOORS has the largest number of installed seats in auto industry applications.

Because of the complexity of the vehicles they build, the German auto industry has done much of the pioneering with software development tools. “Generally, when it comes to technologies like ours, the European companies, specifically the Germans, have been the earliest adopters,” noted Richard Boldt, senior director responsible for the Rhapsody product and automotive industry marketing. “Next are the U.S. companies, followed by the Japanese, who tend to wait and see the lessons learned by the others before they adopt.”

Aquisition by IBM

On June 11, 2007, IBM announced a public cash offer to the shareholders of Telelogic AB of SEK 21 ($3.04) per Telelogic share, or SEK 5.2 billion ($752 million) for the entire company when all 247,179,481 outstanding shares are counted. The offer, which Telelogic’s board unanimously recommended stockholders accept, generously values the company at more than 3.4 times sales. The offer price represents a premium of 21% over Telelogic’s closing stock price on May 31, 2007. Stockholders have until December 2007 to accept the offer.

Telelogic will be delisted from the Stockholm Stock Exchange once IBM completes the acquisition. When that happens, Telelogic will become part of IBM’s Rational Software Unit, reporting to Danny Sabbah, general manager. “Part of the reason we’re acquiring Telelogic is because we see the embedded systems market growing,” said Dr. Sabbah in an article published on eWEEK.com. “We see automotive as an emerging and growing market. It’s clearly one of the reasons we are doing this.” IBM had revenues of $91.4 billion in 2006.

Even after it becomes part of IBM, acquisitions and organic growth will continue to define Telelogic’s growth strategy. Any further acquisitions by Telelogic are on hold until the IBM transaction is closed.

I-Logix

In March 2006, Telelogic acquired I-Logix (Andover, Massachusetts), for $80 million in cash. I-Logix produced $26.8 million in sales in 2005, 29.5% more than in 2004. Operating margin in 2005 was 11%. At the time of the acquisition, I-Logix had 133 employees and 550 customers. 2005 sales per employee were $202,000. As a result of the acquisition, I-Logix had 133 employees and 550 customers. 2005 sales per employee were $202,000. As a result of the acquisition, I-Logix was a major player in embedded modeling, behind IBM/Rational, which is where Telelogic will report. The $80 million purchase price was funded in part by a SEK 500 million ($72.4 million) bank loan to Telelogic.

The I-Logix products Rhapsody and Sytemate are still available, both as stand-alone products and integrated into Telelogic offerings. One of the biggest benefits of Telelogic’s acquisition of I-Logix is the degree of interplay between software tools. “Rhapsody could always be integrated with products like DOORS and Synergy, but now that we are under one banner those integrations are rapidly becoming stronger. Now we can use some of the capabilities within Synergy that we didn’t have access to as an external company,” Mr. Boldt said. Mr. Boldt, a graduate of Rensselaer Polytechnic Institute (Troy, New York), joined I-Logix in 1994.
DOORS Requirements Management Tool

"DOORS is a platform for communicating across the organization—or throughout the supply chain," said M. Stueckel. "It helps to make sure that information that is shared is always up to date, and that testing is done according to the requirements, not just testing that it somehow works. The perfect customer is an organization that is concerned about building its products in line with expectations.

"Requirements management is particularly important in the automotive industry, because there are so many conflicting requirements and so many product families to take care of. Working with numerous written documents or spreadsheets really leads to a lot of confusion," she said.

With DOORS, engineering managers and project managers can capture, link, trace, analyze and manage changes to ensure that projects conform to requirements and comply with regulations and standards. DOORS is used by engineers and marketing people, even by people in finance.

With a scalable master repository, DOORS transforms a global development organization into a cohesive team working toward the same goal. And because requirements typically evolve during a project, the software provides powerful analysis capabilities, so users can understand the impact of approving a change. Traceability features improve quality by ensuring that no requirement is lost or overlooked.

 Especially good at capturing, organizing and analyzing a large number of requirements, the tool is also well-suited to development teams when parts of projects are outsourced. The aerospace and defense industries were the first large-scale adopters of DOORS and remain its largest markets, followed by the automotive industry.

DOORS has won more than its share of accolades. Yphise, the IT research firm ranked DOORS the number-one requirements management tool for three consecutive years.

DOORS became part of Telelogic in 2000 with the acquisition of Quality Software Systems, which it bought for $115 million. At the time, QSS had sales of $30 million. Now Telelogic's largest selling product family, with sales in 2006 of nearly $90 million, DOORS license and maintenance fees range from $470 to $1,470 per year, per seat. In all the industries served by DOORS, there are currently about 250,000 users.

Engineers in the Freightliner truck division of Daimler were among the earliest users of DOORS, but adoption has spread throughout the company. Daimler is using DOORS for specification, administration and management of components for Mercedes-Benz passenger cars, in close cooperation with its suppliers. The tool allows globally distributed development teams to share specifications across brands.

DOORS is also used as standard technology in the Volkswagen Group, where scores of licenses are deployed. A nother major user is Siemens VDO.

To view a five-minute demonstration of the impressive requirements management capabilities of DOORS, visit this website: www.telelogic.com/campaigns/2007/global/doors_auto_demo/index.cfm.

Rhapsody Software Modeling Tool

Rhapsody, which came with Telelogic's 2006 acquisition of I-Logix, is a tool for model-driven systems design and software development, providing simulation, testing and code generation for embedded systems. I-Logix brought Rhapsody to market in 1998.

Rhapsody, which automates the design process, is based on the Unified Modeling Language (UML), a standardized specification language that uses graphical notation to create an abstract model of a system. Rhapsody also makes use of the systems modeling language, SysML, a UML variant that makes Rhapsody applicable to systems engineering tasks.

Telelogic engineers helped define both UML and SysML. With Rhapsody, engineers can use either of the two languages or use some of each.

Once the models are created and tested, Rhapsody automatically compiles them into machine-readable software code to be run by the electronics control unit's computers, so-called automatic code generation. A valiable languages include C (MISRA compliant), C++, Ada and Java. Rhapsody can embrace structured models, state charts, activity graphs, algorithms and process flows.

"Rhapsody's architectural framework is what's driving automotive people toward the tool; they take body and comfort, the chassis and powertrain systems IP from their existing tools and plug that into Rhapsody, which provides the architectural design," noted M. Boldt.

Rhapsody is the second-best-selling tool in Telelogic's product portfolio after DOORS, in terms of new licenses. As with DOORS, the automotive industry is

Three Tools for the Automotive Electronics Industry

At some of Telelogic's major customers in the automotive industry—OEMs and suppliers—more than 1,000 users work with Telelogic's DOORS, Rhapsody and Synergy.

Each of the tools serves different aspects of the software development process. DOORS is used at the beginning to gather and analyze the project's overall requirements and then throughout the process to track its progress. Most DOORS requirements are textual, although other representations are supported as well, such as models, graphics and tables.

Rhapsody handles the next development steps, including specification of the systems and the actual software design. It is used by engineers to create model elements and model diagrams of software code, all of which can be simulated and tested at the model level before source code is automatically generated from the model.

Synergy comes into play as system design is begun; it is used to keep track of the versions of each piece of software and where each version is configured into a system.
Rhapsody's second-biggest market behind aerospace and defense.

Rhapsody's main competition comes from two IBM products: Rational System Architect and Rational System Development Solution. But Rhapsody differs from those two products in that it focuses more on embedded and real-time applications. General Motors is Rhapsody's biggest automotive OEM customer; Siemens VDO is Rhapsody's biggest customer among automotive suppliers.

The entry level price for Rhapsody is between $1,000 and $2,000. This provides modeling and static analysis capabilities. A typical Rhapsody configuration including simulation and code generation costs from $10,000 to $15,000, depending on what capabilities are included.

Rhapsody for Automotive

On October 10, 2007, Telelogic announced the release of Rhapsody for Automotive, the first UML and SysML-based solution designed especially for systems engineers and software developers working on automotive electronics projects.

Rhapsody for Automotive is the only SysML/UML environment that supports automotive standards, including:

- AUTOSAR standard software platform
- OSEK standard operating system
- CAN, MOST, LIN and FlexRay bus protocols
- MISRA C software development standard for the C programming language

With Rhapsody for Automotive, engineers can seamlessly integrate with a number of other tools, including Telelogic DOORS, Synergy and Statemate, and with Simulink from The MathWorks.

Users of Simulink and Statemate will see Rhapsody as a fitting complement to those popular tools. "State- mate and Simulink are very good at capturing and refining algorithms but not so good at assigning and scheduling those software pieces within a network of ECUs," explained M. Boldt.

"With Rhapsody, engineers can model the functionality of the whole network of ECUs on a laptop and debug it at the system level."

Despite the estimable benefits of using Rhapsody—it makes engineers more productive, producing software that is reusable and of higher quality in less time—only a minority of automotive software engineers today use tools like Rhapsody. "But as software complexity continues to climb over the next five to ten years, usage will ramp up to a point where it will be much more common for engineers to be using tools like these," predicted M. Boldt.

"We are very excited about this new automotive product; we think it’s going to do quite well for us," declared Mr. Boldt. "We expect sales of Rhapsody in the automotive domain to increase faster than total Rhapsody sales over the next several years."

Statemate Modeling Software

Before Rhapsody there was Statemate, a modeling tool developed by I-Logix on the concept of state charts. Statemate was widely used in the aerospace, defense and automotive industries beginning in the late 1980s. Rhapsody and Statemate do similar things, although Rhapsody is more versatile with 13 different diagram types compared with just five diagram types in Statemate. Still, some automotive engineers favor Statemate because it is particularly good in body control and comfort applications, especially when tight budget constraints demand finely tuned, compact software that can be run on inexpensive microcontrollers.

Synergy Configuration Management

Synergy is used to keep track of different versions of software files and the configuration of multiple software files into functional units. Synergy is particularly helpful in large, complex software development projects, or where much of the work is done in parallel, or when developers are located in different places. Synergy helps to coordinate and communicate the development activities of team members. Not only does Synergy give software developers control over projects, it is useful in demonstrating compliance with legal requirements.

"One of the earliest automotive users of Synergy was BMW. They were already using it in 2000 when Telelogic bought Continus, the company that developed the product," noted Ms. Stuecka. "Even then, BMW was using a lot of software. Now with the growth in the amount of software in the car, other OEMs and suppliers are finding configuration management and change management software essential. BMW uses Synergy to track all of its internally developed software systems," she added. Telelogic paid $42 million for Continus, which in 2000 was a $37 million company. The Volkswagen Group also uses Synergy at three locations responsible for developing automotive electronics: in Wolfsburg, in Ingolstadt, where Audi is located, and in Braunschweig, where some electronic control units are developed.

Synergy’s price starts at 2,500 euros; change management software can be added for an additional 640 euros.
Features...

Cameras Enhance Safety Systems

Cameras are finding their way into more vehicles in a variety of safety applications. OEM-installed rear-facing cameras for safely backing up SUVs normally require a large in-dash display. Gentex integrated a small LCD display, activated when the vehicle is in reverse, into the auto-dimming rearview mirror, which makes a much more affordable solution that carmakers can install in any vehicle. First introduced in the 2007 Mazda CX-9, the Gentex rearview mirror display is offered in five 2008 Ford trucks and SUVs.

GM's Lane Departure Warning System uses a forward-facing camera (from Mobileye) on the inside mirror to read the lane markings in the road. The system debuts on the 2008 Cadillac STS.

Blind spot detection is offered in MY 2008 vehicles by jaguar, Volvo, Audi, Mercedes, and in the Cadillac DTS and STS, and the Buick Lucerne. Volvo released adaptive cruise control (ACC) with Distance A lert plus Collision Warning with A uto Brake, which is forward collision warning radar with automatic braking. If you approach the car ahead too quickly, a red light appears on the head-up display, and the system precharges the brakes. If the driver takes no action, automatic braking kicks in.

A available in the S80, V70 and XC70, Collision Warning with A uto Brake uses data from a long-range radar sensor plus a camera. Production will start in mid-N ovember. The previous version of this system, introduced in 2006 on the S80, used radar only. Volvo Distance A ert works even if a CC is disengaged.

A ccording to Volvo, its Driver A ert System option, also available in the S80, V70 and XC70 at the end of 2007, is the world's first passenger car application of its kind. The system incorporates lane departure warning and a system to alert the driver if his concentration wanders, whether from distraction or fatigue. Using a windshield-mounted camera, plus sensors and a control unit, Driver A ert monitors the car's movements in relation to the road markings, rather than monitoring the driver's face or eyes. According to Volvo, the technology for monitoring the driver is not yet mature enough.

The new BMW 5 Series' optional lane departure warning system, from Siemens VDO, gives an alert as the car moves close to the lane marking. The feedback alert simulates a rumble strip through steering wheel vibration.

Nissan uses four cameras mounted on the outside of the new Elgrand minivan, available in Japan in late October 2007, to give the driver a 360-degree, bird's-eye view of the vehicle and what's around it. One side of the display shows a view of the car from above; simultaneously, the other side of the display shows either the front or rear camera's view, depending on the gearshift position.

Infotainment/Connectivity

The market research firm iSuppli (El Segundo, California) predicts that the market for automotive infotainment will grow 8% per year through 2013. Consumers' desire to bring a wide variety of personal communications, computing, music and navigation devices into their cars led to the Ford Sync, which comes to market in the 2008 Focus. With Sync, portable devices can be operated with the steering wheel controls or by voice. Ford says the initial take rate for Sync is 32%.

Most new vehicles now offer iPod and/or MP3 connections. Siemens VDO estimated that in two years, 70% of CD-based audio systems will include MP3 capability, and that carmakers will soon begin to abandon the CD music format.

Telematics Research Group predicts that in the next two years there will be nine or 10 carmakers worldwide offering telematics services. Today the vast majority of telematics users are GM OnStar customers. OnStar continues to add innovative services to the basic emergency alert and driver information packages.

OnStar's latest (Generation 8) hardware, available on 1.7 million vehicles in 2009, will enable the new Stolen Vehicle Slowdown service, which helps law enforcement quickly recover a stolen vehicle. Once the vehicle is reported stolen, the subscriber can ask OnStar to locate it and report the location to the police. When the police have the vehicle in sight, OnStar will send a signal to the car that instructs the powertrain system to reduce engine power and the vehicle will gradually slow down.

Ford will offer H D Radio on nearly all Ford, Lincoln and Mercury models in MY 2008 as a dealer-installed option. HD Radio is a digital broadcasting technology that improves sound quality and reception, and allows additional data to be transmitted along with the music programming. BMW was first to offer HD Radio, factory installed. Jaguar and Hyundai also offer HD Radio as factory equipment. A according to iBiquity Digital, the company that developed HD Radio, HD Radio is offered on 69 different vehicle models representing 13 brands.

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