

AUTOMOTIVE

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In association with Shell

Interview:

Joel Hoffmann

Treasurer, GENIVI Alliance

Joel Hoffmann outlines the role of the GENIVI Alliance in developing an open source in-vehicle infotainment reference platform

By Martin Kahl



The GENIVI Alliance was formed in 2009 by eight founding members: BMW, Delphi, General Motors, Intel, Magneti Marelli, PSA Peugeot Citroën, Visteon and Wind River. The non-profit organisation was created to drive the development and broad adoption of an open source in-vehicle infotainment (hence “IVI”) reference platform.

Joel Hoffmann is a Business Strategist in founding member Intel’s Automotive Solutions Division. Having been with the GENIVI Alliance since 2000, Hoffmann now sits on the GENIVI board as Treasurer, and heads up the GENIVI marketing team.

Automotive Megatrends spoke to Hoffmann to learn more about the work of the GENIVI Alliance. “GENIVI aims to develop a set of working codes that the auto industry can use to build less expensive and more functional head units,” Hoffmann explains. “That goal is challenged by the fact that automotive head units are becoming increasingly complicated. Typically, when software gets more complicated then the development cost goes up, and it mostly goes up because of the cost of testing and validation.”

GENIVI set out to take the concept of Linux that had been successful in other industries, and apply it to the automotive industry. “The idea was to solve some of the additional issues that come up when you’re dealing with a Linux platform. Linux is so malleable that there’s not a lot of re-use use when it comes to building an actual end product.” The core functions of Linux tend to be fairly stable, says Hoffman, but adding features also multiplies considerably the number of variations. “The challenge is to make it not only reusable but also more consistent, enabling software developers to work from a common baseline. GENIVI is attempting to be that common baseline; within GENIVI, the potential exists to have one set of requirements that we all

agreed to for the most basic functions of the infotainment system.”

Bringing open source design to the automotive industry

GENIVI operates on open source platforms. “Of GENIVI’s total effort, 80% comes directly from the open source community,” explains Hoffmann. “Much of it comes as part of the kernel. And then there are other projects that have been widely accepted in the embedded open source community. They’re mature, robust and well accepted. And the GENIVI Alliance will examine and approve those elements of open source code.”

With 80% of the software accounted for, “the next section would be approximately 15%, representing the open source code that had to be modified to accommodate automotive-specific requirements. GENIVI will compile those requirements. If they can’t find a component of software that meets the needs of the automakers, GENIVI will reach out, or hire a company to introduce these proposed changes, or create a patch.”

This accounts for 95% of the GENIVI base code. What remains “doesn’t exist in any other community, like MOST. GENIVI creates an extraction layer and develops this internally. This becomes GENIVI owned code, and all GENIVI members have access to the code. They don’t have to pay for it.”

The automotive industry is one of the least likely industries to embrace open source design, and Hoffmann says the response of GENIVI’s automotive partners in the past has been “very negative.” The open source community and the automotive software community are learning to be more alike, “but typically the automotive software industry has a very different development methodology to the open source community developers. Over the last five or six years, GENIVI has been coaching and training the automotive guys to

understand how they benefit from sharing their software, because, in the past, everything was proprietary.”

In terms of convincing the automotive industry of the benefits of open source design, the cyclical nature of the automotive industry has worked in GENIVI’s favour. “The lower the cycle, the more open the automotive industry becomes,” says Hoffmann. “This economic downturn pretty much matched up with an increase in the automotive industry’s interest in open systems. As an industry, it’s more receptive to inviting others to contribute to its technology than when times are good. If the automotive industry really gets back on its feet, it may close down a little bit. So our purpose here is training, teaching, incubating these concepts, and then formulating our GENIVI deliverable, which is pretty much a compliant specification, or a GENIVI specification with a compliant programme added to it.”

GENIVI’s broad membership

The GENIVI Alliance currently boasts over 165 members from a variety of industries. This includes ten or 11 automotive OEMs, including vehicle manufacturers that don’t publish their membership.

Hoffmann says about 90% of the automotive Tier Ones are GENIVI members. “Tier Ones are interested in GENIVI because the Tier One marketplace is being changed dramatically. The lines between Tier Ones, Tier Twos and Tier Threes are being blurred and the technologies that are available to the car companies are coming from a variety of sources. The business models of yesterday’s Tier One are being disrupted, partly by GENIVI but really by the whole economic force.”

The third key group of members is made up of the silicone suppliers. “Every one of the silicone suppliers that produces automotive silicone is a member.”

Other members are ISDs (software developers) and services companies, “and this is where I think the biggest opportunity exists,” says Hoffmann. “The ISDs are typically involved in developing some type of an application for sale to a Tier One or an automaker. They want to be involved in GENIVI because they can influence how GENIVI’s definition of middleware is going to be laid out. And if they have some influence over that then they can build their product to plug into it. So when they pitch to an OEM, they can say they are already a GENIVI member with a GENIVI compliant product.”

OEMs don’t want to lose their head units

A key motivation for OEMs is to do whatever they can to retain the thousands of dollars in revenue that they are used to making on head units, says Hoffmann. “They anticipate that the form factor of head unit is going to change, and, because of mobile phones and other innovations, they may not have that same profit opportunity. So they have to see a way to reduce their costs. If it’s making the software more efficient, then that’s what they hope is going to happen.”

A focus on infotainment

The GENIVI Alliance is focused on infotainment, and not telematics. At this point, it is worth defining how infotainment differs from telematics, and whether there is likely to be a blurring of the two. “GENIVI is inter-community, very focused on infotainment. Certainly there’s a lot of shared infrastructure between a telematics system and an infotainment head unit,” explains Hoffmann. “Traditionally, the head unit contained all the electronics that fit in the centre stack of the car, and then typically the telematics elements would be in a separate dedicated telematics control unit. The telematics unit controls the telephony equipment that may be in the car. It’s connected to an antenna. It makes a certain amount of decisions there. And then it just inserts whatever it needs to into the display of the head unit. When we originally started laying out some of the definitions of GENIVI, we tried for a while to break down the very small form factors such as the telematics box, and then a mid-range configuration, and then a high-end configuration for a luxury car. We really haven’t invested much to put a GENIVI stack into a telematics box. It could be that also the processing and the intelligence of a stack is so much smaller for the telematics control unit that it wouldn’t really see as much return on investment as it does in the head unit.

So your head unit is likely to be a connected head unit, but perhaps with its own telematics control unit, at least for the next several years.”

Built-in or brought-in?

The development of mobile handsets and tablets has the potential to threaten the built-in head unit. Is there a future for the built-in head unit, or will tablets and handsets take the place of such devices? "I think both will happen. Plenty of people will tell you that the head unit will go away and it will just be an LCD panel. But the real issue is cost. If the cost can be contained to put an intelligent head unit in the car, it will always be a better performing and more trustworthy function for the driver. We're seeing the head unit take on more functions, not necessarily the TCU functions, but maybe driving the instrument cluster or the HVAC controls. So it's not just a head unit for entertainment but it is integrated with the vehicle operation."

Currently, there is little that can be done between a phone handset and the head unit in terms of command and control, says Hoffmann. "Bluetooth provides a level of control over media, enabling you to stream music from your phone into the radio of your car. But there's not a lot of protocol or technology to do much more than that. So if you're just using the phone for entertainment, that's a very good use case, but there are so many more things that can be done in the car itself."

GENIVI won't go after the aftermarket...

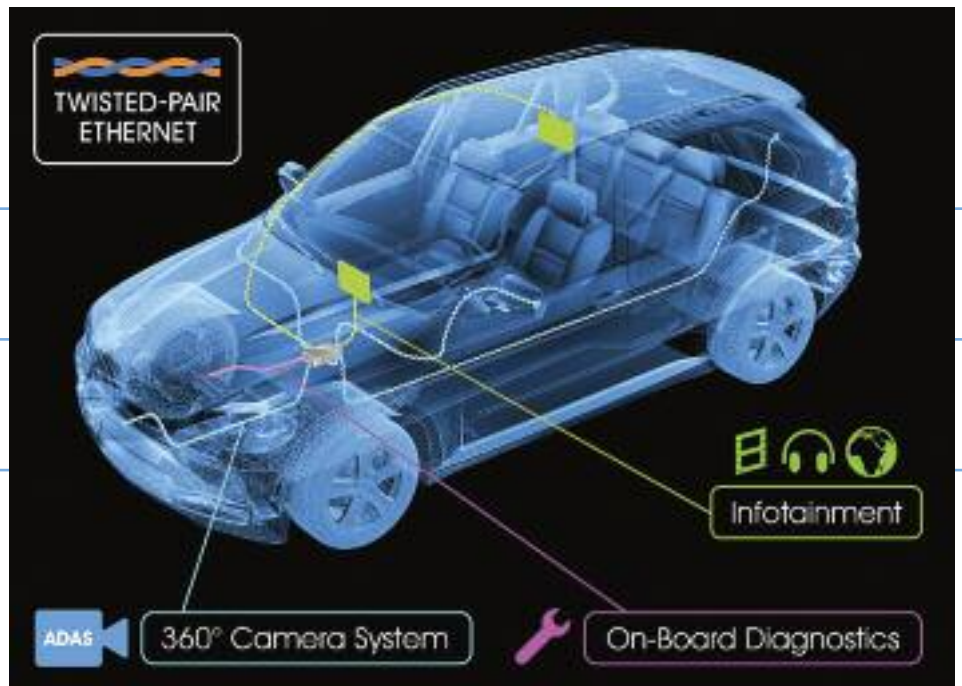
GENIVI's development is for future models, cars which are not on the road today. That technology will be out of the reach of the millions of cars on the road today that are not connected at all. Is there anything that GENIVI can do to help those cars? "Those cars could use a GENIVI-compliant stack. But there's nothing being done in GENIVI to advance the rate of adoption of an aftermarket system. Aftermarket systems are having a big problem these days. It used to be that you could buy a car and it always had the same size opening, so if you pulled the radio out, there was a slot where you could put any radio you wanted. That's not true very often any more. Car makers are styling the infotainment system into the interior. Retrofitting a car with a different system is very difficult."

...but the potential is strong for software key-activated functions in new vehicles

Although an aftermarket option appears to be out of the question, Hoffmann outlines the potential for adding features and functions through software. "Let's say that a car that comes out in 2013 has a GENIVI compliant head unit; the features in that car could make it more realistic to attach new peripherals, new devices, because of the scalability of the software. A very good feature of Linux is its ability to grow dynamically as the need arises. So, you could have a car that could be designed with an expansion slot and that slot could be located anywhere in the car. Some cars may be already equipping themselves with hardware features like cameras that are not activated unless the customer purchases a software key. And that software key could be supported on the GENIVI compliant system. The software, says Hoffmann, could come from a variety of different sources, "and that's very important. Today, if you want to upgrade software in a legacy car radio, there's no option except to replace the entire image of software. There are no options available to replace just parts of it. But the flexibility of Linux based system gives you an additional way to do that." Hoffmann emphasises that these ideas are outside of GENIVI's scope - "it's entirely up to a Tier One or an automaker to decide that's what they want to do, but the openness of the platform is going to really be important for that purpose."

GENIVI-compliant products on the road

Despite being an alliance based on open source design, GENIVI Alliance members do not publicly announce GENIVI-related product plans. "In terms of rollout and deployment, no automaker has made a public statement," says Hoffmann. "We know of more than two and less than five members of GENIVI that have stated their intent to bring a product to the market."



degree surround view parking assistance system jointly developed by Broadcom, Freescale and OmniVision in October 2011.”

IEEE - Ethernet-based PHY technology for automotive

Earlier this year, the Institute of Electrical and Electronics Engineers (IEEE) created a study group to work on automotive Ethernet-based PHY technology. IEEE RTPGE (reduced twisted pair gigabit Ethernet) aims to find reduced (ie old-generation domestic-type Ethernet cabling) twisted pair gigabit Ethernet solutions for automotive applications. “Many individuals affiliated with Broadcom and several other companies such as BMW, Bosch, and Daimler contribute to this study group,” says Abaye. The second meeting of IEEE 802.3 (the main body for the standardisation of Ethernet technologies), took place recently in San Diego, but it is too early to comment on the outcome of the meeting, says Abaye. “We are not able to comment on meeting developments at this time but look forward to continuing our involvement in the industry group.”

The targeted speed, one Gigabit, is key. “We always wanted to take a higher data rate to an established standard body, so the automotive industry can leverage the standard solutions.” Abaye is anticipating a rapid acceleration of in-car data transfer speeds. “We see in-vehicle data transfer speeds growing to over 2 Gbps (Gigabits per second) in the next couple of years, based on speeds of 2.3 Gbps for

compressed video. We expect this to come to fruition with video player-to-display devices.”

Other ways to connect

Broadcom also offers technologies for wireless, Bluetooth and broadband. In January 2010, Broadcom announced that Broadcom’s Bluetooth + Wi-Fi ‘combo’ chip solution, featuring InConcert technology, was used to provide wireless connectivity in certain Ford vehicles. “And Broadcom’s wireless and Bluetooth technologies are integrated in Ford’s SYNC system, which is based on the Microsoft Embedded Auto software platform,” says Abaye.

In the future, Abaye expects to see a combination of connectivity technologies used in cars, including Ethernet, Bluetooth and Wi-Fi, which he says “will interoperate to deliver entertainment and advanced safety features for drivers and passengers”. The car, he says, will ultimately become an access point for data. “Through developments in vehicle-to-vehicle communications (V2V) or telematics, we expect that external data can be transferred to the car so that it is treated as an access point.” Once that data reaches the vehicle, “Ethernet could function as a backbone to transmit the data,” he explains. “Bluetooth or Wi-Fi could be used to wirelessly stream songs or movies from the infotainment system to passengers’ mobile devices like smartphones, tablets and notebooks.”

Abaye hopes to tap into the widespread use of Ethernet in non-automotive applications. “Our vision on the networking side is to make Ethernet in the car happen. Ethernet is used everywhere, and the automotive industry also clearly can take advantage of that.”

The benefits of a de facto standard

With the launch of the first vehicle using OPEN Alliance-approved technology expected in 2013, the big question is whether Ethernet will ever become the de facto standard technology for in-vehicle data transfer. “Ethernet lends itself to certain applications like infotainment and safety systems,” says Abaye, “but low-bandwidth networking technology does exist today that is suitable for certain applications like body control. As such, we don’t expect Ethernet to completely displace low-bandwidth networking technology in the car and expect that Ethernet and Controller Area Network (CAN) will coexist for many years.”

Finding a de facto standard does, however, offer distinct advantages. In addition to the weight of cabling in a vehicle – wiring harnesses weigh between 30-80kg, meaning cars carry wiring equivalent to the weight of a child or even an adult – the use of multiple cable formats adds complexity. “Currently, different networks are used in cars: coax, MOST, FlexRay and so on. Eventually, and I am not saying this will happen overnight, but eventually they could all run over Ethernet, talking the same language. And that will save a lot of operations and R&D costs.”