ETI Industry Update
A publication of the Equipment & Tool Institute

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President's Message - Mike Cable

ETI has been very busy with events and implementing more programs and tools to improve the ETI membership experience. Mike Cable, ETI's president summarizes the year so far and what to expect over the next several months. Go to Page 2 to read Mikes message

Executive Manager Report - Charlie Gorman

What a year. After a somewhat scary 2009, we have rapidly recovered. 2010 has been a great year for ETI and 2011 looks even better. Go to Page 3 to read Charlie's update report on ETI's membership status, financial situation, marketing activity and technical activity.

Member Profiles

In this issue we Profile Hickok, Inc. a long standing member of ETI. Hickok recently celebrated one hundred years in business.

The year is 1910. William Taft is President, the Philadelphia Athletes win the World Series, Halley's Comet lights the sky, and a watchmaker began the Hickok Electrical Instrument Company in a small building behind his home in Atlanta, Georgia.

With one employee, and less than a thousand dollars in capital, Robert D. Hickok embarked on a long and successful journey designing and manufacturing electrical measuring instruments. Go to Page 5 for the whole story.

ToolTech 2011 Announcement

Save the Date!

Event Date: May 3-5, 2011
Event Location: Gansevoort Hotel, Miami Beach, Florida

The focus of this year's ToolTech is on the new realities of the automotive tool and equipment marketplace and the Shop Of Tomorrow. ETI continues to expand the opportunities at ToolTech 2011 and bringing value to ETI members, OEM's and other segments of the service industry.

SAE 2010 On-Board Diagnostics Symposium Report by Bob Chabot

ETI asked Bob Chabot, ETI Contributing Editor, to attend the recently held SAE OBD Symposium. He files two stories based on content provided at the Symposium.

The Bus is Full - On-board diagnostics (OBD) is on the cusp of major architectural change. The sheer volume and complexity of data being communicated is one key driver. Moving that data faster is another. As a result, the limited data transfer speed and bandwidth of controller area network (CAN) architecture could be overwhelmed in just a few years. Internet Protocol based replacements are now under development, most notably Ethernet. When implemented, scan tool manufacturers and service/repair facilities will be impacted. The whole article can be found on page 8.

Squeeze Play - Recent and pending regulatory changes, as well as safety initiatives, in the automobile industry affecting light duty (LD) and heavy duty (HD) vehicles are creating turbulence for tool manufacturers, especially scan tool makers. In addition, exponential growth in vehicle complexity, increasing interdependency between systems, a shift in underlying on-board diagnostics (OBD) architecture and security/safety concerns, coupled with demand from users for more intuitive ease-of-use and the inclusion of service paths with diagnostics, are putting manufacturers between a rock and a hard place. These forces will bring challenges to some and opportunities to others. Have you got the game to survive in these changing times? The whole article can be found on page 12.

Is J2534 the Future of Diagnostics? by Brian Herron

Standardizing diagnostics is not a new idea, it's been a topic of discussion for as long as I can remember. The one thing missing from widespread adoption in the past has been a proven and mature standard for the diagnostics hardware. Now I think one has fallen into place by accident. The whole article can be found on page 16.

Message from the President

ETI has been very busy with events and implementing more programs and tools to improve the ETI membership experience.

Summer Tech Week was well attended this year and the presentations were informative and well received. The technical information and presentations were educational and engaging and the topics were useful and contained many new MY vehicle details.

With ASRW breaking off from AAPEX/SEMA (Industry Week) this year, ETI partnered with ASA and ASRW to bring ETI diagnostic scan tool member companies to the annual event October 11-13 at the Mandalay Bay Convention Center in Las Vegas.

ETI is sponsored the ETI Scan Tool Pavilion that allowed attendees to see and meet with Diagnostic Tool Manufacturers at the event to explore ways to expand their current business/market share versus outsourcing that business.

There was a Scan Tool Theater that offered presentations daily for education and training. ETI member companies that participated in the Scan Tool Pavilion and Theater included: ATEQ, Autoland Scientech, Innova, ProgRama, Robert Bosch, and SPX Corp.

If you have not visited the ETI website (www.etools.org) recently, I suggest you take some time to check out the updates and additions. ETI is in the process of updating the Equipment Investment Planning Guide for the website. This will allow end users to get advice and plan for all the equipment their repair facility needs now and into the future. There is also a Return On Investment (ROI) calculator that provides quick ROI information and the ability to email member companies for product and equipment details.

ETI members will benefit from the product exposure as well as a marketing tool that can be used by their potential customers as well as their sales organization. And while you are visiting the website, please take a moment to provide feedback by participating in a brief survey regarding our website by clicking the link at the bottom right on our home page.

Lastly, I would like to take this opportunity to remind all of the ETI Members that registration is open for ETI's Winter Tech Week December 6-9, 2010 in Tokyo, Japan. Winter Tech Week provides OEM engineers and designers and ETI companies a forum to meet, collaborate and discuss the upcoming service needs of new makes and models, and the changes necessary in the tool and equipment industry to meet those needs. I encourage all of the ETI Member companies to send representatives to attend and learn about the new technologies being implemented that may affect the aftermarket tool
and equipment industry and plan for those new technologies. More details and the full schedule will be available soon on the ETI website.

Mike Cable
President, Equipment and Tool Institute

Executive Manager Report by Charlie Gorman

Membership:

This year we have added ten new Full Members: Bartec USA LLC, Matco Industries, Trimble Mobile Resource, Actia Inc., IOSiX LLC, FuzzyLuke Inc., Noregon Systems Inc., VRM Technologies, Test Products International and Redline Protection Inc.

We also added three new associate members: Cabeco, Speedemissions and Christian Brothers Automotive.

We currently have 60 Full Members and 14 associate members for a total of 74

Financial:

We have put together a new Finance Committee. The purpose of this committee will be to look after ETI assets, determine what dues should be for next year and beyond and develop a budget. We have always done these things in the past of course, but not through the use of a special committee. In the past this was always handled by the Executive Committee. The members of this committee are:

John Wiedemann (Chairman)	Weld Racing Wheels
Ron Carpenter	ETI's Accountant
Charlie Gorman	ETI
Tom Fisher	SPX
Mike Cable	Hickok
Greg Potter	DG Tech
Bill Eernisse	Dover
Dan Brass	Bright Solutions
Derek Miller	Alldata
Ben Johnson	Alldata

It looks like ETI's reserves will be about $810,000 at the end of the year.

Marketing committee:

Company Profiles

We are requesting that ETI members look into your company history and see if there is something to share with other members and the world. If you can put some text and pictures together, we will publish right here in this newsletter. Take a look at this issues' profile on Hickok, Inc. This is what we are looking for. You will also notice that in the sidebar are instructions on what you need to do to turn in a profile for your company.

Member Recruiting

We are going to put extra effort into recruiting non-scan tool companies into ETI this coming Year. Dan Brass, this year's Marketing VP has put together a spreadsheet of target companies for everyone to concentrate on. You can reach him at dbrass@etools.org.

We are also going to work on adding services that will help justify ETI membership even more. Mr. Brass and Mr. Gorman are working with SEMA to see if there are ways we can work together with OEMs to obtain CAD/CAM drawings that will help our members determine spatial requirements when designing new equipment for new OEM models. This will benefit Under car Group members as well as Collision Repair Group members. More on this as it develops

2011 Marketing Survey

This year's marketing Survey has to do with Collision Repair Equipment. The survey has been completed and turned over to AIM Inc., an information management company. This will be our third year with them. They helped us launch our Reprogramming, TPMS and Telematics surveys. We will be using the Babcox collision repair magazine mailing list which we think will provide us with a high hit rate.

We will be gathering and analyzing data over the winter and will present our findings at ToolTech in early May 2011.

Shop Planning and Investment Guide

The Shop Planning and Investment Guide once was an important and useful document published by the institute. Now we are bringing back, but this time on line.

We are still waiting for reports on Environmental and Safety, Shop Layout and Design and the Equipment Check List. The parts that are completed are already on the website. You can view them here.

Scan Tool Statistical Report

There were a few member companies interested in reviving ETI's Statistical Reports. It was decided that we should concentrate on scan tools first since there are so many companies who make them. It was thought that this would be the easiest product segment to launch. But there has been some resistance to this plan. Mr. Gorman sent out an email containing some questions and a list of possible tracking categories. The response was very light. This topic has been tabled until the next Board meeting.

Program Committee:

The Theme for ToolTech 2011 is "The Shop Of Tomorrow". We will be focusing on the new realities of the Tool and Equipment Marketplace. The "Shop Of Tomorrow" will provide a roadmap to the future with insights into industry trends and standards affecting our member companies, changes and challenges in the marketplace, and a look into the future of the tool and equipment industry.

We are still finalizing speakers and topics for the event. Some of the topics that are being pursued include: Automotive Update From Capitol Hill", "The Role of OEM Scan Tools in the Aftermarket Shop of the Future", "A Roadmap to the Future from the National Service Providers", "Technologies and Standards Enabling the Automotive Aftermarket", and "The Realities of Fleet Service for Today and Tomorrow".

Last year's addition of the Showcase Happy Hour was a big hit and generated traffic for the booths, so we will once again have a Showcase Happy Hour Wednesday evening in the booth area.

The One-on-One Meetings continue to be beneficial to both the ETI Members and the OEM's and National Accounts and will take place on Wednesday and Thursday afternoons.

We have changed the name of the golf event at ToolTech from the "ETI Tee Time Golf Tournament" to the "ETI Golf Outing at ToolTech" We will be promoting the ETI Golf Outing as a fun-filled event with special rules and prizes to draw a bigger crowd than in past years. The event will be a Best Ball Scramble.

Technical Committee:

Winter Tech Week 2010

Individual OEM meetings will be held at Snap-on's Tokyo office – JAMA ETI meeting will be held at the headquarter Hotel.

The website has been launched. Most of everything is there including the schedule and OEM presentation information. We will be receiving presentations from 10 manufacturers. If you haven't registered, please do so now.

To ensure you receive the conference hotel rate, be sure to make your reservation before the deadline of Friday, November 12 , 2010. Reservations made after the deadline are on a space available basis, and the conference room rate is not guaranteed.

Here is the link to go to ETI's Winter Tech Week Pages. Everything you need to know can be found there.

Questions to the OEMs – were sent on time.

Summer Tech Week 2011

We are working with GM engineering and SPX DES services to try to get GM more involved in 2011. At least from a scan tool standpoint, John Van Gilder has agreed to participate and there are others as well. I think GM will be back in 2011.

The Hotel is going to be the Embassy Suites, Troy, MI again. The dates are June 14 to 16, 2011.

The appreciation Dinner will be at the Walter P. Chrysler Museum on June 16, 2011.

TEK-NET Library Update

Mr. Gorman visited Total Solutions in August to discuss changes to the Library. The topic will be porting the library over to SharePoint Server. We need to have a meeting of the scan tool stakeholders to put together a document describing exactly what is needed and then using that document to get a quote from Total Solutions.

Disks have been going out at a regular clip. This year we are going to have an extra release because we got quite a lot of data off cycle this year. Toyota, Ford, VW, KIA, and Mazda have all released data in October. These disks will be sent out in early November.

THE HISTORY OF HICKOK, Inc.

Founding of the Company
The year is 1910. William Taft is President, the Philadelphia Athletes win the World Series, Halley's Comet lights the sky, and a watchmaker began the Hickok Electrical Instrument Company in a small building behind his home in Atlanta, Georgia.

With one employee, and less than a thousand dollars in capital, Robert D. Hickok embarked on a long and successful journey designing and manufacturing electrical measuring instruments.

The Move to Cleveland
By the spring of 1913, Mr. Hickok realized the need to be closer to an industrial center and his customers, so he moved the company to Cleveland, Ohio. One year later, one of the company's largest customers offered to sell its building for $15,000 dollars and take $10,000 of the price out in meters. Mr. Hickok accepted deal, and in June of that year moved to the present plant. The business continued to grow and the company was organized in 1915 as an Ohio corporation. However, it did not offer its securities to the public until 1959.

During World War I, Hickok manufactured indicating instruments of larger panel and switchboard types. Most of the instruments manufactured during this time were used on submarine destroyers. Many of the portable instruments made for the Navy during this time were still in use many years after the War had ended.

New Emerging Technology—Radio
The years immediately following World War I saw the development of a new technology—Radio. Early on, Mr. Hickok realized the market's need for well designed and manufactured commercialtube testers. It is believed the company developed the first ever radio tube tester.

The Hickok Electrical Instrument Company had a reputation among the servicemen for providing a high quality line of commercial radio testers, and despite the depression years, tube tester sales continued to increase. Hickok continued to lead the field by producing a variety of testers, scopes and meters to meet the demands of a developing technology.

Expanding into Aircraft Instrumentation

In 1936, the company applied its skill in engineering and producing precision test equipment to the development of several types of electrical aircraft instruments. The first instrument, a resistance thermometer, with improvements became the A.N. (Army/Navy) Universal type, allowing Hickok to become one of the first quantity suppliers of these meters to the United States Air Force.

World War II
By the time the United States entered World War II, Hickok was firmly established as a leader in their field. Having been long familiar with Hickok testers in their civilian occupations, technical engineering personnel in the electronic and communication divisions of the Armed Services readily recognized the practical usefulness and dependability of Hickok equipment.

By the 1950's, under government contract, Hickok had perfected and manufactured approximately fifty different, highly specialized electronic testers.

Post War Growth
After World War II, Hickok kept its eye on the ever-changing technologies in the electronic world. Televisions and Hi-Fi's were becoming more commonplace in the home and Hickok created the test equipment needed to service them.

Hickok also continued to develop and manufacture precision indicators and meters for aircraft, locomotive, and industrial applications. Their tube testers, voltmeters and other measuring devices were still in high demand by the military.

In 1956, Hickok purchased Supreme Instruments Corporation. Located in Greenwood, Mississippi, the division continues to manufacture the majority of Hickok's products today.

Increasing Diversification

By the mid 1960's, Hickok was active in six distinct market areas:

Commercial Test Equipment—this included oscilloscopes, color bar generators, tube testers, field strength meters, transistor testers and FM stereo generators.

Laboratory and Industrial Test Equipment—this consisted of more sophisticated, sensitive test instruments for use in the research and development laboratories of industry and colleges.

Meters and Electrical Indicating Instruments—an area in which Hickok has a long established reputation for excellence. The company was the leader in the development of the taunt-band movement that eliminated pivots, jewels or hairsprings. Principal customers were original equipment manufacturers.

Systems Control Equipment—the Cardmatic Card Reader, a proprietary product, was a direct-circuit programming activator using a tape feed or vinyl punch cards, It was adaptable to any type of programming, automatic inspection, computer or production control job.

Government Contracts—over the years, Hickok became an important supplier for meters and test equipment to the Department of Defense. The company's meters have been used in some cases for ground support of the nation's space programs.

Teaching Systems—the newest product at the time, Hickok became well known for providing training equipment and instructional aids for use in colleges, high schools, and technical schools. Programs were designed to provide practical training in electronics technology, including computer repair and operation.

The 1970's saw a shift from developing for the servicing market to focusing on measurement instrumentation for engineers and designers. This included developing the first digital measurement system that sold on the market for under $500.

A new aspect was added to the educational division with the acquisition of two schools, the Massachusetts Radio and Electronic School in Boston and the Hickok Technical Institute in Cleveland. Both schools specialized in the vocational teaching of electronics.

Entering the Automotive Market

During the 1980's, the automotive market increased its use of microprocessor-based technology to monitor engine functions, emissions, and fuel usage. Once again, Hickok recognized a need and began concentrating on designing and marketing instruments used to diagnose automotive electronic systems.

By 1995, electrical instruments comprised only a small part of the company's products, so to avoid conveying an inaccurate image of the company and its capabilities, the name was changed to Hickok Incorporated.

The company began by developing specialized test equipment for OEM's, particularly the Ford Motor Company. The New Generation Star (NGS) tester, a factory level scan tool designed for the Ford Motor Company, became a favorite tool of choice by technicians around the world.

Recognizing that much of the technology developed for the automotive OEMs could have application to the automotive aftermarket, Hickok acquired Waekon Industries in 1998. The company embarked on development programs to design tools specifically tailored to the needs of the automotive aftermarket, and develop a variety of sales channels to the market.

Since the late 1990's, products designed specifically to OEM requirements have been balanced with products developed for automotive aftermarket servicers and the emissions testing industry.

Automotive Emissions Testing

In 2000, Hickok took their automotive expertise and developed a reputation for providing quality emission testing products beginning with the patented Fuel Cap Tester that has been used in numerous state programs by emissions testing equipment suppliers.

From 2002 until 2007, Hickok worked with the State of California to develop a patented product for testing leaks in vehicle evaporative emissions systems and began shipping the product in August 2007.

In 2004, the Company developed and marketed a complete emissions testing platform for a State of Pennsylvania program.

Fuel Injection Diagnostic Technology

In addition to developing emission testing products in the early 2000's, Hickok became a leader in the field of fuel injection diagnostic technology. Developing equipment for both gasoline and diesel engines, Hickok provides the primary fuel injection diagnostic tool for several automotive OEMs, including General Motors and Navistar International.

Indicators and Gauges

Hickok continues to provide quality indicators and gauges for the aircraft and locomotive industry. Within the aircraft market, instruments are sold primarily to manufacturers or servicers of business, military, and pleasure aircraft. Within the locomotive market, indicators are sold to both original equipment manufacturers and to operators of railroad equipment.

An original grouping of products, DIGILOG Instruments, were certified with the FAA during 2002. Subsequently, several additional models have also been certified. The DIGILOG instrument is a customizable indicator that is a combination analog/digital indicator for the aircraft market. It can be adapted to display a wide variety of aircraft parameters.

Looking to the Future

As new technologies emerge, the company actively researches these areas to determine how they can develop tools to aid in the diagnosis and service. Hickok is fully committed to providing innovative, quality American designed and manufactured diagnostic equipment for years to come.

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ETI WANTS YOUR ARTICLES FOR THE ETI INDUSTRY MEMBER PROFILE!

ETI invites all of its members to submit articles on their company, products and services for inclusion in our ETI Industry Update. We will include as many articles as possible in each edition of the ETI Industry Update.

This is your opportunity to highlight who you are and what you do, and get some free PR in the process. Newsletters have great potential to promote your business, sell your products, inform your potential customers, and retain existing customers. They can increase affiliate sales, market new products, or keep your customers informed of changes. Don't miss out on an easy opportunity to promote your business. It's a practice that has a double impact on your bottom line - by decreasing expenses and increasing profits.

Please make sure you read and follow the article submission guidelines. Please email your articles to Jessie at jessiek@etools.org .

ETI MEMBER COMPANY PROFILE ARTICLE SUBMISSION GUIDELINES

- ✓ The article must be in MS Word.
- ✓ The article can be an original piece you or someone at your company wrote. It is the responsibility of the author to obtain permission for the use of any copyrighted material, including images.
- ✓ The purpose of the profile is to introduce your company, products, and services to potential customers, partners, and other companies that may be interested. Make sure the article is informative and covers the following elements:
- ✓ The history of your company. When was it founded, how long has your company been in business.
- ✓ Headquarter location and other major branch locations.
- ✓ What is the mission and has that changed.
- ✓ Has the company expanded? Have there been any mergers or acquisitions?
- ✓ Has your company received any special certifications, awards and/or recognition?
- ✓ What unique about your company and its products?
- ✓ In general terms, what are your company's plans for the future?
- ✓ The article should not contain video or sound.
- ✓ In order to maintain our format, we reserve the right to edit articles and images for spelling, grammar and size.

By Bob Chabot, Contributing Editor

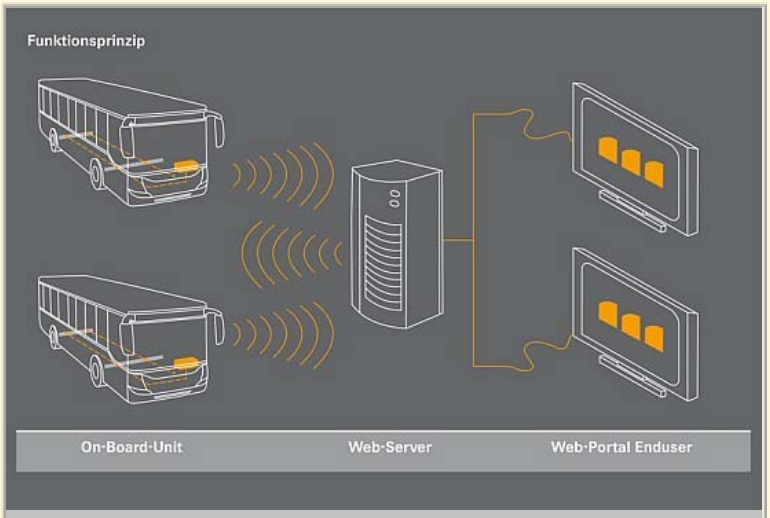
The Bus is Full

Ethernet-based OBD communication architecture will be a game-changer

This article is based on information gethered from presentations given at this year's SAE OBD II Symposium.

On-board diagnostics (OBD) is on the cusp of major architectural change. The sheer volume and complexity of data being communicated is one key driver. Moving that data faster is another. As a result, the limited data transfer speed and bandwidth of controller area network (CAN) architecture could be overwhelmed in just a few years. Internet Protocol based replacements are now under development, most notably Ethernet. When implemented, scan tool manufacturers and service/repair facilities will be impacted.

The regulation of emissions, vehicle complexity, functionality, telematics, safety and worldwide harmonization are just some of the factors causing a surge in the amount and nature of data that is communicated. Not only is the volume of data going vertical, it is also becoming richer in nature. It's also important to note that OBD is not limited to emissions only. Telematics, in-vehicle multimedia content, performance upgrades, emerging complex safety systems and other applications are driving OBD into nonemission areas, a field known as enhanced OBD.



The Openmatics concept employs one on-board diagnostic unit and then uses software to deliver apps for all telematics products and services. (Image — ZF Friedrichshafen AG)

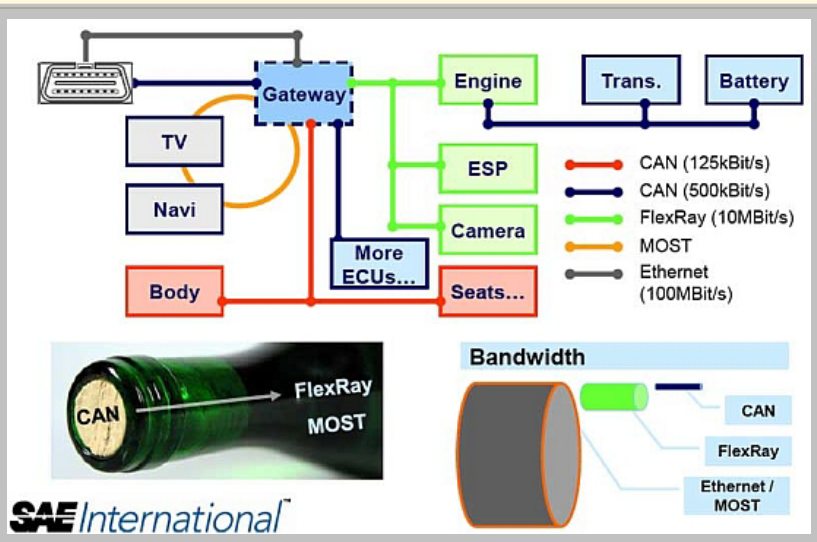
There's an app for that!

Telematics is like a giant elephant in the room that many are trying to ignore. Besides the lack of common standards, like many aspects of the automotive industry, the rise and scope of telematics is accelerating and fragmented – many manufacturers, providers and products with stand-alone solutions that have little compatibility between them. Current applications span vehicle OBD, service and repair information, navigation, logistics management, safety systems, music, video, Internet, emergency applications and more.

For an example of the fragmentation, consider these two divergent paths. Ford has announced they are developing an application program interface (API) that will allow developers to create applications for smart devices that can be controlled through its Sync system's voice and steering wheel controls. Continental's AutoLinQ plans to distribute a open-source operating system software development kit (SDK) that will allow developers to create automotive specific applications for android-based platforms only.

But here's the rub. Ford's approach is more universal, as it will enable developers to interact with the vehicle from multiple smart device platforms regardless of operating system; the Continental approach, while not as universal, potentially provides better integration between the vehicle and the apps. Why not combine the best of both approaches, if proprietary safeguards could be assured?

Research firms say that telematics is still in its infancy and that the automotive telematics market is poised to get even more crowded. For instance, Frost & Sullivan expects the telematics market to grow from $80 million annually in 2008 to over $700 million by 2015. Another consultant, ABI Research, projects that the 37 million telematics users in 2010 will climb to over 211 million by 2015. In addition, the nature of telematic content is broadening and getting richer. Moving that data requires increasing bandwidth.



CAN is quickly becoming the weakest link and the bottleneck in vehicle OBD communications. Of the alternative, Ehernet has the highest data transmission rate as well as the widest bandwidth. (Image — Christoph Saalfeld, Daimler AG)

Moving towards a common, compatible solution

For automakers, suppliers, toolmakers, service professionals and motorists, this staggering growth rate has pace and cost implications. The need for a single, open and compatible telematics platform, rather than multiple stand-alone systems, is clear. Fortunately, it may even be possible, as open-standard telematics platforms, such as the Next Generation Telematics Protocol (NGTP, developed by BMW Group, WirelessCar and Connexis), Openmatics (developed by ZF Friedrichshafen AG and Intel Corp.) and others gain momentum.

"The end-user wants a single solution" claims Thomas Rösch, director of ZF's Openmatics business unit, which is set to begin operation in January 2011. "Openmatics provides the means to integrate multiple telematics stand-alone applications. It will turn competitors into partners. The idea is to develop and offer Openmatics apps for OBD and the delivery of other telematic products and services." He adds that the concept is similar in nature to how apps are developed by many providers and then delivered universally to personal devices (e.g. smartphones, tablets, in-vehicle systems, etc.).

Vehicles would have a single 'on-board unit' (OBU) and a software platform, which will cover all telematics services and products. Using APIs and SDKs to protect their competitive advantage, Rösch says providers can freely develop their own apps, which can be deployed universally to any smart user device, and they can set their own prices. Data security and separation are a top priority: App providers will be able to define user-groups and determine the level of access within the app. Openmatics also takes care of payment processing between users and providers, as well as any further handling of the app.

Consider the potential, positive impacts on the automotive industry.

- The solution lowers costs, as it significantly reduces the redundancy of multiple telematics systems hardware installed into vehicles.
- It also opens doors to new industry initiatives. Need an automaker's service information? Tooling? OBD reflashing? Imagine if there was an app for that!
- For automakers that currently employ their own self-determined structure and system requirements allowing technicians to access service information, an app-based delivery has huge potential. Basic, as well as security- or theft-related, service information could be delivered by an app, with the level of access tiered and determined via vetted bonafides.
- For tool manufacturers, the possibility that scan and other electronic tools could be like smartphones — with automaker-specific tooling information and feature sets delivered and activated via apps — is also attractive.For service professionals, being able to use a 'smart tool' capable of downloading vehicle-based apps would improve productivity and help maintain competencies.

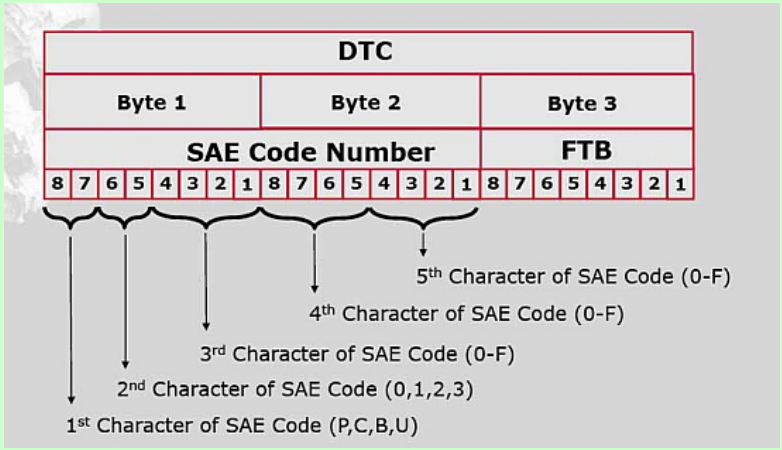
CAN is becoming a bottleneck

CAN is becoming increasingly problematic and limiting. "On all 2008 and newer model year automobiles CAN is the only allowed protocol for legislated diagnostics says Christof Saalfeld, manager for Advanced Engineering Vehicle Diagnostics at Daimler AG. "Today, however, CAN is a data link layer that may not be the best for us."

CAN's lower data transfer speeds and smaller bandwidth results in a communications pipeline that is too constricted to manage the complexity, high volume and rich nature of data today. For instance, CAN transfer speeds are typically between 125,000 and 500,000 bits/second; in contrast, Flexray offers 10 million bits/second, Media Orientated Systems Transfer (MOST) typically offers 50 and 75 million bits/second, while Ethernet delivers 100 million bits/second or more. Factor in the bandwidth attribute for each, and CAN is once again dwarfed by Flexray and MOST, which in turn, have narrower bandwidth than Ethernet.

Functionality and interdependence continues to ramp up as modern vehicles feature an evolving mix of automotive systems, consumer infotainment and comfort systems. In addition, these emerging features and functions require increased memory capacity, faster data transfer rates and wider bandwidth communication networks than CAN is able to provide.

Engine control units (ECUs), for example, are used for multiple interdependent applications today. “This is a world where the ECU is a protocol machine,” Saalfeld explains. “It implements several different communication protocols to observe OBD data, which can be emissions-related diagnostics or concerned with enhanced diagnostics (related to non-emission aspects for performance, comfort or amenities).” This increased functionality means that modern ECUs require more memory and quicker data transfer. Even building the gateways (i.e. interfaces) to connect various communication networks in vehicles requires space, weight and dollar considerations that could be better used elsewhere.



UDS over CAN communication architecture can serve as a bridge for the migration from CAN to Ethernet-based OBD communications. (Image — Jeff Craig, Vector CANtech).

An interim step provides breathing room

With CAN being increasingly viewed as the weakest link in vehicle data communication, automakers are seeking ways to keep pace with accelerating complexity and data diversity. Simplifying architecture, optimizing data transfer speed and bandwidth, as well as seeking open, harmonized standards globally are central to this quest.

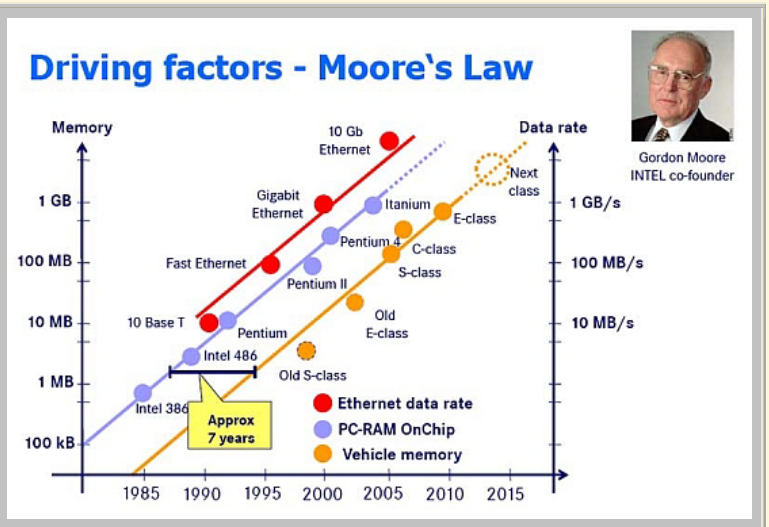
“Communication protocols are the wrappers around data,” notes Saalfeld. At one time, automakers each developed their own protocols, but the advent of emissions regulation led to some standardization regionally, although differences between the North American, European and Asian jurisdictions exist.

Automakers typically employ one protocol specification for emissions diagnostics only, while a different specification is used for enhanced (non-emission) diagnostics. Saalfeld says there is a strong interest in the short term for using the same protocol specification for all OBD, whether emissions-based or otherwise.

“They expend a lot of effort on both, so simplifying to one protocol specification would have merit,” notes Saalfeld. “In the interim, Daimler will use an archtitecture known as Unified Diagnostic Services (UDS) over CAN.” He adds that the concept has received feedback from 30 automakers already, most of it favorable.

UDS over CAN architecture employs an ISO15031-compliant three-byte (i.e. 24-bit) diagnostic identifier, comprised of a two-byte (16-bit) Diagnostic Trouble Code (DTCs) and a one-byte Fault Type Byte or Fault Mode Identifier. Switching from emissions-based OBD to UDS over CAN OBD messages offers several advantages. For example, UDS over CAN:

- Incorporates all current CAN parameter identifiers and DTCs.
- Enables one set of timings and one set of data addresses.
- Provides a means to help harmonize U.S. and European emissions regulations.
- Lets scan tool manufacturers avoid having to implement two feature sets for tools to get essentially the same data.



Saalfeld illustrates the automotive industry's seven-year lag behind the computer industry. He also compares data storage to memory capacity and overlays the evolution of communications technology, showing the speed, volume and richness advantages offered by Ethernet. (Image — Christoph Saalfeld, Daimler AG)

Ethernet will be the game-changer

As an interim step, UDS over CAN buys time for next-generation Internet Protocol-based solutions, such as Flexray, Media Oriented Systems Transfer (MOST) and Ethernet to get established. Compared to these alternatives, CAN is much slower and has a much smaller bandwidth, which can limit or even prevent richer, more descriptive data from being communicated.

Moore's Law, developed by Intel co-founder Gordon E. Moore, states that the number of transistors that can be placed inexpensively on an integrated circuit has doubled approximately every two years. Vehicle electronics and computerization follow computer chip development by a lag of seven years," notes Saalfeld. The lag between the two industries provides both security, surety and efficacy benefits for the automotive industry.

Due to the bandwidth and data limitation of CAN, Flexray and MOST, Saalfeld believes that over the long term, Ethernet will become the dominant communications system for OBD. "Imagine you have a CAN connection to your gateway [interface] and then after the gateway, you have a Flexray BUS," Saalfeld suggests. "If you want to flash reprogram the ESP, a camera system or an engine retooler, you may not be able do this because the CAN slows you down or stops you cold."

The computer industry has already developed well-established standards and in-market product experience in debugging software glitches that typically occur early after product launches. On the one hand, this would require OEMs and scan tool manufacturers alike to abide by computer world rules, not just auto industry rules. On the other, the lag allows adoption of proven technology into vehicle applications.

Besides already having well-established standards, Ethernet connections can handle more data as it has a higher data transfer rate and bandwidth. Ethernet has huge market penetration across a number of industries. Simply put, it works. Ethernet technology is also backwards compatible — new Ethernet technology can accommodate older verisons.
In addition, the explosive growth of telematics is tethered to increasing bandwidth. Current in-car telematics technologies are limited by low bandwidth. Ethernet's increased bandwidth advantage will provide opportunities to leverage richer, more disparate data to significantly increase the interaction between the in-vehicle technology and the outside world. Apps will evolve in tandem with the increased bandwidth.

Saalfeld acknowledges that some Ethernet-related concerns need to be resolved while there is time. The 2008 exclusive mandate granted to CAN architecture has to be revisited. Developing and utilizing shielded Ethernet cables to prevent electromagnetic interference is one area. Collaborating to adopt common, compatible standards to avoid redundant duplicity is another. Finalizing a shape for automotive Ethernet connections that are distinct from consumer products is another safeguard the industry has to address, as is ensuring the security.

But even with these hurdles Saalfeld concludes, "The Ethernet is the future for vehicle OBD."

By Bob Chabot, Contributing Editor

Squeeze Play

Scan tool manufacturers face a turbulent road ahead.

This article is based on information gethered from presentations given at this year's SAE OBD II Symposium.

Recent and pending regulatory changes, as well as safety initiatives, in the automobile industry affecting light duty (LD) and heavy duty (HD) vehicles are creating turbulence for tool manufacturers, especially scan tool makers. In addition, exponential growth in vehicle complexity, increasing interdependency between systems, a shift in underlying on-board diagnostics (OBD) architecture and security/safety concerns, coupled with demand from users for more intuitive ease-of-use and the inclusion of service paths with diagnostics, are putting manufacturers between a rock and a hard place. These forces will bring challenges to some and opportunities to others. Have you got the game to survive in these changing times?

User experience matters

There seems to be a disconnect between those who design and manufacture tools and those who use them. Certainly, developers have the priority to ensure the right functionality, but shouldn't usability be just as important? Perhaps trying to think like a user or involving them in product design would result in tools with functionality they want and need. Let me give you two examples, one from outside the automotive industry and one from within.

Imagine yourself standing third in line at a Starbucks shop waiting to order a cup of plain black coffee. When asked by the counter serviceperson, Customer One says," I'd like an iced quad venti non-fat dark cherry mocha." Customer Two then orders, "I'll have an extra-shot, large raspberry large skim mocha on ice." Does this make you question whether you – as Customer Three – even knows how to order your drink?

Now, let me ask you a seemingly simple diagnostics question: Can you tell me the exact difference between those two drinks? Ask a few of your colleagues, and don't let them write it down. Diagnostics, even in the coffee world, is exact, I presume. Moreover, it's a world of service on the fly.

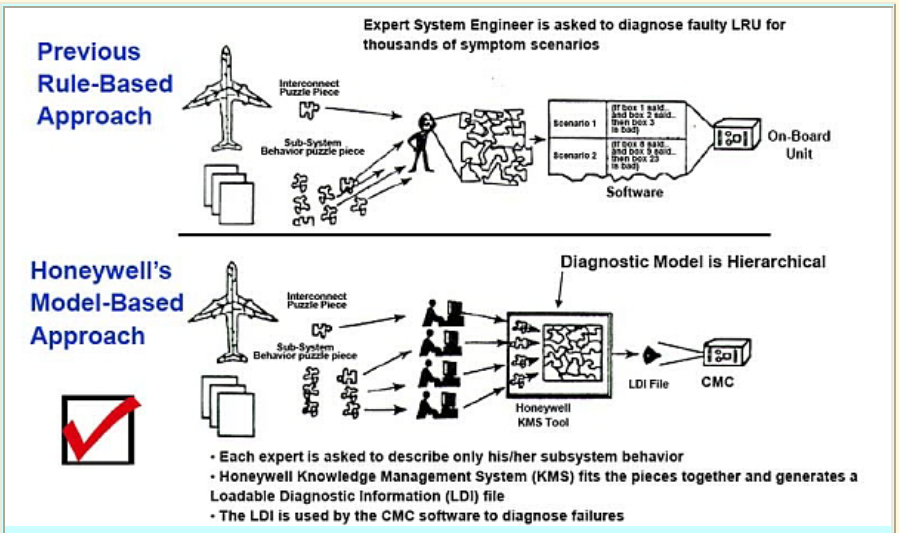
For the record, the two drinks ordered above are identical, other than one single difference — the flavor. The worst that can happen should the coffee technician complete a work order incorrectly is that, other than a short wait, the customer gets an apology and a replacement at no cost. At a price of about $4, most consumers are unconcerned. But what if, like in the automotive world, that upfront price was $100, or $1,000, or even worse, unknown? Comebacks then take on a whole new meaning.

"If you have anything to do with automotive OBD, attending SAE's OBD Conference in Indianapolis is mandatory," said Bernie Carr of Bosch Diagnostics. He went on to say, "This event represents the automotive epicenter for communications and diagnostics. With focus on industry issues and having automotive experts available for discussion, the forum is easily considered best in class by offering excellent networking and information gathering opportunities for ETI members."

Compared to the coffee world, the automotive diagnostics world, its terminology and its technology are just as industry-specific and mystifying, but the stakes and risk for the customer are ratcheted up. Fear, control, apprehension, lack of understanding, trust level and other concerns gain a foothold inside a customer's psyche, often before even purchasing your tool. The answers lie in how you proactive you are and how you respond to user concerns: They can be a hurdle or an opportunity to build relationships and a client for life for those who grasp it.

Now, consider what plays out when a "Check Engine" light comes on: When a tech hooks up a scan tool, the diagnostic trouble codes (DTCs) are displayed. Of course, we all know it doesn't end there. A DTC is not a diagnosis. The on board diagnostic (OBD) system has, however, detected a fault. More diagnosis is almost always required, often with additional diagnostic tools such as a smoke tester, borescope or multimeter, before any parts can be replaced. To do otherwise is to play parts roulette and make comebacks a regular occurrence.

With today's telematics connectivity (e.g. OnStar, Sync, mbrace, AutoLinQ), what if instead of the "Check Engine" light, a more descriptive and appropriate message popped up on an in-car screen such as "Your vehicle may have an emissions fault. Your EVAP system circuit has a problem. It's safe to continue driving your vehicle for a short period, but your car's fuel economy, emissions and performance will suffer. You should schedule a service appointment as soon as possible." Wouldn't this make for a more connected motorist-customer?



Conditions-Based Maintenance (CBM) is replacing Rules-Based Maintenance on aircraft. CBM reduces the cost of fault model development and offers better support for the diagnosis of intermittent faults, prognostic data collection and design improvement. It also uses limited on-board computing resources and network bandwidth. The next front may be a migration of CBM to automotive safety-critical electronic systems. (Image — Tim Felke, Honeywell, presented at 2010 SAE OBD Symposium)

Pie in the sky?

Recently, safety has emerged as a growing issue. Safety-related concerns, related legislation under consideration and innovative passive and active vehicle safety systems (each with OBD) is in the news almost daily. When it comes to safety, there has been a long history of influence from the aerospace industry upon the automobile industry.

Airplanes have much more complex OBD, prognostic and redundant systems, much of it designed to prevent a catastrophic fall to earth, says Tim Felke, Engineering Fellow in Honeywell's Condition-Based Maintenance Group. The high regard for safety in addition to the higher investment in an airplane relative to an automobile makes the premium for safety and diagnostics more affordable. Yet technology does transfer to automobiles over time.

Boeing 777s have three multipurpose control display units (CDUs) located on the flight deck that provide data display and entry capabilities to the pilot for flight management functions. These units are the primary interface with the integrated Airplane Information Management System (AIMS). Developed in 1991, AIMS replaces the former system of multiple black boxes and eliminates much of the wiring harness communication on aircrafts. It organizes everything together in one rack that the OBD modules plug into. This enables higher speed communications between the modules and allows system partitioning to be optimized around functional blocks, such as power supply modules and processor modules.

In addition, aerospace conditions-based maintenance OBD architecture employs two supervisory systems. The Crew Alerting System provides safety-critical indications of loss of function to the flight crew. The Maintenance System provides nonsafety critical assistance to ground personnel for fault isolation and repair. Line Replaceable Unit (LRU) modules detect fault conditions and loss of functionality.

"LRUs are responsible for fault containment and recovery," explains Felke. "Flight deck checklists have been created for fault conditions that require action by the crew," He adds that all crew actions are entered into a log book. "When something goes awry on a Boeing 777, a schematic of the affected safety system pops on a display in the cockpit," says Jack Hendrickson, senior trainer for American Airlines Training and Conference Center in Dallas-Fort

Worth. "The location of where the problem is highlighted on the schematic. The pilot can then touch the screen and get detailed instructions from the AIMS to address and correct the problem in-flight. If necessary, the pilot can make Arrangements for an emergency landing, if necessary, at the nearest airfield, normally no more than 160 miles away during a flight."

While there is typically a time lag before aerospace OBD systems migrate to vehicles, as well as a watering down of functionality based on need vs. cost, it is unlikely that a pop-up system schematic and OBD remedy system will show up in vehicles. But given recent safety problems associated with vehicle electronics and the political attention being paid to them, the potential for more sophisticated OBD safety-related scan tool functionality appearing in cars is there. For instance, imagine if automotive scan tools diagnosis worked more like a 777's.

Reining in Diesel

"OBD is an unsung hero," says Tom Cackette, chief deputy director for the California Air Resources Board (CARB). "California's goal is to achieve an 80 percent reduction in CO2-equivalent emissions by 2050. The reality is that if we don't get started now, we automatically lose. This means OBD will continue to be an enabler for both LD and HD diesel."

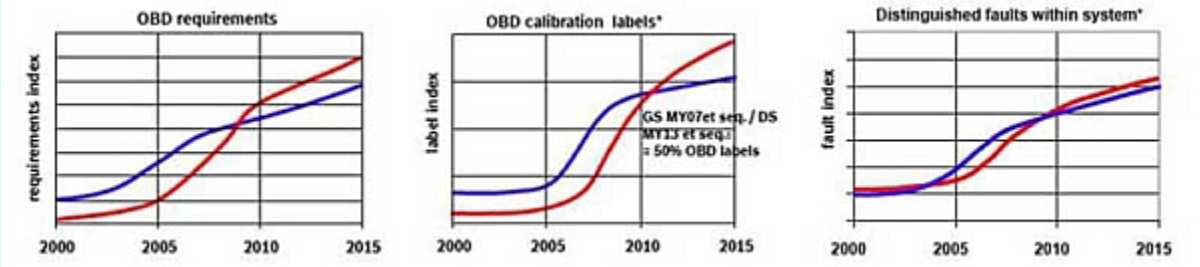
California Air Resource Board (CARB) emission regulations for HD and LD diesel were formally approved in May 2010, for implementation in 2013. The next planned review is in 2012. For the most part, changes were made to harmonize HD with LD diesel OBD II regulations, which are newer.

"Diesel engines can be a significant low-emission, high-efficiency powertrain option," says Joe Kubsch, executive director of the Manufacturers of Emission Controls Association. "But achieving near-zero exhaust emissions poses significant future OBD challenges that will drive technological innovation."

As diesel engines begin to be monitored to the same strict levels as gasoline engines, there will be more and more need for scan tools to diagnose them. Diesel scan tools will become increasingly more complicated to design from a software standpoint. These two factors will motivate established LD scan tool manufacturers to enter the field and cause HD scan tool manufacturers to improve their game.

However some changes regarding HD were made:

- J1962 connector must be mounted to the left of the brake/clutch pedal and it may not be covered by a door.
- All 2013 and subsequent model-year engines shall have the engine serial number (ESN) available in a standardized format (e.g. Mode $09, Infotype $0D).
- Only one electronic control unit shall report the ESN to a generic scan tool.
- The addition of Mode $09 IUMPR reporting for diesel fuel system monitor.
- Revised engine idle definition for HD vehicles.



Underlying architecture for scan tools is headed for change, driven by system type — gasoline (blue) or diesel (red)— and pending applicable legislation. OBD requirements, the number of OBD calibration labels and number of slots available for more DTCs and parameter identifiers (PIDs) are rising, especially for diesel. (Image — Gunther Driedger, Robert Bosch GmbH, presented at 2010 SAE OBD Symposium)

Harmony is a moving target

Recent attempts to harmonize the differences in OBD standards and monitoring that exist globally have had limited success. It's immensely difficult to braid divergent regulatory systems, each with their own inertia and sense of authorship.

"The worldwide OBD regulatory efforts are not harmonizing in all areas of HD diesel regulation," notes Jim Nebergall, a technical advisor with Cummins Inc. "Monitoring requirements are converging in some areas, while standardization requirements are significantly diverging."

For example, the United States uses continual malfunction indicator lamp (MIL) behavior as criteria, while Europe uses discriminatory MIL behavior. Another is the U.S. broader focus on particulate matter, oxides of nitrogen (NOx), hydrocarbons and carbon monoxide; Europe is only focused on the first two. From a HD certification standpoint, the United States allows self-certification, while Europe requires witnessed certification.

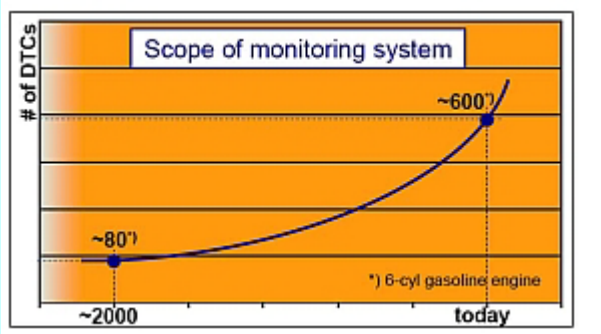
The gaps that remain impose different requirements on scan tool manufacturers feature sets for different jurisdictions. “Having common requirements reduces complexity, lowers costs and increases quality and reliability, with little value to the environment or end-user,” Nebergall adds. Challenges that need to be overcome include developing a common OBD system that can meet the different sets of requirements and harnessing increased scan tool development costs.

Shifting architecture

Changes to Society of Automotive Engineers (SAE) or International Organization for Standardization (ISO) documents can mean new or repositioned connectors, algorithms, coding and scan tool implications. That’s everyday, run-of-the-mill stuff. Major shifts in underlying network communications architecture are on the near horizon that are poised to impact scan tool manufacturers.

Relatively slow data transfer speeds and bandwidth limitations are prompting initiatives to move network communications from controller area network (CAN)-based to other architecture, such as Flexray, Media Orientated Systems Transfer and ultimately, Ethernet.

Another example of architectural change heading downstream is Fault Symptom Exchange Description (FXD), a new standardized diagnostic exchange format, agreed to by Volkswagen, Audi, Mercedes-Benz, BMW, Porsche, Continental and Bosch. “The evolving complexity of OBD monitoring systems and regulation has increased the number of DTCs dramatically,” explains Matthias Stampfer, a spokesperson for Continental AG.



The motivation for the development of FXD as a new standardized diagnostic exchange format lies in technological progress, evolving complexity of OBD monitoring systems, the need to be capable of handling more DTCs, and more OBD regulation, notably for diesel. (Image — Matthias Stampfer, Continental AG, presented at 2010 SAE OBD Symposium)

In this joint venture, the automakers defined the requirement, while Continental and Bosch developed the FXD format, Stampfer adds. The format can accommodate more disparate sources of diagnostic information (photos, documents, table, mixes) that was driving the generation of consistent and common documentation between OEMs and suppliers and regulators. FXD is currently being piloted, with the first diagnostic scan tool to be released in late 2010.

Another architectural concern is security. Carmakers and suppliers are adding smartphone connectivity to vehicles. Examples include General Motor’s OnStar, Ford’s Sync, and Daimler’s mbrace and Continental’s AutolinQ. “For the first time, engines can now be started and doors locked by ordinary consumers, from anywhere on the planet with a cell signal,” states Dave Kleidermacher, chief technology officer at Green Hills Software, which builds operating system software that goes into vehicles and other embedded systems.

“Manufacturers need to design the systems with security in mind from the very beginning,” Kleidermacher adds. “You cannot retrofit high-level security to a system that wasn't designed for it. People are building this sophisticated software into cars and not designing security in it from the ground up, and that's a recipe for disaster.” He notes that there have already been several instances of hacking into electronic systems, including ones with OBD.

The extension of OBD to monitor and address nonemissions malfunctions to monitor faults is clearly a trend that scan toolmakers have to address. Examples include airbags, antilock brake system (ABS), electronic stability program (ESP), active safety systems and app-delivered telematics. In addition, making tools backward-compatible isn’t always done or possible without driving costs beyond an economic threshold.

It is clear that OBD isn't going away; it’s just going to get more complex and demanding of scan tool manufacturers. So consider one more trend. Just a few years ago, smartphones and apps didn’t exist. What if scan tools a few years hence are smartphones or tablets? Would that rock your world?

Global Diagnostics using SAE J2534-1 and J2534-2
By Brian Herron

Standardizing diagnostics is not a new idea, it's been a topic of discussion for as long as I can remember. The one thing missing from widespread adoption in the past has been a proven and mature standard for the diagnostics hardware. Now I think one has fallen into place by accident.

In this article I'm going to build a compelling case for a change in diagnostics. I'll first take a look at the current state of the industry, and for opportunities for improvements that can benefit the OEM, supplier, dealership, repair shop, and ultimately the customer.

These improvements not only save cost, but increase accessibility to the right tools needed to fix the car correctly; anywhere, anytime.

Next I'll cover SAE J2534, a vehicle communications standard that many believe is the answer. I'll talk about its history, intent, and what's happening with it today.

After that I'll take a look at the Vision of using SAE J2534 as the standard diagnostics interface, and review the use case. Lastly, we'll summarize the benefits of standardizing diagnostics with J2534, cover some of most common misconceptions, and outline a plan to move forward.

I think the first thing we need to do is step back and look at what happens during development of a next generation tool. Typically Next Generation diagnostics programs start several years before they reach dealers hands. Each OEM may be different, but generally the process is similar.

In the early stages, the OEM sends out RFQ's for the diagnostics Hardware, and awards a contract. Sometimes the contract is based on improving the vendor's existing hardware platform, but more commonly the hardware is designed from the ground up to meet the OEM's requirements

In these scenarios, there must be a communications spec that PC application developers use to talk to the hardware. When a SAE standard vehicle interface is not a requirement, not only does that preclude the opportunity to use off-the-shelf hardware that may be cheaper and readily available, but it also adds a lot of work in development to define and test the proprietary interface.

After contracts are awarded, development usually begins quickly. A PC Application for Diagnostics and a hardware interface must be developed for the factory program. In addition to this effort, there must also be an application developed to satisfy EPA, CARB, and EURO reprogramming requirements (J2534 or ISO22900)

What many are doing under today's model is re-creating the wheel. On one hand we're re-inventing hardware that can be displaced by standardized hardware already in the market. The other major opportunity is to consolidate the Diagnostics Application and J2534 regulatory program.

Once initial development is over, the product is released to dealers. There is a huge variation in cost from one OEM to another, but the average for non-standardized hardware programs is between $2000 - $8000 for the tool itself.

Around the same time, the OEM launches a J2534 diagnostics program from their website. This is required by the EPA, CARB, and EURO regulations for emissions programming.

After the dealer roll out, the factory diagnostics tool is re-sold to the aftermarket. The aftermarket price is typically higher than dealer cost for a number of reasons, most commonly because it is marked up and distributed thru a different channel. Shops will have to decide if they can justify the cost of each OEM's factory tool as most cannot afford to buy them all.

During the program's life, the OEM will have to support both the factory diagnostics program, and the J2534 application. Often the 2534 application will be maintained by separate code and will require separate updates every time a new vehicle is launched or a bug is found. In other words, problems fixed during the normal course of support for the factory diagnostics program may not make their way into the J2534 application used in the aftermarket.

At the end of the program, the whole development cycle will begin. In the past this would mean all new hardware. In today's model, the hardware needed just to perform factory diagnostics is expensive and out of reach for most technicians in the aftermarket.

Looking at the current development cycle, it's clear that there are some improvements that can be made. That's true for anything, nothing is perfect. But there needs to be a driving force to make it happen.

That driving factor here is COST! Everyone is worried about cost from the OEM and dealership to the aftermarket technician and ultimately the CUSTOMER.

The OEM's cost could be reduced by shortening development time, consolidating J2534 development with the factory program, and picking from hardware solutions that are standardized and therefore more competitively priced. At the same time, having a more affordable solution would allow more aftermarket shops to purchase it, leading to increased diagnostics subscription revenue.

The Dealership and aftermarket repair shop both are always looking for lower cost fully functional tools. Additionally, a lower cost to repair shops mean they can afford to buy more factory diagnostics tools, and have a greater level of service to their customers.

Technicians want a single interface that works for multiple OEMs. Imagine if the same piece of hardware could be used to service two different car brands. A standardized tool would allow them the ability to purchase tools from multiple competing vendors, share the same tool for multiple OEM diagnostics solutions, and enjoy a longer life for the hardware than a bespoke factory tool.

The customer benefits because they can take their car anywhere and have the car fixed with the right tools.. When your customer's car is broken, they are likely to remember good and bad experiences the next time they are shopping for a new car.

The key to reducing cost is adopting standards. Imagine a world where next-gen system could re-use the previous generation of hardware.

As I said at the beginning of this article, this whole concept isn't new. But until now there have been several factors that have prevented widespread adoption of a standard vehicle communications interface.

Current generation tools were developed 10 years ago. What did the landscape look like then?

In the Past	Today
few similarities in the VCI from OEM to OEM	CAN is widespread and Tier1's provide the same ECU systems to multiple OEMs
Bespoke "handheld" diagnostics tools were very popular	Using a PC, Laptop, or Netbook is very popular
no proven standards for the vehicle communications interface	there is a proven standard that exists, SAE J2534

I think one of the main reasons for lack of VCI standardization has been the difference in vehicle networks. If you walk back in time 10 years, which is when many OEMs developed their current generation diagnostics systems, it was a completely different world. In the vehicles of 10 years ago, there may have been completely different protocols used. CAN was still an emerging technology at that time and not present on most vehicles. Today, CAN is on almost every vehicle and Tier1's are supplying the same ECU's to several different OEMs.

Looking back 10 years ago, the PC was just beginning to be introduced into the repair shop as an essential tool. Today, I don't think there's a high end diagnostics shop in the country without one.

Another reason why the industry hasn't standardized yet is the lack of standards. Again, you have to look back 5-10 years when today's systems were being developed.

With all of these pieces falling into place, it's not time to stop re-inventing the same thing. Why do 10 OEMs all need to have their own proprietary VCI design? The same minimum set could satisfy all of them.

At this moment in time, we have reached a point where an existing SAE standard has become relevant for a new role.

The SAE standard J2534 was first written in 2002. It was originally developed as a standard for emissions reprogramming, and was regulated by the EPA and CARB. here have been several revisions to the document to improve the spec and increase testability of devices. Today, it has been proven as a viable standard and has had success.

The intent behind SAE J2534-1 was to offer aftermarket repair shops the ability to repair vehicles that required software updates. The EPA Legislation required emissions programming on any 2004 or newer vehicle. Since release, many OEM's have offered J2534 emissions programming back to as early as 1994 vehicles.

There are three J2534 standards, J2534-1, J2534-2, and J2534-3

- J2534-1 is the regulated standard. It was mandated for emissions programming and all OEMs must comply with it
- J2534-2 is the optional set.
- J2534-3 is the test against J2534-1

Since it's publish date, every major OEM selling cars in the USA has been required to offer J2534-compliant software for emission reprogramming.

In the aftermarket, where the standard was meant to help technicians, it has grown into an important tool. Over the past 8 years technicians have learned what it is, how to use it, and it has become necessary for service at shops that do not have the factory diagnostics solution.

SAE J2534 has also been included in EURO5/6 regulations, and can be used to fulfill the requirements for emissions programming.

J2534's original intent was for vehicle reprogramming. IT was developed because there was no standard for vehicle interfaces that could be utilized in the aftermarket. Once it was published, OEMs began to realize that the same API used for diagnostics could also be used for reprogramming. This lead to OEMs developing their own internal engineering applications that use SAE J2534 devices, and ultimately releasing diagnostics to the aftermarket over SAE J2534. This was welcomed by technicians in the aftermarket that had already purchased SAE J2534 interfaces for reprogramming.

This activity also had a unique benefit to OEMs. They could now use the same software stream for diagnostics and reprogramming, fulfilling the EPA/EURO J2534 requirements. This not only meets the requirements now, but pre-empts future regulatory requirements

There is now a growing number of OEMs that are offering diagnostics over J2534. BMW was the first to offer some factory diagnostics over J2534 from their web-based system. Toyota was next, and was the first to offer the entire factory diagnostics solution, at the dealership AND in the aftermarket over SAE J2534. Several other OEMs have announced plans to develop their next generation systems using SAE J2534.

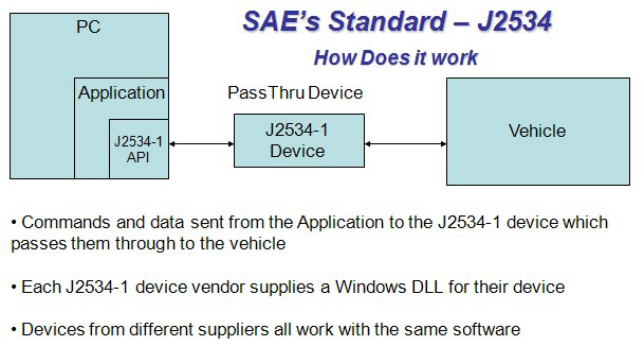
Toyota is the first OEM to offer full factory diagnostics to the dealership and aftermarket using J2534.

Depending on the OEM requirements, J2534-1 may be complete enough to meet the full diagnostics requirements without the use for J2534-2. I mentioned that Toyota implemented their entire factory diagnostics program over J2534. This is a great example of an automaker that was able fit their entire program requirements within the J2534-1 Specification.

As the J2534 specification has matured, it was clear that some OEMs would need special features for service that extend beyond what is written in J2534-1. The SAE committee wanted to create a way that OEMs could add in optional features while still having them standardized and developed in the working committee.

That need lead to the creation of J2534-2. J2534-2 is not regulated or required by any legislation, but does allow the OEM to expand J2534 to meet special requirements. OEMs have expanded it to support diagnostics, security keys, and non-emissions module programming:

Some recent examples include: Honda added Diag-H, GM added UART and Single-wire CAN, VW added TP2.0. This standard gives OEMs a mechanism to standardize and support new diagnostics protocols as technology advances.



There are some other intangible benefits of using SAE J2534 for diagnostics beyond just using standards.

As described earlier, the SAE J2534 standard is basically just passing data thru from the PC to the vehicle in a standard way. The secrets and intellectual property relating to diagnostics, proprietary data, reprogramming, and ECU security is all controlled from the PC application. This allows the OEMs to separate the hardware from their intellectual property. There are no OEM secrets stored inside the hardware, and the OEM can maintain full control of the PC Application where their secrets are held.

By moving the complexity into the application, it makes standardizing the hardware much easier. Now the hardware vendor doesn't need to keep track of OEM-specific diagnostics data and continually update their device. It also removes cost because the device is simply passing messages back and forth.

Moving the IP to the PC application also allows the OEM to re-use more IP with each next generation tool because the hardware is interchangeable and PC application code is often re-used.

The vision for the future is simply this: In the future, OEMs should write their factory diagnostics software to use the SAE J2534 standard.

This enables them to have a single software stream for both the dealers and aftermarket that fulfills the diagnostics and J2534 requirements.

In addition, OEM's can release this to the aftermarket by charging a subscription fee from their website. This allows the OEMs to bring in revenue directly from the technician without having to give profits and markup thru distribution channels.

Shops will enjoy this model because they will be about to use one J2534 tool for multiple OEMs. When using the OEM software it will detect with J2534-1 and J2534-2 features are present on the tool and only features that can be supported on their device.

Finally, this mass implementation of J2534 will drive down the cost of hardware to technicians. What costs thousands of dollars per tool today will cost hundreds of dollars per tool in the future when it's more widely adopted. Toyota's J2534 "Techstream Lite" tool the first J2534 tool to be adopted in dealerships, retails for $495 to technicians everywhere.