Verizon a Telematics Player

As cars become increasingly electronic, more and more carmakers are making their presence felt at the world’s biggest electronics industry gathering, the Consumer Electronics Show in Las Vegas. This year most of the carmakers and their suppliers were saying the same thing, “Our products will keep you and the vehicle connected to the outside world.”

The ability to connect has been dramatically upgraded. As Verizon CEO, Lowell McAdam, said in his keynote address at CES, “When LTE 4G was launched in 2011, the average speed of mobile connections was less than one megabit per second and now the average speed has climbed to more than 12 megabits per second.” He sees higher speed as the next big wave of the computing revolution, a new era of advanced mobile devices. Mr. McAdam, who was joined on stage during his keynote address by Ford CTO, Paul Mascarenas, believes the connected car will be a significant part of that revolution. Mr. Mascarenas hinted that future Ford vehicles would be cloud-connected, not only to keep drivers and passengers connected, but to optimize the vehicle’s performance.

A year ago Verizon acquired the cloud services company Terremark for $1.4 billion. Terremark has more than 200 data centers worldwide. This past July, Verizon purchased Hughes Telematics Inc. for $612 million. In 2011, HTI’s revenue was $71 million with a net loss of $85 million. HTI provides telematics services to Mercedes Mbrace customers. Thus far, Mercedes is HTI’s only carmaker account.

Mark Spain, director of planning and marketing for Verizon Wireless, spoke at the Consumer Telematics Show prior to the CES, page 3
CAN FD...

users and manufacturers, CiA promotes the standardization and use of the CAN protocol.

Use Cases
- **Faster Downloads at the Factory and in the Service Bay**
  CAN FD will first be used to speed up end-of-line programming of vehicle ECUs, particularly those with especially large programs, for example powertrain controllers. Since CAN FD controllers can also take part in standard CAN communications, all ECUs needn’t be fitted with CAN FD protocol controllers. During downloads, controllers that don’t support CAN FD can be kept in standby. For that to work, partial network CAN transceivers must be used in each ECU. “Based on our calculations, programming times in our factory can be reduced to one-third or even one-fifth of what they are now,” said GM’s Ms. Wienckowski.

- **Faster Communications Between ECUs**
  With more and more features coming, data traffic from sensors and between ECUs is inevitably on the rise. CAN FD’s higher data rate and larger payload mean carmakers will be able to use fewer networks. “CAN FD is reducing the number of CAN networks we will need,” said GM’s Ms. Wienckowski. “Instead of having two or three CAN networks in some ECUs, we’ll be able to have just one because we are able to get more data on that same pipe. Without CAN FD, the number of CAN networks would probably have to double. Migrating to CAN FD requires significantly less effort than moving to a new standard.”
  According to Vector, CAN systems with bus loads in excess of 50% are good candidates for CAN FD. CAN FD is expected to be used in event-triggered applications that require a higher data rate, whereas FlexRay is better suited to time-triggered applications.

- **Faster Communications on Large Commercial Vehicles**
  According to Daimler Trucks, CAN baud rates on long cable runs are limited, due to propagation delay, to 667 kbit/s. With CAN FD, the bit rate could theoretically be increased to 2 Mbit/s using existing physical layers and topologies.

**Bosch’s Comprehensive CAN FD Rollout**
In creating CAN FD Bosch wanted to speed up CAN communications while keeping the barriers to adoption as low as possible. The protocol was invented in 2010 and a white paper was published in August 2011. An ecosystem is already developing to support CAN FD, including tools from Vector Informatik (CANalyzer and CANoe) and ETAS (Busmaster).

**NXP, Freescale and STMicroelectronics**
have announced roadmaps for CAN FD transceivers and microcontrollers. The protocol specification has been available since April 2012, and work to adopt the specification as ISO standard 11898-7 is underway. This past August, the Autosar consortium agreed to accommodate CAN FD in release 4.1.1. Organized and supported by Bosch and CiA, CAN FD TechDay was held in Detroit in October.

For much more on CAN FD and the Detroit Tech Day please visit http://can-newsletter.org. A similar event is planned for Frankfurt in March 2013.

Next-generation ECUs from Bosch will support CAN FD. “We’ll gain the ability to more quickly flash ECUs on our production floor, and that alone will pay for our investment in CAN FD,” said Thomas Lindenkreuz, director of Bosch Automotive Electronics, during his CAN FD presentation at AUTOMOTIVE ELECTRONICS. "With CAN FD, the bit rate could theoretically be increased to 2 Mbit/s using existing physical layers and topologies."

Continued from page 1
the start of CES and sat down with the Hansen Report after his presentation to talk about the significant role Verizon can play in this era of vehicle and personal connectivity.

“With our network, our telematics software and platform, our security platform, our cloud services and content, Verizon is now positioned to reduce a lot of the complexity that confounds carmakers,” he said. “Carmakers can’t possibly embed hardware in the car that can anticipate what the car will need ten years from now. We can deliver software updates, services and content from the cloud throughout the vehicle’s life. And we can collect and analyze data coming from the vehicle to create value for the carmaker.”

Mr. Spain was senior director of the Microsoft Automotive Business Unit in 2006 when Microsoft collaborated with Ford to commercialize Ford Sync. Martin Thall, who is the vice president for M2M Platforms at Verizon Enterprise Solutions, also has experience at Microsoft. Mr. Thall was vice president and general manager of Microsoft’s Automotive Business Unit from 2004 to 2008.

Verizon believes that ultimately most cars will come equipped with embedded connectivity, and it is devising ways to make paying for the required data plan palatable even to the most cost-conscious consumers. Verizon already offers its Share Everything plan, which provides unlimited data for up to ten devices. A family’s cars with their embedded modems could be among the devices served by the plan, or each LTE connection could be split into multiple channels with a number of entities splitting the bill. “For example, one channel could provide the consumer with content, another channel could be used by the carmaker to collect data, a third channel could be used by a service provider,” offered Mr. Spain.

Delphi announced a new cloud-based automotive connectivity service for consumers that connects the vehicle to the cloud by means of a device that plugs into the vehicle’s OBD II diagnostic port. The device, which includes a modem, GPS receiver and accelerometer, can connect any car sold in the U.S. since 1996 to the cloud. It allows owners the ability to track, locate, access and monitor their vehicles from a smartphone or browser. The device, called Vehicle Diagnostics, qualifies for Verizon’s Share Everything plan and will be available online and in Verizon Wireless stores in the coming weeks. Data transmitted through the Delphi connectivity system remains secure and encrypted over the Verizon Wireless network. Vehicle Diagnostics operates through a downloadable smartphone app available for Android 2.2, and later for Apple iOS 5.0 devices.

Audi won’t need Verizon’s aforementioned cloud services. The carmaker is—or soon will be—using its own private cloud to analyze traffic, ensure data security, enhance maps based on traffic sign recognition, keep track of driver presets and to update software. These are just some of Audi’s cloud based M2M applications, according to Audi Connect project manager, Arne Zörb, who I spoke with at Audi’s visually stunning and crowd pleasing exhibit at CES. Audi sees the cloud as core technology, especially when it comes to data encryption and protecting the vehicle from hackers. Audi won’t do real-time computing in the cloud; that is done onboard the vehicle. Rather, the cloud will be used as a data warehouse and for extracting value from the data.

Ford used CES as the venue to launch its AppLink Developer Program, which enables software developers to write smartphone apps that directly interface with the vehicle. App developers can now register at http://developer.ford.com to download Ford’s AppLink SDK.

### Possible Future E/E Architecture with CAN FD and Ethernet Backbone

<table>
<thead>
<tr>
<th>Body &amp; Cabin</th>
<th>Vehicle CU</th>
<th>Communications Gateway (Optional)</th>
<th>Domain Backbone</th>
</tr>
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<tbody>
<tr>
<td>CAN (FD)</td>
<td>CAN (FD)</td>
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<tr>
<td>Inverter, DC/DC CU</td>
<td>Battery CU</td>
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<tr>
<td>message</td>
<td>Charger CU</td>
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<tr>
<td>Sensor 1</td>
<td>Sensor 2</td>
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<tr>
<td>Sensor 3</td>
<td>Camera 1**</td>
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<tr>
<td>Range extender CU</td>
<td>Camera 2</td>
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<tr>
<td>Powertrain</td>
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<td>Ethernet</td>
<td>Audio/Video</td>
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<td>Ethernet</td>
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<td></td>
<td>Ethernet</td>
<td>Camera 1**</td>
</tr>
</tbody>
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*Driver assistance systems
**Camera for top view

*Source: ETAS, a subsidiary of Robert Bosch GmbH*
The Company Profile... Parrot S.A.

**Thumbnail Sketch**

**Headquarters:** 174 quai de Jemmapes, 75010 Paris, France; Telephone: 33 1 48 03 60 60; www.parrotoem.com; www.parrot.com

- **2011 Revenue:** €247.7 million
- **R&D:** 12% of revenue
- **Interest Expense:** €291,000
- **EBIT Margin:** 13.1%
- **Operating Cash Flow:** €38.6 million
- **Working Capital:** €132.8 million
- **Shareholders’ Equity:** €197.5 million†
- **Financial Debt:** €26.2 million†
- **Market Capitalization:** €361.7 million as of December 27, 2012
- **Employees:** 695 at year end 2011, including 395 in R&D. At year end 2012, Parrot employed 500 R&D personnel, 450 of whom worked on software.
- **Sales per Employee:** €356,403; Parrot has no in-house manufacturing.
- **2012 Estimated Revenue:** €280 million
- **Ownership:** Company founder Henri Seydoux holds 35.3% of the company’s capital and voting rights.
- **Automotive Products:** Integrated and stand-alone infotainment connectivity modules; infotainment systems
- ***As of December 31, 2011**
- **†As of September 30, 2012**

**Background**

Founded in 1994 by Henri Seydoux, Parrot is organized as a public limited company (société anonyme) with headquarters in Paris. The company completed a public offering in June 2006, but Mr. Seydoux still holds 35% of the company’s shares and voting rights. The first Parrot product launched was a voice recognition-enabled electronic diary, in 1995. The company moved quickly to establish itself as a leader in handsfree phone kits—cradles that held the phone—for vehicles starting in 1999 with wired solutions sold in the aftermarket. Based on some development work it began for Peugeot, Parrot launched its first Bluetooth car kit in 2001. Two years later, after the product proved successful and reliable in the aftermarket, Peugeot introduced the first OEM Bluetooth phone kit.

<table>
<thead>
<tr>
<th>Parrot Revenue and EBIT Margin by Year</th>
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<tbody>
<tr>
<td>2007 to 2011 CAGR: 3.0%</td>
</tr>
<tr>
<td>2007               12.2%</td>
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<tr>
<td>2008               7.5%</td>
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<td>2009               4.4%</td>
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<tr>
<td>2010               13.1%</td>
</tr>
<tr>
<td>2011               13.1%</td>
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<tr>
<td>2012*              13.1%</td>
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</table>

<table>
<thead>
<tr>
<th>EBIT Margin</th>
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<tbody>
<tr>
<td>2007: 12.2%</td>
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<tr>
<td>2008: 7.5%</td>
</tr>
<tr>
<td>2009: 4.4%</td>
</tr>
<tr>
<td>2010: 13.1%</td>
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<tr>
<td>2011: 13.1%</td>
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<tr>
<td>2012*: 13.1%</td>
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</tbody>
</table>

*Hansen Report estimate

Capable of standalone connectivity products, which are silvermodules, accounting for half of total revenue.

**2011 Total:** €247.7 Million

- **OEM:** 46%
- **Retail:** 54%
- **Other:** 3%

- **Installed handsfree kits:** 33%
- **Plug and play:** 5%
- **Multimedia:** 13%

**Parrot OEM Sales**

<table>
<thead>
<tr>
<th>2009 to 2012 CAGR: 84.4%</th>
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</thead>
<tbody>
<tr>
<td>2009: 26.8</td>
</tr>
<tr>
<td>2010: 81.3</td>
</tr>
<tr>
<td>2011: 114.5</td>
</tr>
<tr>
<td>2012 Estimated: 168</td>
</tr>
</tbody>
</table>

- **Multimedia:** 13%
- **Retail:** 54%
- **Other:** 3%
- **Installed handsfree kits:** 33%
- **Plug and play:** 5%

**Eric Riyahi**, executive vice president in charge of global business operations, was recruited by Mr. Seydoux in 2005 to organize Parrot's OEM business and chart its strategy. “We realized that for OEMs, a Bluetooth handsfree phone solution would not be enough. We saw a need to connect nomadic devices like iPods and USB for music management. Based on that Peugeot project, we created a new processor that was able to manage not only Bluetooth, but media players as well,” Mr. Riyahi said.

Since 2010, Mr. Riyahi has been responsible for both the OEM and aftermarket segments, which together account for 95% of Parrot’s total revenue. Recent acquisitions DiBcom and Varioptic account for the remainder. Before joining Parrot, Mr. Riyahi was an infotainment product manager at Visteon for seven years. Prior to that, he worked for seven years at Valeo. Mr. Riyahi has an MBA from INSEAD and a master’s degree in engineering.

Parrot firmly believes that by first launching its products in the aftermarket, it can confidently offer OEMs a field-tested, proven solution that has already won market acceptance. Given the business it has booked thus far, Parrot is on a path to significantly grow its OEM sales in the next several years. In the third quarter of 2012, Parrot’s OEM business was up by nearly 50% and accounted for 60% of total revenue.

**Infotainment Connectivity for OEMs**

Today Parrot’s OEM business comes exclusively from two versions of its connectivity products: modules, which are integrated within the head unit, and stand-alone solutions, which are silver boxes with dissociated display integration capability. Modules and standalone solutions each account for 50% of Parrot’s OEM sales.

Parrot’s connectivity products wirelessly connect the infotainment head unit to portable devices via Bluetooth (for
Wi-Fi, Bluetooth, media players and voice software inside the head unit, we call a module, which we design to be better if we integrated that technology into the head unit," explained Mr. Riyahi. "So we designed a companion chip, which we call a module, to the main head-unit processor. It is powerful enough to handle connectivity for Wi-Fi, Bluetooth, media players and voice recognition. The business exploded."

In 2012 alone, Parrot produced 10 million connectivity modules. The modules range in price from six euros up to 35 euros, depending on features and volume. No one else makes connectivity modules that can be integrated within the head unit, according to Parrot.

The modules are produced almost entirely from Parrot’s own intellectual property. The processor is Parrot’s as is the software stack for Bluetooth, Wi-Fi, USB connectivity, including modem control. It is entirely from Parrot’s own intellectual property within the Android framework and uses Android only to manage apps. “We’ve enhanced Android with our [Linux-based] automotive libraries taking on the work done by Parrot’s connectivity module. This trend to integrate connectivity into the main microprocessor will soon dampen the demand for Parrot modules. “The market for our modules will grow until 2014 and decline from there,” Mr. Riyahi noted.

Distinctions Claimed by Parrot

- First to market with Bluetooth wireless hands-free phone connectivity, with Peugeot
- Number-one European supplier of retail, installed handsfree car kits (80% share)
- One of only a few OEM suppliers offering embedded infotainment systems based on Android

Parrot Moves Aggressively Up Supply Chain with Its Own Infotainment System Offerings

In October, Parrot announced that it had entered the tier-one OEM market for embedded infotainment systems, a market already crowded with more than 20 suppliers, both large and small. Parrot says it will distinguish itself by being one of the few companies to focus on providing head units capable of running Android apps. The apps will be certified by Parrot on behalf of the carmaker as appropriate for automotive use.

Parrot integrates its own Linux-based intellectual property within the Android framework and uses Android only to manage apps. “We’ve enhanced Android with our [Linux-based] automotive libraries that are already installed in more than 10 million factory-fitted parts per year,” said Mr. Riyahi.

With the expectation that the demand for embedded infotainment systems is quickly moving down market, Parrot’s offering will be priced for entry-level to mid-range vehicles. A Parrot multimedia head unit will cost carmakers less than $200 including text-to-speech, voice control, messaging, AM/FM tuner, and device connectivity via Bluetooth, USB and Wi-Fi.

Because its connectivity modules already include many of the features found continued on following page
Parrot S.A.

in infotainment systems—Bluetooth handsfree calling and audio streaming, USB/iPod/iPhone connectivity, voice recognition, Wi-Fi and 3G/LTE access to the Internet—the step up to a complete infotainment system wasn’t awfully big for Parrot. “The [ARM] processors we have designed have gotten more powerful, so they are able to also manage the whole system, including the tuner. We don’t care about CD mechanisms because they will go away. … Using our own intellectual property, we have the capability to manage all the traditional solutions like RF, Bluetooth, media player and tuner, plus handle [Android] apps,” Mr. Riyahi explained. Parrot recently acquired DiBcom, which makes digital radio tuners and TVs for BMW and Audi.

With 30 million lines of code on a high-end system (and that complexity soon coming to mid-priced systems) owning its IP allows Parrot to be faster to market than tier ones who start new infotainment systems from scratch each time with different architectures. Parrot claims it can bring a new system from start to mass production in a year and a half or less.

While carmakers still rail about the difficulty of pairing in-vehicle systems with all the new phone models being introduced every year, Parrot claims this is a problem it has solved. Parrot maintains a global testing program that enables the company to keep a current database of all the different types of phones and which Bluetooth profile should be used to synchronize a particular model. The compatibility issue is two-fold, according to Mr. Riyahi: “The first issue is the different interpretations of Bluetooth from one company to another. The Bluetooth SIG specification is very vague. The second issue is that because there is so much competition among phone manufacturers to get new products to the market quickly, they hurry their design; they don’t finish the job.”

Parrot says it has already booked five new infotainment system deals with carmakers that together will account for sales of a half million parts over the next three years. Three of the orders—two with European carmakers and one with an American carmaker—will begin shipping in 2013. In 2014 two more deals go into mass production: one with a Chinese carmaker and the other with a European carmaker.

In 2014, Parrot is on track to begin delivering Android-based, integrated smart display modules for rear seat entertainment (RSE) systems. Parrot feels very strongly that the Android operating system is a natural fit for RSE, which obviously does not carry driver distraction concerns and can more readily leverage the vast Android platform developer ecosystem.

Parrot automotive libraries already integrated in its head units are based on Linux, while the head unit itself is based on Android. The company has no plans to build infotainment systems using any other operating system.

**Acquisitions**

DiBcom (Carquefou, France), a specialist in digital TV and radio technology, was acquired in September 2011 for €16.7 million.

Varioptic (Lyon, France), acquired in May 2011, brought camera and sensor technology. Parrot paid €7.9 million for Varioptic (including an earn-out of €3 million).

In two to three years, Parrot plans to introduce an augmented reality feature for cars based on Varioptic technology that would watch the driver’s head position and adjust the head-up display accordingly. Parrot is already testing the camera technology on its AR Drone device sold in the consumer market.

**Acquisition candidates** include companies with 3D image management and software capability.

**Why Android**

Android is a Linux-based operating system developed by Google for smartphones. An open-source operating system, Android accounts for nearly 70% of smartphone shipments worldwide. Android is well proven, with a large ecosystem of developers, tools and applications. The Android Software Development Kit is available for free, worldwide.

Rather than having automotive users find their apps at Google Play, Parrot is creating its own app store. “I don’t want somebody putting their own app in the system,” said Mr. Riyahi. “For safety, to guard against distracted driving and to guard against hacking, I want to authorize and certify the apps that run on our head units.” Parrot and/or the carmaker will also want the significant revenues from selling apps such as navigation, music on demand and Internet radio. Parrot will sell basic head units without applications onboard and let customers go to the app store to get what they need.

While Parrot plans to offer 100 to 200 apps worldwide, no more than 10 apps will be needed in each region. “We will have different apps for different regions,” said Mr. Riyahi. “I don’t need CNN in France, but I need to validate that CNN will work on our system in the U.S. American listeners prefer Pandora Internet radio while Germans prefer Spotify.” Users will be able to install Parrot-certified apps via their 3G or LTE con-

DIN version of Asteroid that will demon-

lion in sales.

completed in 2012, the one-DIN version

with all brands of Bluetooth mobile

for searching music files and compatibility

various sources, voice recognition suitable

ation to a GPS antenna, music played from

work (using a mobile phone) and connec-

Internet service via access to the 3G net-

that features handsfree phone operation,

an Android-based infotainment platform

Asteroid to the aftermarket. Asteroid is

afe. In 2012 Parrot started selling

Parrot and LG Electronics were among

the first suppliers to offer infotainment

systems capable of managing Android

apps. Denso is currently developing an

Android-based system. Continental had

been working on one, but has dropped the

effort. “It is very difficult to manage An-

droid or any operating system if you don’t

have your own IP,” said Mr. Riyahi. “Like

LG Electronics, we do not modify An-

droid, we just enhance it.”

Asteroid

Parrot’s aftermarket strategy has helped

convince carmakers that infotainment

systems running Android applications are

a safe bet. In 2012 Parrot started selling

Asteroid to the aftermarket. Asteroid is

an Android-based infotainment platform

that features handsfree phone operation,

Internet service via access to the 3G net-

work (using a mobile phone) and connect-

ion to a GPS antenna, music played from

various sources, voice recognition suitable

for searching music files and compatibility

with all brands of Bluetooth mobile

phones. With just five months of sales

completed in 2012, the one-DIN version

of Asteroid has already produced €10 mil-

lion in sales.

“In 2013 we will begin selling a three-

DIN version of Asteroid that will demon-

strate portable-navigation-like ingenuity,”

said Mr. Riyahi.

Infotainment Technology Trends

According to Mr. Riyahi

◆ Extremely bullish on the embedded

infotainment market, Mr. Riyahi thinks

that in just five years that market will ex-

and to ten times its size today.

◆ As a critical mass of affordable em-

bedded infotainment systems reach the

market, connectivity to smartphones via

MirrorLink will no longer be needed. Rather

than making the car a smartphone

terminal, embedded head units will run

their own apps and go to the cloud to ac-

cess music and personal data. The head

unit will still need to connect to the

driver’s smartphone to use its modem and
data plan but can do so by means of a Wi-

Fi connection.

◆ The Windows Embedded Auto-
mative operating system will die in favor

of Linux (including Android) and QNX for
automotive applications.

◆ Harman is the world’s number-one
embedded infotainment system supplier

(seven million to eight million parts per

year). Continental is number two (six

million to seven million parts per year).

◆ With only BMW and PSA aggres-

sively backing it, Genivi is clearly not the

future. Genivi is exactly the same concept

as the e.solutions (Audi-Elektrobit JV)
infotainment framework, which also sup-
ports software reuse. The e.solutions plat-
form has already made it into mass
production, this past September on some
Audi models. A fully compliant Genivi solu-
tion won’t find production at least until

2016, according to Mr. Riyahi.

◆ Parrot’s key technology is software.

There is nothing it can optimize anymore

in hardware. The processor, RAM, flash
and RF chip have all been done. Parrot

designs its own processors because a Tegra

processor or one from Texas Instruments

would be too expensive. ◆

In-House Intellectual Property

According to Parrot, it owns nearly all of

the most valuable intellectual property

essential to making infotainment systems,

and what it doesn’t own is uncomplicated

and inexpensive to obtain. Parrot designs

its own ASICs.

Parrot-Owned

Bluetooth telephony

Personal information management

Messaging (SMS, email, MMS)

Audio/video processing

Multimedia audio (USB, UPnP, iPod, iPhone)

Digital radio and TV (technology from

DiBcom, recently acquired by Parrot)

AM/FM tuner (a commodity, via DiBcom)

Wi-Fi access point/client

Internet access via 3G/4G

Non-Parrot IP (Provider)

Text-to-speech and voice recognition (Nuance)

Navigation (Elektrobit, Nav-N-Go, others)

LCD control

MirrorLink

Video player

OEM

Handsfree telephony

Multimedia connectivity (USB, iPod/iPhone)

Multi-speaker voice recognition

Audio processing (echo/noise cancellation)

Head units*

Infotainment systems*

Integrated smart display modules for RSE*

Retail

Installed Handsfree Kits

Car Kits – Provide handsfree telephony

features for conventional mobile phone

users (launched in 2001)

Music Kits – Designed for users of smart-

phones and the iPhone in particular.

Provides advanced handsfree telephony

features and wireless music playback on

the vehicle’s audio system (launched in

2008)

Asteroid – Web-enabled car radio, combines

advanced handsfree telephony features with

connection to Web services, apps and the

ability to listen to music from multiple sources

(launched in the summer of 2011)

Plug and Play

Products have an integrated speaker and can

be recharged from 12-volt power outlet.

Portable handsfree kits with voice recognition

and noise reduction

Handsfree charging holder for smartphones

with voice recognition and speech

synthesis

*New products

The Company Profile Continued
Support for Automotive Ethernet/IP Broadens

BMW’s pioneering effort on behalf of automotive Ethernet and Internet Protocol is working. The automotive industry is on a path to make the world’s most ubiquitous computing technology its own. Leading by example, BMW has for years made public its plans to take Ethernet/IP into production.

BMW has been using Ethernet links for vehicle diagnostics and flashing since 2008. In 2013, the carmaker will use Ethernet to knit images from four cameras into a bird’s-eye view of the vehicle. In 2015, BMW will apply Ethernet to infotainment systems and to a premium driver assistance system. In 2018 a mid-sized BMW vehicle will come to market with Ethernet support. BMW is working. The automotive industry is aligning automotive technology with consumer electronics and the cloud.

“We’ve exchanged our architectural plans with two other German OEMs and both of them are planning to switch to domain architecture based on Ethernet/IP,” said Peter Schönenberg, responsible for the design of E/E architectures at BMW.

As they share their roadmap with the industry, BMW executives seem lately to make a special effort to point out that Internet Protocol goes hand-in-hand with any transition to Ethernet. I asked Mr. Schönenberg why. “Ethernet is focused only on OSI layers one and two [the physical layer and the data link layer of the Open Systems Interconnection model]. But if you want to take advantage of the full power of the Ethernet you have to use the Internet Protocol on top of that, layers 5 through 7 [the session, presentation and application layers]. BMW engineering specialists are similarly organized according to their OSI layer expertise.”

According to Mr. Schönenberg, Ethernet/IP is getting plenty of support from the automotive industry. Toyota and General Motors are “very, very interested,” as is Volkswagen, who used the same laboratory that BMW used at West Saxon University, Zwickau, Germany, to verify the satisfactory EMI behavior of the BroadR-Reach technology on unshielded twisted pair at 100 Mbit/s. BroadR-Reach technology from Broadcom Corporation was touted as overcoming the EMI issues, permitting 100 Mbit/s Ethernet transmissions over unshielded twisted pair cables. According to BMW and others, that technology has now been proven. NXP has licensed the Broadcom technology, becoming the first second-source for the BroadR-Reach transceivers. Automotive microcontrollers from Freescale will also provide Ethernet support.

“Among tier-one suppliers, Bosch and especially Continental have been supportive. Continental volunteered very aggressively to host the second Ethernet Technology Day,” said Mr. Schönenberg.

That conference, held on Continental’s home turf in Regensburg, Germany, last September provided ample evidence of the support Ethernet is receiving from the global automotive electronics community. Nearly 400 people were in attendance, representing 142 companies from Austria, Belgium, China, France, Germany, Italy, Japan, South Korea, Spain, Sweden, Taiwan, the U.K. and the United States.

Even the Japanese, usually latecomers when it comes to creating and adopting global E/E standards, are very much onboard the effort to standardize Ethernet/IP technology for the automobile. In his presentation at the Ethernet Technology Day, Hideki Goto, developer of automotive networks at Toyota, described the effort begun in April 2012 by the JASPAR High-Speed In-Vehicle Network Working Group to define requirements for next generation high-speed networks for infotainment systems and automotive control systems. The project, involving 26 companies, has been divided into four teams: application layer, middleware/data link layer, physical layer/wiring, and the development environment. Toyota is the working group’s chair; Bosch Japan is the vice chair. JASPAR will coordinate its work with the consortia that have been working to develop automotive Ethernet/IP standards. Those include the AVnu Alliance, the OPEN Alliance SIG, Genivi and Autosar.

New IMS Study Forecasts Big Growth in Automotive Touchscreens

According to The World Market for Automotive User Interfaces – 2012, automotive touchscreens, some linked to voice recognition systems, will proliferate in the next eight years. Unit sales in Asia Pacific should reach 17.9 million units in 2019.

Global Automotive Touchscreen Market 2019 Unit Sales Forecast

2011 to 2019 CAGR: 25.5%

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>5.8 million</td>
</tr>
<tr>
<td>2019</td>
<td>35.7 million</td>
</tr>
</tbody>
</table>

Data: IMS Research, part of IHS Inc., Wellingborough, UK; www.ihs.com