Look into the future: Concept vehicles

The CES is not the place to announce cars that you can buy today. But concept vehicles are shown – some of them will drive on the roads very soon.

Figure 1: The Snap concept car comprises a chassis, the "skateboard", and the passenger cell, the "pod" (Photo: Rinspeed)

These concept vehicles are a look to the far future. But also vehicles for the next generation are exhibited. One highlight of the CES 2018 was the electric concept car by Rinspeed called Snap. The idea is simple: The concept vehicle comprises two parts. One part is the skateboard, which carries the durable mechanical and the fast-aging IT equipment. They will be recycled after a few years of intensive use once they have reached the end of their design life, while the much less stressed pod, the other part, is able to remain in service for much longer, before it also must be sent to recycling. This benefits the environment, because it plays a significant role in conserving natural resources.

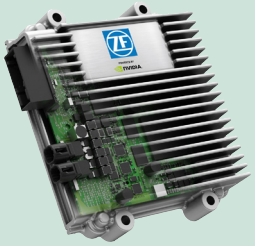
Combing technology and creating new features

Frank Rinderknecht, head of the Rinspeed company, has already developed 23 concept cars. The name Snap really says all: everything fits together and can be snapped together. The concept car from Rinspeed was again designed at the Swiss company 4erC (Switzerland) and technically executed at Esoro (Switzerland). The electric vehicle – as always when Rinderknecht is at work – is full of technical and visual finesse, contributed by a worldwide network of companies. The two steering axles along with the integrated electric powertrain came from ZF. They allow the Snap to turn practically on a small coin and produce no emissions in urban traffic. Optionally, there is a 'personal assistant' in form of an autonomous, intelligent robot to accompany the occupants. It will also be happy to help with running errands, carrying purchases, or handle other tedious tasks.

The Snap, an SAE level-5 automated driving vehicle, uses a lot of electronic technology from third parties: ZF has contributed its ProAI control box (see insert "Artificial intelligence computing platform") as well as radars and cameras, and NXP supplied its Bluebox and several semiconductors, for example. The domain controller architecture has been developed by NXP. It uses different communication technologies including CAN.

Lidar sensors by Ibeo, owned partly by ZF, ensure that obstacles in the road are detected by means of real-time measurements of the light reflections. The products are 3-D solid-state sensors without rotating mirrors. Gentix delivered ▷

Artificial intelligence computing platform



The ZF ProAI control unit powers the Dream Car by ZF as well as the Snap concept car by Rinspeed (Photo: ZF)

Nvidia and ZF have joined forces to provide an artificial intelligence (AI) computing platform. On CES 2017, the companies launched the ZF ProAI system based on Nvidia's Drive PX 2 AI platform to process inputs from multiple cameras, lidars, radars, and ultrasonic sensors. ZF has integrated this control box in its Dream Car and demonstrated it this year in Las Vegas. The solution is nearly ready for volume production stated ZF's CEO, Dr. Konstantin Sauer, in Las Vegas. The German Tier-1 supplier uses a network of partnerships and co-operations to integrate additional features to the ZF ProAI control unit. A visible example at CES was the Snap concept car by Rinspeed.

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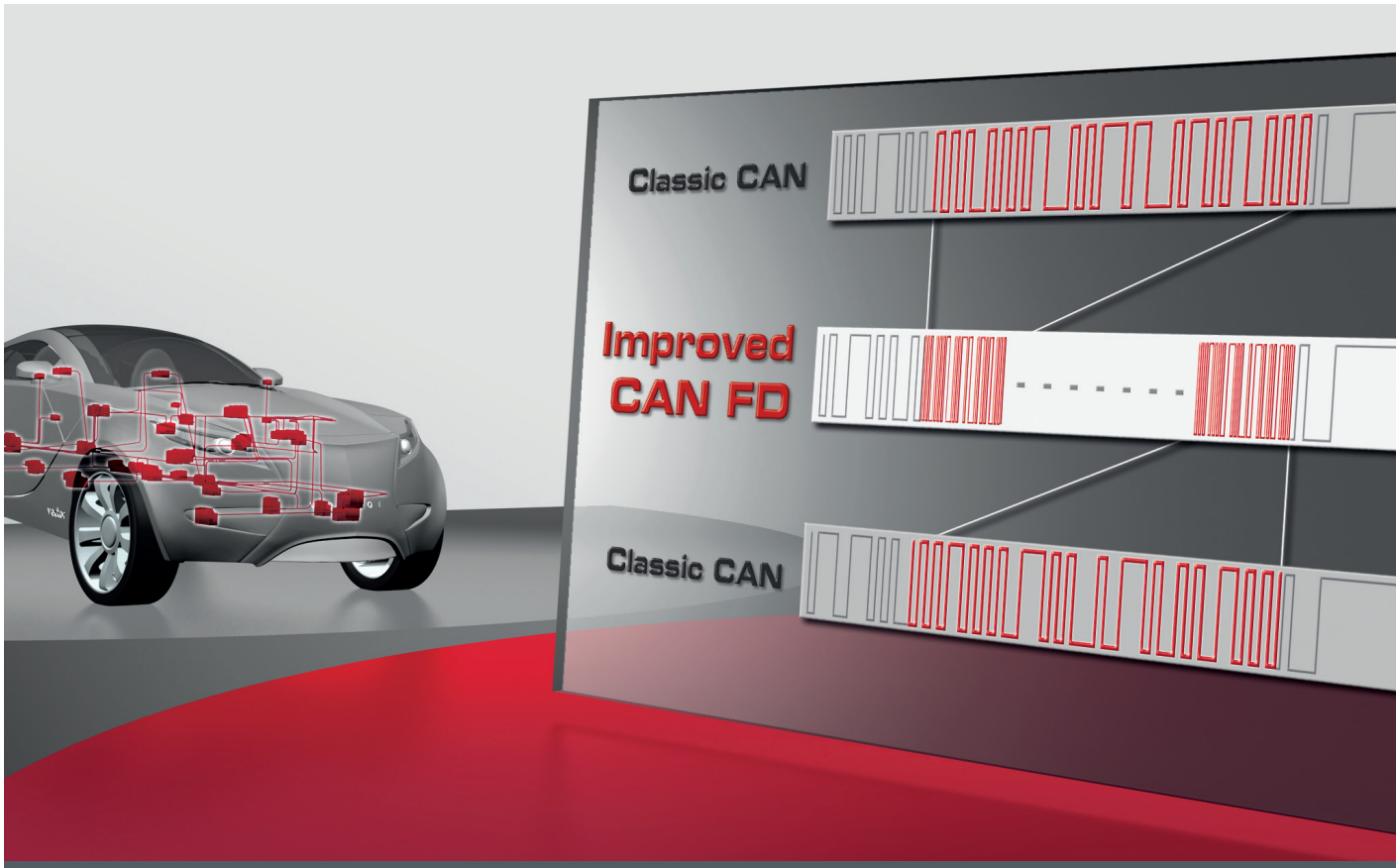

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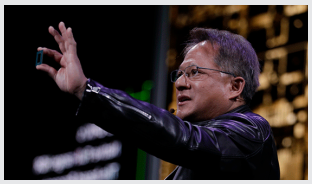
Statements at CES 2018



(Photo: Nvidia)

Jensen Huang, Nvidia's CEO: "In the future, every car will be self driving. There will be 100 million cars built each year, millions of robo-taxies, and several hundred thousand trucks. All of it will be autonomous. On top of this, what will define the driving experience is the AI. The complexity of autonomous driving, the complexity of the software of future cars is incredible. It starts with, of course, building a brand new type of processor we call the Drive Xavier, an autonomous machine processor that is able to do deep learning, perception, has the ability to do parallel computing and also computer vision and high performance computing at very, very energy-efficient levels."

(Photo: Baidu)

Qi Lu, Group President and COO of Baidu: "Apollo is an example of 'China Speed', demonstrating the rapid pace of China's innovations and development in the global autonomous driving industry. Artificial Intelligence and innovation are borderless. We're facing a historic moment with immense opportunities for people around the world, which requires big countries and great enterprises, including China and Baidu, to lead and explore together. We are very pleased to be at the center of this large-scale innovation and stand together with each partner at the forefront of this momentous time."

(Photo: Baidu)

Aido Toyoda, president of Toyota Motor: "The automobile industry is clearly amidst its most dramatic period of change as technologies like electrification, connected, and automated driving are making significant progress. Toyota remains committed to making ever better cars. Just as important, we are developing mobility solutions to help everyone enjoy their lives, and we are doing our part to create an ever-better society for the next 100 years and beyond. This announcement marks a major step forward in our evolution towards sustainable mobility, demonstrating our continued expansion beyond traditional cars and trucks to the creation of new values including services for customers."

Video: Toyota at CES 2018

Research platform for automated driving

Highly equipped with lidar sensors: Self-driving Lexus LS 600hL (Photo: Toyota)

Toyota introduced in Las Vegas its "Platform 3.0", which is able to fuse many sensors. The Japanese carmakers demonstrated it in a special Lexus LS 600hL. The number of connected sensors was not disclosed, but it was said that the car was equipped with more than fifteen. This included four lidar (light imaging detection and ranging) sensor systems by Luminar with a 200-m range tracking the forward direction. They enable to detect objects in the environment including difficult-to-see dark objects. The connected sensors enabled a 360-degree perimeter. Additional shorter-range lidar sensors are positioned low on all four sides of the vehicle—one in each front quarter panel and one each on the front and rear bumpers. These can detect low-level and smaller objects near the car like children and debris in the roadway. Production of the platform starts this spring. It has been developed in the Toyota Research Institute (TRI) located in California. Of course, the platform provides also CAN connectivity to communicate with the other ECUs (electronic control units).

the Iris scanner for occupant detection and dimmable front and rear glass elements, which also can be found on Boeing's Dreamliner.

MaaS – Mobility as a service

Automated driving enables that what is called mobility as a service abbreviated as MaaS. Toyota introduced at CES 2018 its e-Palette concept vehicle, which is dedicated for such services. The Japanese carmaker will cooperate closely with partners. This includes Amazon, DiDi, Mazda, Pizza Hut, and Uber, who will collaborate on vehicle planning, application concepts, and vehicle verification activities. This alliance will create a broad-based ecosystem of hardware and software support designed to help a range of companies utilize advanced mobility technology to better serve customers. In the near term, the alliance will focus on the development of the new e-Palette concept vehicle, also unveiled at CES.

The concept reflects one of Toyota's visions for automated mobility including MaaS applications. Of course, these vehicles based on the Mobility Services Platform (MSPF) announced already in 2016 will be battery powered. Toyota plans to conduct feasibility testing of the e-Palette concept in various regions, including the United States, in the early 2020s. The carmaker hopes to contribute to the success of the Olympic and Paralympic Games Tokyo 2020 by providing mobility solutions like the e-Palette and other innovative mobility offerings. There are three sizes of the e-Palette concept ranging from 4 m to 7 m. Due to a flat and extensive barrier free interior space layout designed with a low floor, equipment can be installed in accordance with the ▷

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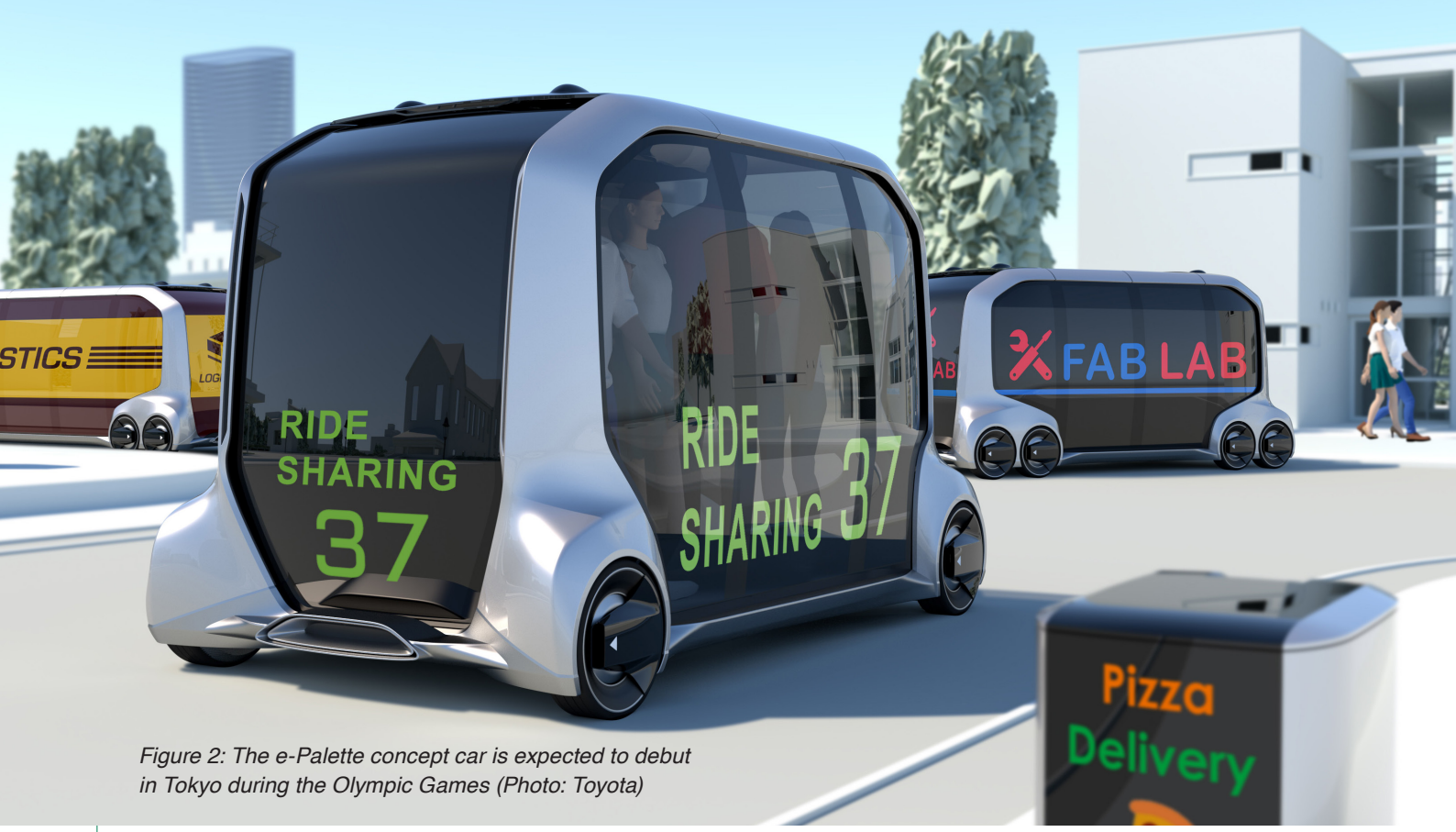


Figure 2: The e-Palette concept car is expected to debut in Tokyo during the Olympic Games (Photo: Toyota)

user's needs, such as ride sharing, hotel room, and retail shopping specifications. Toyota president, Akio Toyoda, mentioned in a press conference Apple, Facebook, and Google as competitors for its mobility initiative, but not the other OEMs (original equipment manufacturers). He said: "My goal is to transition Toyota from an automobile company to a mobility company."

Vehicle information is gathered from the Data Communication Module (DCM) fitted to the e-Palette concept and accumulated in the Toyota Big Data Center (TBDC) through a global communication platform. DCMs are currently different depending on the region and country, but will be standardized by 2019. Besides the telematics interfaces, the DCM also provides connectivity to the in-vehicle networks including CAN-based sub-systems. Already last year, Toyota submitted a patent application (US 20170208074A1), which describes a method to detect unauthorized access attempts by device using the DCM's CAN interfaces (e.g. the OBDII interface).

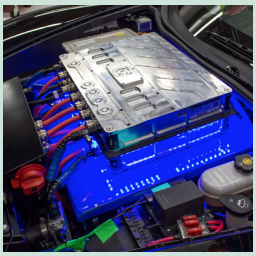
There is already competition to the e-Palette approach: The Chinese bus maker King Long will operate self-driving L4 shuttles, e-Palette look-alikes, using Baidu's Apollo platform (see also page 14).

Production-ready ADAS solutions

At CES 2018, Renesas demonstrated ADAS (advanced driver assistance system) solutions based on its R-Car H3 SoC (system-on chip) featuring among other connectivity options two CAN FD on-chip modules. The Dodge Ram 1500 truck used the SoC in its cockpit. Also the Lincoln MKZ model implemented the chip, which processed data from nine cameras to detect other vehicles, pedestrians, lane markings, stop signs, speed-limit signs, traffic lights, and parking spaces. After processing all of this information, the results are shown on the dashboard or leads to commands transmitted via CAN, for example, to the related ECUs (electronic control units) to perform acceleration, deceleration, steering, etc. The SoC was also used in the exhibited Cadillac SRX for the 3-D surround view.

Prototype implementations of ADAS solutions using SoCs (Photo: Renesas)

E-cars keep the city clean



Look under the hood: The GXE Corvette is a battery-powered car reaching 250 km, when not running at the highest speed of 330 km/h (Photo: Genovation)

To keep the still growing megacities clean, it is necessary to power the cars electrically. Of course, not all of the electrical energy generation will be green and CO_2 neutral. This "dirty" generation of electrical energy happens in remote areas, not visible for those living in urban areas.

Look under the hood: The GXE Corvette is a battery-powered car reaching 250 km, when not running at the highest speed of 330 km/h (Photo: Genovation)

Many of the in Las Vegas launched vehicles were electric-powered cars. Genovation presented at CES its GXE Corvette sports car, which achieved a record speed of 330 km/h. The development started four years ago. Just 75 units will be produced. The price is US-$ 75000. The e-car is based on the C7 Corvette and retains all the stock safety systems and onboard LAN communications but adds a dedicated CAN network to connect the eleven control modules and the instrumentation, which includes a Volvo-like vertical touchscreen. The CAN network is fed just enough information to trick it into thinking there's a perfectly functioning powertrain onboard.

In particular, the Chinese government forces foreign OEMs to manufacture e-cars. In Las Vegas, the Chinese start-up Byton deputed an all-electric SUV (service utility vehicle). The company plans to roll-out the US-$ 45000 SUV already next year in China. Two models will be offered, a 268-hp rear-wheel drive version and a 469-hp dual-motor all-wheel drive version.

Autonomous driving is possible now

Google and others do it since some years. In dedicated areas, self-driving prototypes are driving on normal roads. Of course, a human driver has to sit behind the steering wheel – so-to-say just in case that electronics fail. In Las Vegas, Lyft provided together with Aptiv the largest fleet of robotic cars, BMW 5-series models (see also page 12). ◀

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