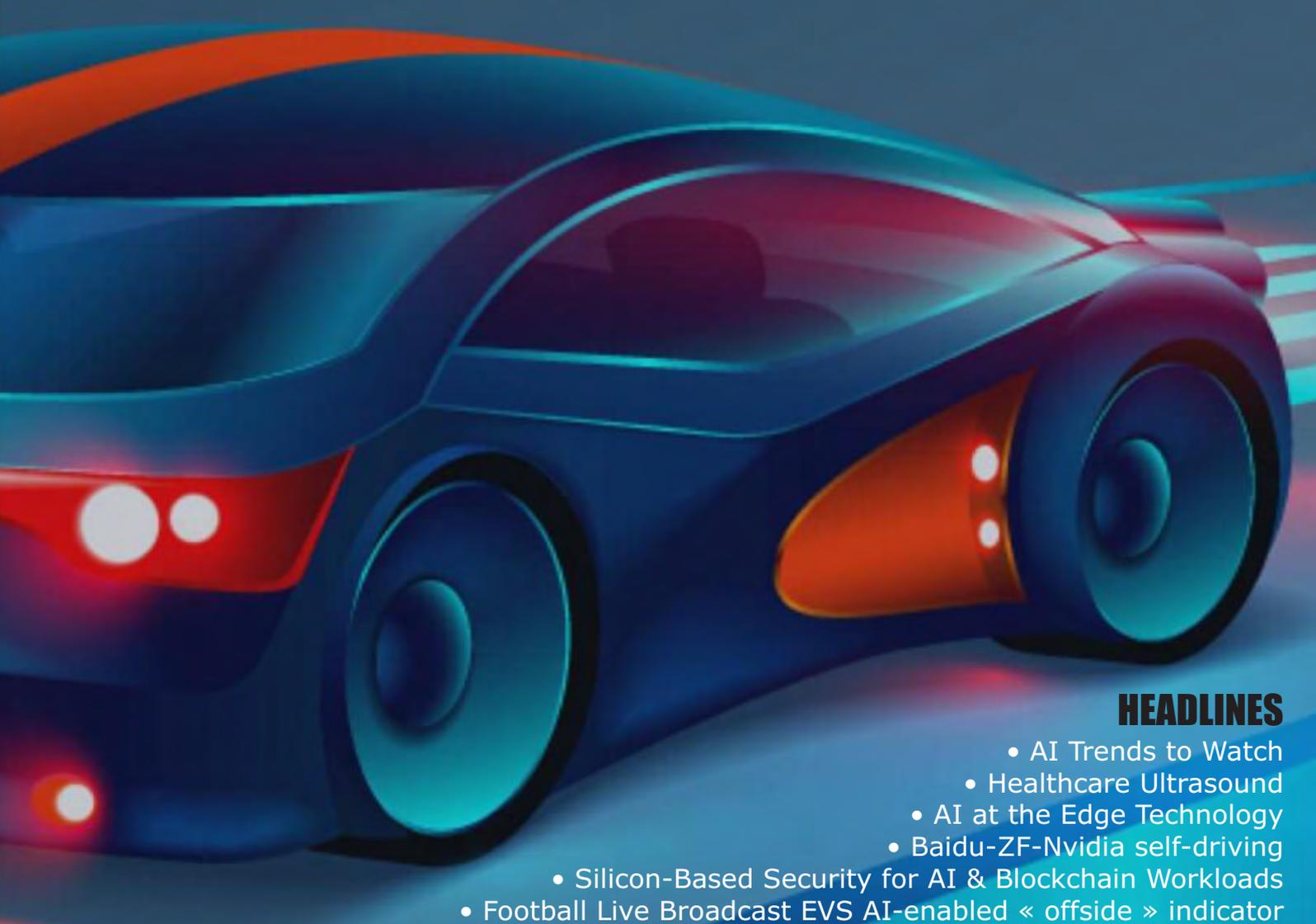


Giant Auto Industry Disruption Ahead

Autonomous vehicles will cause fundamental shifts across a number of established industry segments tied to automotive, opening up big opportunities for chips and tools



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- Healthcare Ultrasound
- AI at the Edge Technology
- Baidu-ZF-Nvidia self-driving
- Silicon-Based Security for AI & Blockchain Workloads
- Football Live Broadcast EVS AI-enabled « offside » indicator

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Daniel Dierickx
CEO & co-Founder
at e2mos
Acting Chief Editor



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Chips & Embedded Systems
Global Market Expertise*

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Here is a two page introduction to the 38 pages excellent report from CB Insights

A look at 13 AI trends reshaping industries and economies

By: CB Insights -- 15-Feb-2018

China is racing ahead in AI. Deep learning is getting a make over. AI is coming to Cannabis tech. We look at 13 artificial intelligence trends reshaping industries and economies.

Artificial intelligence is changing the fundamental structure of every industry in areas ranging from agriculture to cybersecurity to commerce to healthcare, and more. We're also interacting with technology in new ways, from giving voice commands to washer-dryers to playing advanced gesture-controlled video games.

Governments are competing to establish superior AI research, seeing AI as a lever for greater economic influence and power.

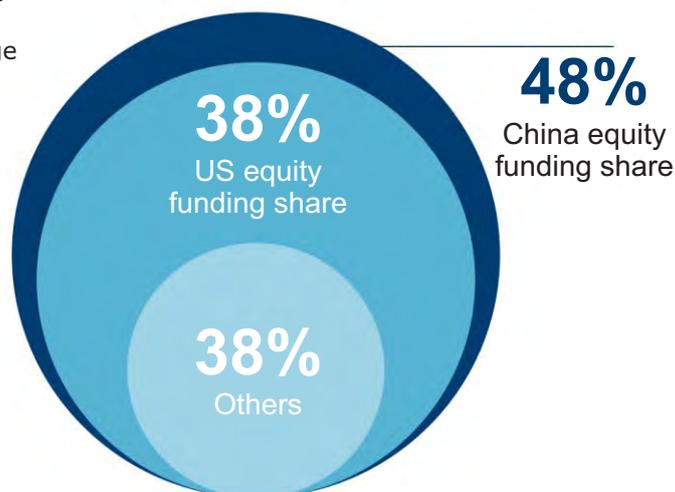
We are also in the early stages of drastic shifts in the labor market. The hype around machine learning may start to fade — but that's because machine learning has already penetrated virtually every major piece of software, from calendar apps to search engines to sales management software.

AI can now out-bluff world poker champions. A humanoid robot can do a perfect back flip and land on its feet. But despite these advances, AI algorithms are far from perfect in basic tasks that are easy for humans, such as understanding a scene in an image or recognizing a conversation's context.

Meanwhile, the promise of general AI — or artificial intelligence that can quickly learn new tasks without supervision — remains uncertain. Although a handful of companies like Vicarious Systems and Kindred have raised money to develop general AI, there is little evidence of specifics or real traction.

AI applications today focus on very narrow tasks. But together these narrow AI-driven tasks are reshaping businesses, markets, and industries.

We examined our database for the metrics and trajectories of thousands of AI companies globally to bring you 13 artificial intelligence trends our analysts will be watching in 2018. These range from China's ambitious plans to the emergence of capsule networks to 6-figure salaries for AI specialists.



The United States is losing its global AI deal share

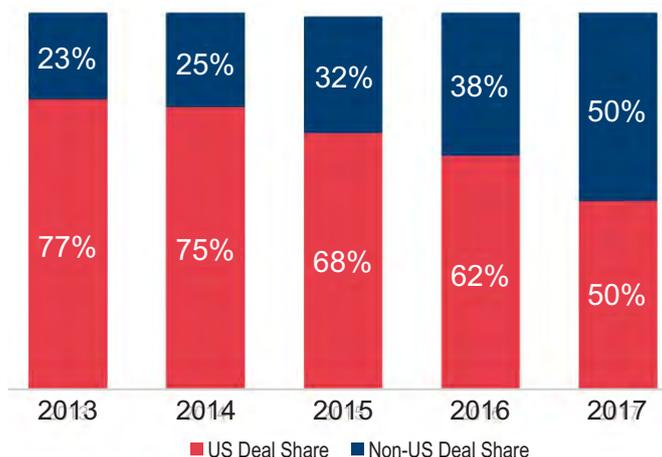
Equity deal share, 2013–2017

Chinese companies' R&D efforts are reflected in their patent activity.

Chinese companies seem to be overtaking their US counterparts in AI patent applications. Based on basic keywords searches of title and abstract, AI-related patent publications in China are surging far ahead of patents being published in these spaces by the US Patent and Trademark Office.

China invests heavily in facial recognition technology

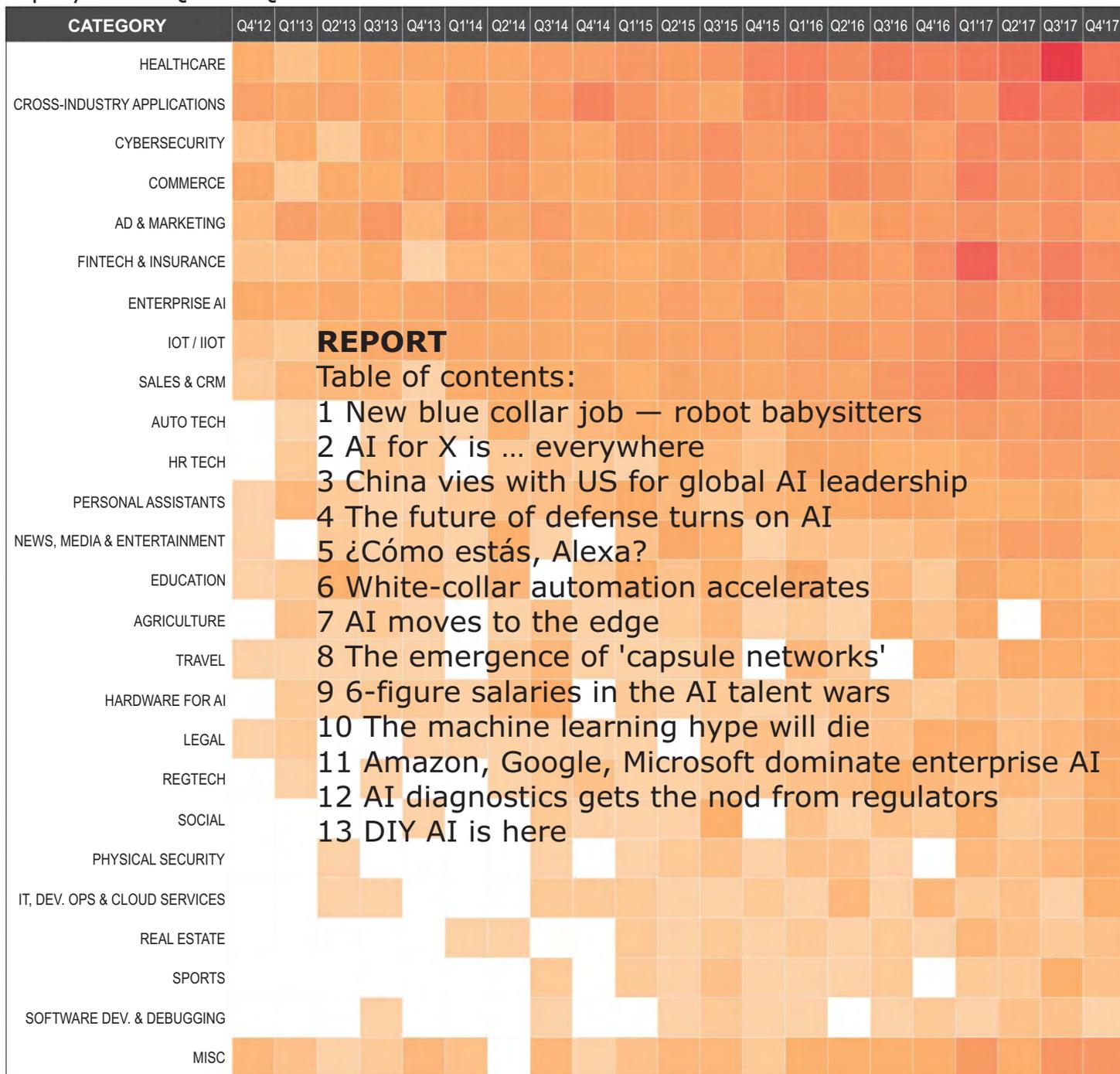
Startup Megvii already has access to 1.3 billion face data records on Chinese citizens and is backed by Chinese insurance companies (Sunshine Insurance Group), government entities (Russia-China investment group), and corporate giants (Foxconn, Ant Financial).



... to next page

AI is heating up across every industry

Equity deals Q4'12–Q4'17



AI can now out-bluff world poker champions. A humanoid robot can do a perfect back flip and land on its feet. But despite these advances, AI algorithms are far from perfect in basic tasks that are easy for humans, such as understanding a scene in an image or recognizing a conversation's context.

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**FREE DOWNLOAD
THE 38 PAGES REPORT**

Computing Solutions that Enable AI at the Edge



ADLINK Technology Showcasing Latest AI & Edge Computing Solutions at GPU Technology Conference San Jose, CA

Edge Learning, Edge Interfacing, and Edge Computing Hardware Solutions

22-Mar-2018 -- San Jose

ADLINK Technology, Inc., a global provider of advanced Edge Computing products has showcase a series of hardware reference designs for Factory-of-the-Future, Smart City, and Networking and Communications applications at the NVIDIA GPU Technology Conference (GTC) on March 26-29, at the San Jose, CA convention center.

ADLINK has responded to the growing demand of for AI and machine learning applications by incorporating industry leading GPU technology into our ready, reliable and robust computing platforms. This includes solutions for compute-intensive applications in industrial automation, automotive (e.g., autonomous vehicles), aerospace and defense, and accelerated Multi-Access Edge Computing (MEC).

"We are very excited to showcase our latest edge computing platforms at this year's GTC," said Elizabeth Campbell, General Manager ADLINK Americas. "By incorporating powerful GPU technology into our existing leading edge computing platforms, ADLINK customers can now develop the next generation of computing solutions that are optimized for machine learning and artificial intelligence."

According to a recent IDC FutureScape report, 75 percent of developer teams surveyed indicated inclusion of AI functionality in one or more applications or services this year. This move toward integration of AI technology in mainstream industrial processes is driving ADLINK's goal of producing heterogeneous (multi-vendor) computing platforms that combine best-in-class CPU's, FPGAs, ASICs, and GPUs. Several proof-of-concept solutions that incorporate AI at the Edge, will be shown including:

An accelerated Multi-access Edge Computing Development Kit (AMEC DEVKIT) with custom GPU capacity for designing Telecom carrier-grade, multi-purpose platforms in support of edge computing applications.

Smart camera technology that exceeds current machine vision platform capabilities, enabling robust deep-learning inference and empowering defect inspection and object classification requirements in manufacturing environments.

A smart city platform designed to calculate vehicle flow for improved traffic management.

An overview of #accessibleollie, a friendly neighborhood mobility solution and the world's first co-created, self-driving, electric and cognitive shuttle. ADLINK edge computing devices run the inclusive rider experience, sign language translation, and 360° 3D immersive bus ride experience.

Edge Computing is a robust market serving a wide variety of industry verticals requiring many form factors. Combining ADLINK's extensive and market-proven expertise in supplying embedded and connected platforms for industrial markets with the GPU leader for AI Computing is ideal for enabling high performance, compute-intensive applications in robotics, autonomous vehicles, healthcare, and many other industries.

Source: https://www.adlinktech.com/en/News_18032713064490908.aspx

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Artificial Intelligence Technology Behind Advanced Gaming and Driverless Cars Powers New GE Healthcare Ultrasound System



GE Healthcare's most advanced radiology ultrasound system – the LOGIQ™ E10 – offers 48X data throughput and 10X processing power of previous systems

Vienna – 28 February 2018 – In the lead up to the European Congress of Radiology, GE Healthcare today announced the commercial launch of its new generation of high-end radiology ultrasound system, the LOGIQ™ E10. This fully digital system integrates artificial intelligence technology, cloud connectivity, and advanced algorithms to acquire and reconstruct data faster than ever before. As a result, it enables confident diagnosis with comprehensive tools and concise workflow.

"We perform an average of 30 ultrasound exams every day and more than 1,000 ultrasound-guided interventional procedures in a year for which we need advanced tools to guide us," says Dr. Knut Brabrand, head of the ultrasound at the department of radiology at Oslo University Hospital, Rikshospitalet. "I've noticed an impressive and significant improvement in image quality with the LOGIQ E10. We achieved a better penetration with high frequency transducers. As a result, I was able to spot tiny lesions in the liver that I have not seen with our previous technology. The image was focused at all times - eliminating the need to look for focal zones, and the B-Flow technology allowed me to clearly visualize the blood flow. Ultimately, it gives us, as the clinicians, improved diagnostic confidence particularly in difficult cases."

With today's increasing patient volumes, the LOGIQ E10 adapts to contemporary challenges – and anticipates those of tomorrow – by leveraging technologies to create incredibly detailed images in real-time:

Artificial Intelligence Technology: The same technology that is powering driverless cars and the next generation of 3D video gaming is now used in the new generation of intelligent medical devices. It is also behind this ultrasound system's platform – the cSound™ Architecture. This advanced GPU hardware technology acquires and reconstructs data in a similar way to an MRI or CT system, enabling 48 times the data throughput and 10 times the processing power of previous systems. The cSound™ Architecture is so powerful that it can process an amount of data equivalent to playing two entire DVDs in just one second, in real-time. The system eliminates the need for focal zones, as the entire image is always in focus throughout the exam.

Digital Offerings: With hospital systems growing and expanding their geography, many ultrasound exams are now read by a clinician not on site. The new Photo Assistant App enables users to photograph relevant anatomy and include the photos with the clinical images sent to the radiologist, providing valuable context and documentation. Another tool – called remote clinical application – allows radiologists to manipulate the ultrasound's settings with a remote control on their tablet or smart phone. Clinicians can also analyze how the system is being used with a web-based secure portal or get assistance remotely.

Cloud Connectivity: Providing a new way for clinicians to connect with their colleagues and patients, Tricefy™ from Trice Imaging adds cloud-based image sharing, diagnostic collaboration, remote viewing, archiving and Electronic Health Record (EHR) integration.

"Our engineers have come up with an entirely new way to create an image with image formation algorithms that are software based and allow for further development in the future," said Brian McEathron, general manager of GE Healthcare General Imaging Ultrasound. "From liver, OB/GYN and breast imaging to musculoskeletal and interventional radiology, ultrasound has the potential to dramatically improve patient care. We are confident that the LOGIQ E10 will lead that transformation, improving imaging for patients from head to toe – no matter their age or size."

As the next iteration of GE Healthcare's most commercially successful ultrasound system, the LOGIQ E10 empowers clinicians to take advantage of digital advances to improve exam efficiency and user productivity with comprehensive tools and concise workflow.

About GE Healthcare

Harnessing data and analytics across hardware, software and biotech, GE Healthcare is the \$19 billion healthcare business of GE (NYSE:GE). As a leading provider of medical imaging equipment, with a track record of more than 100 years in the industry and more than 50,000 employees across 100 countries, we transform healthcare by delivering better outcomes for providers and patients. Follow us on Facebook, LinkedIn, and Twitter or The Pulse for latest news. For more information about GE Healthcare, visit our website at www.gehealthcare.com.

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**ANNOUNCING
BAIDU AND ZF SELECT
NVIDIA DRIVE XAVIER
AV COMPUTER FOR CHINA**



Darrell Etherington@etherington / Jan 8, 2018

Baidu and ZF tap Nvidia Drive for self-driving compute tech

Nvidia announced at its CES 2018 keynote that it's now partnering with two Chinese companies on bringing autonomous driving to roads, including Baidu and automaker ZF. Nvidia CEO Jensen Huang announced that Nvidia's Drive Xavier autonomous compute platform would be used for Baidu's Apollo project, which aims to offer an open platform for self-driving cars in partnership with a wide variety of automakers, suppliers and tech companies.

The partnership will give Nvidia key access to supplying the Chinese market with AV tech, letting it build a platform that can truly span the world, and operate in what's become the most important, largest and fastest-growing auto market in the world.

ZF is a huge, crucial supplier in safety and ADAS tech, too and it's likely to help Nvidia grow aspects of its business that focus on steps between safety features now, and eventual full self-driving later.

Baidu has a large presence at CES this year, a first for the Chinese internet tech giant. It's going to be showing off its latest AV prototypes at the show, which will include tech from Nvidia on board.

ADLINK Brings 'AI at the Edge' with NVIDIA Technology

Autonomous Mobile Robotics and Other Factory-of-the-Future and Smart City Technologies was Demoed at Embedded World 2018

ADLINK Technology, Inc., a global provider of advanced Edge Computing products, is delivering 'AI at the Edge' solutions with NVIDIA technology. The combination of ADLINK embedded systems and connectivity solutions with NVIDIA's AI and deep learning technologies is ideal for compute-intensive applications. This includes robotics, autonomous vehicles, healthcare and many other industries. This initiative is just one example of ADLINK's 'Leading EDGE COMPUTING'.

ADLINK and NVIDIA technology has showcased in a series of mobile robotics, Factory-of-the-Future and Smart City demonstrations at Embedded World 2018 in Nuremberg, Germany.

"We're very pleased to collaborate with other leading technology companies such as NVIDIA," said Jim Liu, CEO, ADLINK. "Our combination of advanced technologies provides customers with opportunities to deploy leading-edge solutions in support of operational excellence and new business models. It's the right vendor combination to transform the landscape for AI-enabled Edge Computing systems."

As part of the series of demonstrations at Embedded World, an autonomous mobile robot platform was showcased using ROS 2, an open source software stack specifically designed for factory-of-the-future connected solutions. Features of this technology include object recognition software and the real-time sharing of data between mobile robots. Another 'AI at the Edge' demonstration featured smart camera technology that can scan barcodes on irregularly shaped objects. This platform provides the capability to differentiate between various kinds of products, thus optimizing product classification and lifecycle traceability. A third 'AI at the Edge' demonstration featured a platform designed to calculate vehicle flow for improved traffic management in a Smart City context.

"Adding AI to embedded systems benefits a variety of markets, including industrial sectors," said Eddie Seymour, Director Embedded Business EME AI at NVIDIA. "By working with partners like ADLINK, new and exciting applications are now possible, pushing the boundaries of AI at the edge."

Stressing ADLINK's extensive and market-proven expertise in supplying embedded and connected platforms for industrial markets such as manufacturing, telecom, defense, transportation and healthcare, Liu added, "This collaboration combines the strengths and core competencies of both companies in a highly synergistic way. We are very excited about what this will mean for our customers."

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Good news for the football / soccer: the discussion about offside is over

EVS implements unique AI-enabled offside indicator into Xeebra 2.0

Updated video refereeing system uses EVS' new modular platform to enable faster and easier user operation

Liège, Belgium – March 28, 2018 – EVS, the leading provider of live video production technology today announces the release of the latest version of its video refereeing system Xeebra 2.0. This new version, which will be presented at the 2018 NAB Show, provides users with new features including AI-driven field calibration, audio support for exports and IFAB protocol support for VAR usage.

Xeebra 2.0 relies on a new technology platform that EVS has introduced at the 2018 NAB Show. This new modular platform is built on a suite of microservices that will sit at the core of all EVS products, and which will offer new AI engines based on machine learning.

The machine learning technology implemented into Xeebra 2.0 automatically calibrates the field of play – something that's time-consuming and subject to error if not done carefully. The AI-driven calibration in Xeebra 2.0 doesn't require any pre-game setup or the deployment of additional sensors or cameras. It uses only the images from the live broadcast camera feeds. As a result, operators don't need to hassle with the calibration process and can feel confident that the graphics that they overlay on the field is done with the highest level of precision.

Additionally, Xeebra 2.0 offers ingest and export of game audio as well as customizable buttons on its dedicated BEPlay controller.

Built on EVS' industry-leading replay technology, Xeebra allow sports officials, and on-air analysts to replay any number of live camera angles for review.

Users can swiftly select preferred angles that remain entirely in-sync on the system's intuitive touchscreen and zoom into the images with a simple touch-and-pinch gesture. Xeebra's client/server architecture also implies that it can be deployed wherever it needs to be, whether on the sidelines, in a venue production control room or a remote officiating facility.

EVS is accredited as an official technical partner of FIBA, the international governing body for basketball. Xeebra is also widely deployed by leagues, federations and facilities providers all over the world. MEDIAPRO uses Xeebra as a VAR system for top soccer leagues on both sides of the Atlantic, including the Primeira Liga in Portugal and the Liga MX in Mexico (for more information about VAR deployment, read our white paper). Xeebra is also used by the British Horseracing Association and just recently by NEP Ireland for the NatWest 6 Nations' rugby championship.

About EVS

EVS is globally recognized as the technology leader for live video production. The company introduced Live Slow Motion replay in 1994, and has continued to build on its reputation for quality and reliability with solutions that enhance live sports, entertainment and news content. Innovations – such as the C-Cast multimedia platform and DYVI software-defined switcher – are raising the bar for live production enrichment, management and distribution. Broadcasters, rights owners, producers and venues alike use EVS to maximize the value of their productions and increase revenue streams.

The company is headquartered in Belgium with offices in Europe, the Middle East, Asia and North America, and provides sales and technical support to more than 100 countries. For more information, please visit www.evs.com



The United States Of Startups: The Most Well-Funded Tech Startup In Every US State

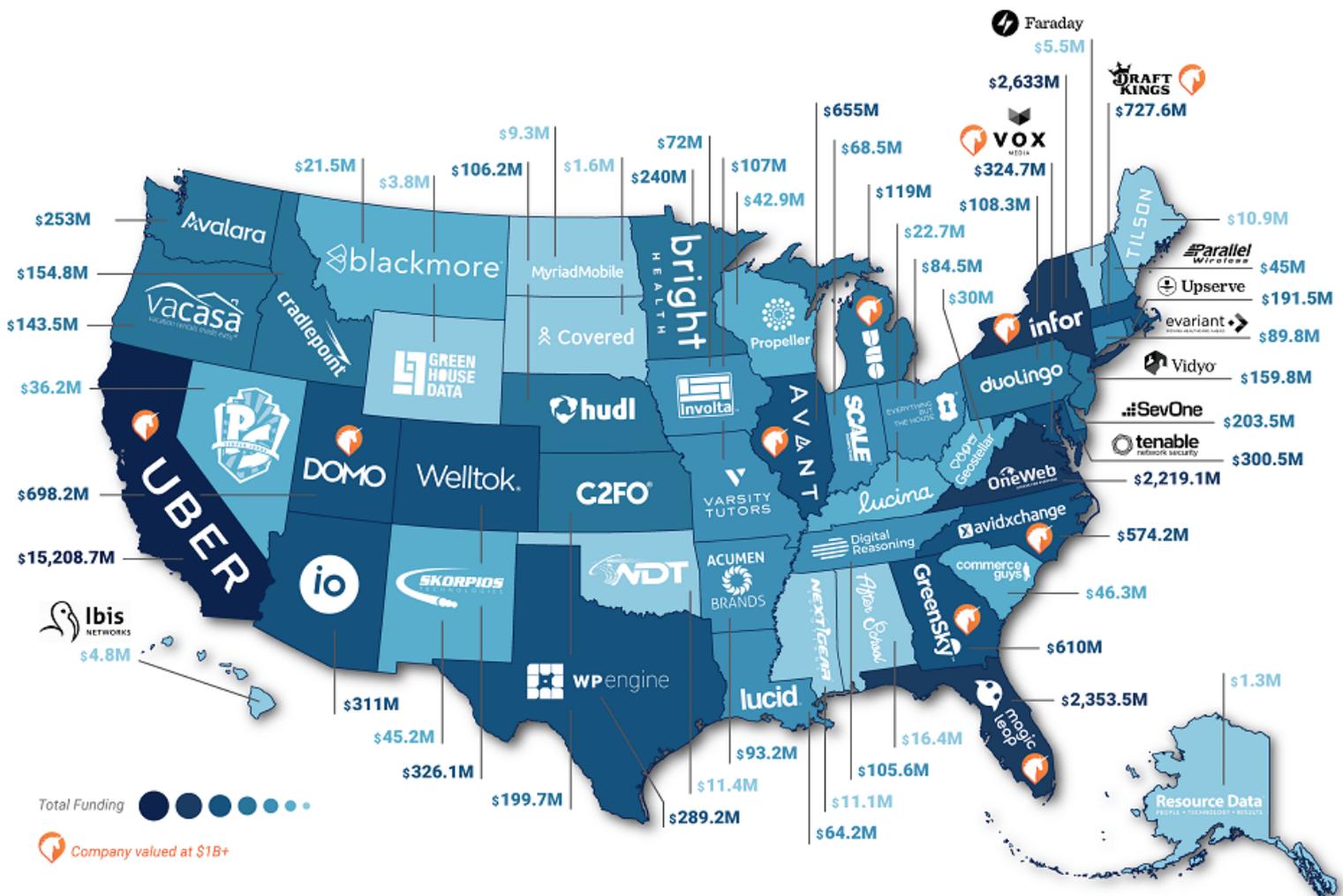
Source: CBINSIGHTS

https://www.cbinsights.com/research/well-funded-startups-us-map/?utm_source=CB+Insights+Newsletter&utm_campaign=296ac57049-Top+Research+Briefs+06+30+2018&utm_medium=email&utm_term=0_9dc0513989-296ac57049-88860985

Using the CB Insights database, we identified the most-well funded VC-backed technology startups by state based on disclosed equity funding. We excluded funding from debt as well as lines of credit, and only considered companies that have raised at least \$1M of equity funding since 2015 to date (5/23/18).

UNITED STATES OF TECH STARTUPS

The most well-funded VC-backed tech startups by state with more than \$1M in disclosed equity funding since 2015. Excludes debt and lines of credit.



Alaska, Mississippi and Wyoming had no companies meeting our full criteria. Companies featured in these states are the most well-funded private tech companies that have raised funding since 2015. They do not have disclosed equity funding. (Data is as of 05/23/18.)

Qualcomm and Ford Collaborate on C-V2X Global Initiative to Improve Vehicle Safety, Traffic Efficiency and Support for Autonomous Driving



Cellular Vehicle-to-Everything Technology Has the Potential to Help Cities Around the World Create Safer, More Capable Infrastructure and Connect Vehicles to a Larger Communications System

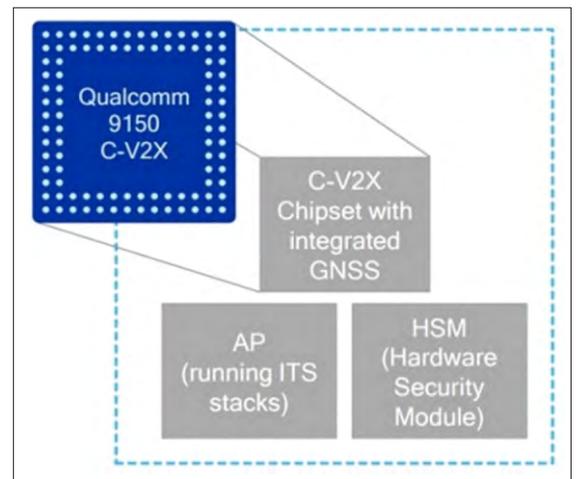
Source: Qualcomm 09-Jan-2018 <https://www.qualcomm.com/>

Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated (NASDAQ: QCOM), and Ford Motor Company (NYSE: F), are accelerating the development of connected cars with the extension of their long-standing relationship into the development of advanced connectivity systems for Ford vehicles and upcoming Cellular Vehicle-to-Everything (C-V2X) technology testing. C-V2X is a highly advanced wireless connectivity technology for safety-conscious and automated driving solutions, which has the potential to help cities create more capable infrastructure as they look at how to connect vehicles to their surroundings, and to larger communications systems, facilitating the development and delivery of smart, connected transportation throughout the world. The technology is planned for further field validations beginning in 1H 2018.

Qualcomm Technologies' first C-V2X commercial solution, the Qualcomm® 9150 C-V2X chipset, is expected to be commercially available the second half of 2018. Depending on the results of those field validations, and a change to the current regulatory environment, this technology may be featured in vehicles in the near-future. Ford and Qualcomm Technologies are currently working together on the first announced U.S. C-V2X trials in San Diego, along with additional trials in Detroit, with both trials utilizing the 9150 C-V2X solution.

As the automotive industry prepares for advancements towards 5G, Qualcomm Technologies and Ford plan to explore next-generation telematics platform concepts featuring C-V2X technology.

Using direct communication mode, C-V2X is designed to allow vehicles to directly communicate with other vehicles, pedestrian devices, and roadside infrastructure, such as traffic signs and construction zones, without the involvement of a cellular network, or cellular network subscription. Importantly, these capabilities supported by some of the latest advancements in wireless technology based on today's standards, such as 3rd Generation Partnership Project (3GPP) Release 14 specifications and ITS standards, while also providing a strong path towards 5G. This means C-V2X-enabled vehicles are designed to remain compatible with future devices, services and infrastructure that connect via 5G technology.



Wireless communication is expected to play important role as autonomous vehicles are expected to be ubiquitous on city streets today and in the future. By facilitating communication between vehicles and a variety of other Smart City constituents, C-V2X technology complements Advanced Driver Assistance Systems (ADAS) sensors to help build a comprehensive picture of the world in which vehicles must navigate. C-V2X is designed to allow vehicles to provide information about the vehicle's surroundings and identify objects that may be out of view, including accidents that are further down the road, or pedestrians that are obstructed by large trucks or buildings.

As a part of the ongoing relationship, the companies are working on automotive telematics platforms with integrated Qualcomm® Snapdragon™ LTE modems to provide the fast, reliable and efficient connectivity needed for telematics applications, connected navigation and infotainment systems. As the automotive industry prepares for advancements towards 5G, Ford and Qualcomm Technologies plan to work on next-generation telematics concepts and solutions featuring C-V2X technology.

“Our goal is to provide the smartest and best connected, human-centered experiences for our customers around the world,” said Don Butler, Ford Motor Company. “Ford and Qualcomm Technologies believes that C-V2X holds great potential for the cars of the future. We’re excited to prove its ability to create a more connected environment where people can move more freely.”

“This relationship with Ford is part of a leading effort in the automotive industry in accelerating the adoption of Cellular-V2X into production vehicles and provide for enhanced safety, driver assistance and support for autonomous driving,” said Nakul Duggal, vice president of product management, Qualcomm Technologies, Inc. “Connectivity is the cornerstone for innovation in vehicles, and we are excited to work closely with Ford on its goal to integrate cellular connectivity on the vast majority of its vehicles, expedite adoption of C-V2X and towards 5G.”

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The Road To Autonomy

Automotive manufacturers and chip companies reveal what they're up to in realizing self-driving cars.

February 1st, 2018 - By: Jeff Dorsch (About see end of article)

Visions of autonomous driving were everywhere at CES 2018 in Las Vegas and the North American International Auto Show in Detroit. Still, while there is progress in the technology, it will be years before the average motorist can get a fully autonomous vehicle.

Advanced driver-assistance systems are gaining in complexity and scope, representing steps toward automated driving.

At CES 2018, there was a baker's dozen of exhibitors in the Self-Driving Technology Marketplace, including ZF Friedrichshafen, Renesas Electronics America, Aptiv, and Autoliv. The Stockholm, Sweden-based Autoliv is in the process of spinning off its Electronics business segment, which will be known as Veoneer. The supplier of ADAS and automated driving technology is scheduled to become an independent, publicly traded company during the third quarter of this year. Autoliv's Passive Safety segment will continue to operate under the Autoliv name, with continued listings on the New York Stock Exchange and Nasdaq Stockholm.



Fig. 1: The APTIV vehicle with autonomous technology drives on the strip Friday, December 1, 2017 in Las Vegas, Nevada.
Photo by John F. Martin for APTIV

For all the attention paid to autonomous vehicles, the public attendees at the Detroit auto show were more interested in the latest pickup truck models. And vehicles with a high degree of autonomy won't be in car-dealer showrooms this year or next year. They may be available on a limited basis in 2020.

Nvidia had plenty of announcements at CES 2018. It added Volkswagen to its portfolio of partnerships with automotive manufacturers, which takes in Audi, Mercedes-Benz, Tesla, Toyota Motor, Volvo Cars, and others. The chip vendor's DRIVE IX technology was demonstrated in VW's new I.D. Buzz microbus.

Nvidia and Uber announced that the ride-hailing company would use Nvidia's chips in the computing systems of its self-driving cars and trucks.

Jensen Huang, Nvidia's president and CEO, predicted at CES 2018 that robot taxis could be available in 2019, to be followed in succeeding years with vehicles that have varying levels of autonomy technology.

Announcements galore

At the Detroit auto show, Chery Automobile announced it would adopt the ZF ProAI system, which is based upon the Nvidia DRIVE AI technology, for Level 3 autonomous vehicles to be built and sold in China. The ProAI system was developed by Baidu, Nvidia, and ZF.

Baidu announced its second-generation Apollo 2.0 open-source self-driving system at CES 2018. Daimler, Ford Motor, and General Motors are among the 90-plus companies working on development of Apollo, along with Microsoft, Nvidia, and TomTom.

... to next page

The Road To Autonomy

Automotive manufacturers and chip companies reveal what they're up to in realizing self-driving cars.

... from previous page

"Open platforms and ecosystems are the best way to accelerate the transition of AI technologies toward commercialization," Baidu President and CEO Qi Lu said in a statement. "Based upon this idea, Apollo has emerged as the world's most open, complete, and powerful autonomous driving ecosystem."

GM announced at CES 2018 that it would put self-driving cars without steering wheels or floor pedals into volume production by 2019. This would represent the fourth generation of its driverless Chevy Bolt electric vehicles, which are going through public trials in Phoenix and San Francisco. The cars are being made at the GM plant in Orion, Michigan, and will be deployed as ride-hailing vehicles in various cities.

Lyft and Aptiv said they would extend their partnership in self-driving car technology, operating autonomous BMW prototypes in Las Vegas after the conclusion of CES 2018. Aptiv (formerly Delphi Automotive) and Lyft are said to be discussing a second pilot program in another American city. Waymo is also partnering with Lyft on self-driving technology.

The race is on

There are many companies, obscure and well-known, that are addressing various aspects of automated driving. Cisco Systems, Google, Green Hills Software, Intel, Qualcomm, and Renesas Electronics are among the better-known companies, each looking for their piece of the autonomous pie. And then there's the lesser-known ventures, such as AIomotive, Argo.AI (financially backed by Ford), Aurora, Clarion (a Hitachi subsidiary), Keolis, Navya, Ntunomy (acquired by Aptiv), Torc, Transdev, and Zenuity (a joint venture of Autoliv, Nvidia, TomTom, and Volvo).

The elimination of errors by human drivers is often cited as a compelling argument for automated driving. "A connected vehicle will save lives," says Gary Streelman of Magneti Marelli Electronics Infotainment Navigation & Telematics. "When you look at that situation and say how we are going to fix that, you really need to fix the driver."

Autonomous vehicles will generate massive amounts of data, and they will receive a lot of data as they operate along roadways.

Jennifer Dukarski, an attorney with the Butzel Long law firm in Ann Arbor, Michigan, is concerned about all the data that will be involved with autonomous vehicles. "The minute that you connect to any of your platforms is the minute that your vehicle is looking at you, taking pictures of you, checking your blood pressure, or like for those who were at CES, if you got to see the brain-to-vehicle interface that Nissan was demoing, taking your brain waves and mapping them to your steering ability," she says. "As a repository of personal health data, facial recognition data, we need to start talking about what privacy laws are implicated."

IHS Markit sees mobility-as-a-service as a driving factor in the future of automotive manufacturing. The market research and consulting firm has an ongoing project called "Reinventing the Wheel," taking stock of continuing developments in automobiles and related industries.

"A great 'automotive paradox'-where more travel via car than ever, but fewer cars will be needed by individuals-will be a defining quality of the new automotive future," said Daniel Yergin, IHS Markit's vice chairman. "The shift is just beginning. By 2040, the changes in transportation will be accelerating in a way that will be visible on roads and highways around the world. The pace and degree of this dynamic shift will have significant implications for industry, for public transportation systems and for how people get to work and live their lives – and spend their money on transport."

Jim Burkhard, IHS Markit's vice president, global energy markets and mobility, adds, "We could very well be on the cusp of the greatest transformation in personal transportation since the dawn of the automotive age. Understanding the implications of such a transformation requires a broad perspective that goes beyond any single industry or market."

Transportation Secretary Elaine Chao spoke at the Detroit auto show, hailing the "tremendous potential" of self-driving vehicles. She emphasized that autonomous driving should be available in rural areas, in addition to the big cities where the technology is widely expected to first take hold.

"We want to be inclusive, as well, and consider how this technology can benefit rural America," Chao said in an interview. "And it is worth noting that rural America accounts for a disproportionately large share of highway fatalities. So automated technology (has) an important role to play in rural mobility and safety."

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The Road To Autonomy

Automotive manufacturers and chip companies reveal what they're up to in realizing self-driving cars.

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Early results are in

During CES 2018, Autotrader.com named the seven best semi-autonomous driving systems currently available on the market. They are:

- Audi Traffic Jam Pilot
- BMW Traffic Jam Assistant
- Cadillac Super Cruise
- Mercedes-Benz Drive Pilot
- Nissan/Infiniti ProPilot
- Tesla Autopilot
- Volvo Pilot Assist

"Semi-autonomous systems can help drivers minimize mistakes and have the potential to make driving safer," said Brian Moody, executive editor for Autotrader. "All of these vehicle systems are either currently available or will be available in the near future, giving shoppers a great opportunity to get into a vehicle with the latest and greatest in-car driving technology. They represent the best in autonomous driving advancements, even if they don't quite let you sleep or watch TV while you're moving down the road."

And in a surprising development, it appears that most self-driving cars of the future will be available in white or light colors. The reason: LiDAR sensors can more easily detect light-colored vehicles. It's not the end of dark-colored vehicles. But the capability to detect darker paint colors will require more sensors, which means higher costs and higher prices.

Tesla has drawn a lot of publicity about its self-driving semi-trucks. They won't be the only autonomous vehicles for transporting freight, however. Einride showed off its T-Pod autonomous big rig in Detroit. The Swedish company is in the testing phase in the development of the cargo vehicle and expects to deliver the first one for customer use during the third quarter of 2018. A formal entry into the U.S. market will come later.

Among other concept vehicles shown in the Motor City is the GM Surus, an acronym for Silent Utility Rover Universal Superstructure. The Surus is a hydrogen-powered flatbed vehicle suitable for a number of applications.

And then there was the odd-looking 2018 GMC Sierra 2500HD All Terrain X All Mountain Concept truck. Instead of the standard rubber tires, the vehicle has four Mattracks treads, similar to the treads of bulldozers and military tanks. The truck has a 6.6-liter turbo-diesel V8 engine with 445 horsepower and 910 pounds of torque.

Conclusion

The road goes on forever and the party never ends. Highway's jammed with broken heroes on a last-chance power drive. In short, the road to automated driving will be a long one, and progress may not be continuously steady. There will be government regulations to observe, and the accident liability issue will have to be worked out. Still, the car companies and their partners in the tech industry are optimistic about resolving the technical issues to be addressed in the next two decades, and beyond.

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Jeff Dorsch ([all posts](#))

Jeff Dorsch is a technology editor at Semiconductor Engineering.

Giant Auto Industry Disruption Ahead

Autonomous vehicles will cause fundamental shifts across a number of established industry segments tied to automotive, opening up big opportunities for chips and tools.

January 29th, 2018 - By: Ed Sperling (see end of page 20)

The move to self-driving vehicles over the next decade or so will result in a massive restructuring of entire segments of the global economy that have evolved to create and support automobiles and the people who drive them.

The shift will create many new jobs-particularly for semiconductors and electronic systems-and conservatively it will eliminate hundreds of thousands of existing ones. It will reshape entire communities and ecosystems. Perhaps even more consequential to existing automotive companies, it has the potential to upend established companies and replace them with others, including some that have played only limited roles in the automotive market.

The general consensus is the path to fully autonomous vehicles will precipitate one of the biggest disruptions in the history of business. Just how vast and deep the changes will become is difficult to grasp because there are so many interconnected pieces to the global automotive industry, not to mention scores of companies entering this market. But consider that in an age of autonomous vehicles, revenue from speeding tickets will evaporate. Speed traps will be non-existent. Billboards will be ineffective on long-distance trucking routes, and truck stops may cease to be viable. Rental car agencies at airports could cease to exist.

Car insurance, a thriving industry today, will likely cease to exist as we know it. It may be included with a car-if people even own those cars. Accenture estimates the loss to insurance companies will be \$26 billion by 2035. But it also points out there are new opportunities alongside autonomous vehicles, including comprehensive coverage models for cybersecurity risks, software or hardware failures and infrastructure risk and fleet operation liability.

The economic impact of autonomous vehicles ripples out everywhere. A commonly used metric in economics is that money changes hands five times from the first dollar spent. In the case of automobiles, that adds up to a significant amount of money that will move in completely different directions than in the past.

Consider the following statistics from the Alliance of Automobile Manufacturers:

- Half of companies listed in the Dow Jones Industrial Average depend on automobiles for revenue.
- Of the G20 member nations, every country except Saudi Arabia manufactures automobiles.
- Automotive manufacturing accounts for \$953 billion in revenue, and is responsible for \$109 billion in R&D around the globe. In the United States, it represents between 3% and 3.5% of total GDP-and that's just one slice of the automotive sector.
- In the United States, 7.25 million jobs are tied to the automotive industry, including 2.44 million at automakers, 1.65 million at auto dealerships, and 3.16 million at auto suppliers.

There is no shortage of data or opinions on this subject. Every major consulting firm has issued one or more reports on the impact of assisted and autonomous driving. (Accenture Mobility; PwC 2017 Strategy & Digital Auto Report; McKinsey's Self-Driving Car Technology; Deloitte's Fact, Fiction And Fear Cloud Future Of Autonomous Vehicles, among many others.)

There are a several reasons this shift has garnered so much attention. First, the automotive industry has been progressing almost linearly for more than a century. "The car industry went through a huge change in the 1950s," said K. Charles Janac, chairman and CEO of ArterisIP. "For the last 60 years, it has been almost completely stable. It's basically the same product being incrementally improved until mid-2010 (when Tesla issued its IPO). If you look at a legacy car company, the dealers make all their money from maintenance, the assembly people are skilled at mechanical assembly, and the purchasing people have relationships that have to be fractured. The implications are humongous."

Lip-Bu Tan, president and CEO of Cadence, agrees: "This is a very old, established industry and it's now going through a big transformation. It's comparable to what Steve Jobs did with the phone. Apple came from nowhere, and suddenly everyone was chatting and sharing data. You can apply that same kind of change to the automotive industry."

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Second, this is a huge industry with large amounts of capital, and spending continues to rise.

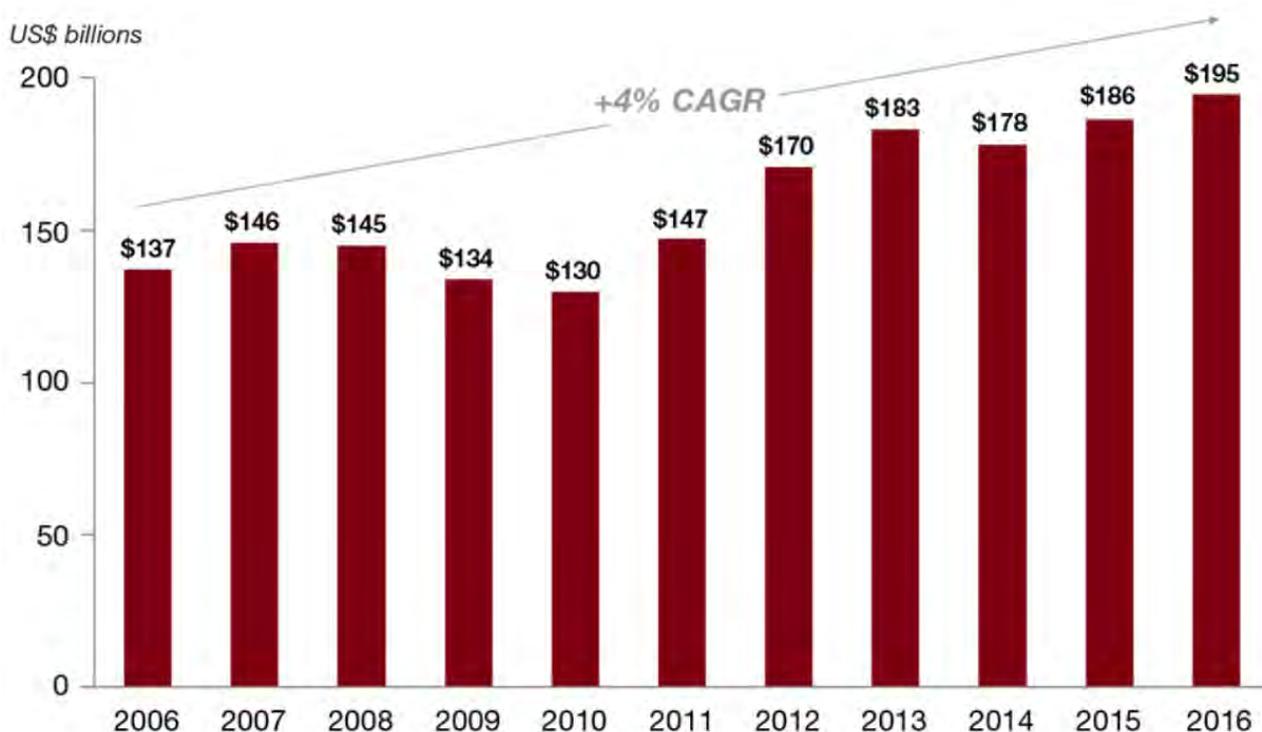


Fig. 1: Combined capital spending, R&D and M&A of top 10 automotive OEMs. Source: PwC.

And third, the automobile is a key component in people's lives. It is essential for many people to get to their jobs or away from work altogether. Outside of cities, it is critical for getting groceries, getting medical treatment. And cars consume a significant amount of money earned, both for purchase and maintenance.

For all these reasons and more, there are plenty of companies vying for a piece of this market, particularly from the semiconductor side. The Consumer Electronics Show, which until several years ago was the primary venue for connected technology such as smart watches, 3D TVs and smart appliances, is now dominated by automotive technology. The GENIVI Alliance, which focuses just on in-vehicle entertainment, required two full ballrooms in Las Vegas' Bellagio Hotel this year, rather than a handful of booths. And the number of companies with some connection to the automotive industry keeps rising.

Winners and losers

"We're tracking 330 companies focusing on electric vehicles, and 107 on autonomous vehicles," said Wally Rhines, president and CEO of Mentor, a Siemens Business. "Not all of them will survive. But the good news for EDA is everyone has to load up on design tools for at least the next five years. A big area for this market is fault inject and driver simulation. If you were to verify a driverless car, you would have to drive 14 billion miles. We're now in the single-digit millions. The only way to get there with driverless cars is virtually."

This includes everything from modeling and simulation to virtual prototyping, and for semiconductor tools companies this is contributing significantly to sales. "Some of the published numbers show this will be a \$160 billion market in 2022," said Rhines. "Today, semiconductor TAM (total available market) is somewhere around \$375 billion. Next to sensors, this is the fastest growing segment for chips. The question is how much of what we already have will be able to migrate to autonomous vehicles. So if you look at speech recognition, it's good enough for a cell phone, but it's not good enough to turn your car."

Part of the opportunity comes from the electrification of vehicles, which is step No. 1. The other piece involves assisted and autonomous driving.

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This is a manageable problem, but it is still a problem because it requires a separate system to recharge the batteries. It's not so easy to add high-voltage lines everywhere and just replace gas stations. But all of this has to happen in parallel with the electrification of vehicles.

The move to fully autonomous vehicles adds yet another set of challenges.

"The amount of computation that will go into autonomous vehicles is enormous," de Geus said. "You have an enormous amount of data being taken in from an array of cameras on a car (including LiDAR and radar). There is an enormous amount of work going into collecting data and actually doing the learning, which is being done in the cloud. There is a whole field developing with specialized computation for that. There are companies designing their own processors for specialized algorithms. If it is 10 times faster, there is enormous value in that."

Who reaps that value isn't obvious, though. "As we move to autonomous vehicles, incumbents may not be incumbents anymore," said Cadence's Tan, noting that consolidation will lead to more startup activity. "With autonomous vehicles there are more electronics, more software, and higher-speed data. The whole business model is changing, and that's a big change for an established industry. This is equivalent to the way Amazon has changed retail, where now you deliver products to the home. It's the same with Netflix. And as business models change, so do the leaders."

Impact	Current	Future
Carmakers	Revenue from car sales, leases	Car as a service
	Traditional car companies	Tech giants could win significant market
	U.S., Japan, Germany, China dominate	New players enter market, dominance not clear
Technology	Combustion engine/hybrid	Electric motor
	Human-driven	Artificial intelligence-controlled
	Limited data processing	Gigabytes per second
Infrastructure	Cameras/image sensors	Radar, LiDAR, sensor fusion
	Gas stations	Charging stations
	Speed /sobriety enforcement	Cybersecurity
Personal	Cellular to people	V2V, V2I, multi-channel communications, OTA SW updates
	Regular maintenance at dealers, repair shops for low usage models	More frequent maintenance due to higher utilization; vehicles will obtain service without drivers
	Roads shared by cars, people, bicycles	Restricted access roads
Personal	Trade-in cars every 3 to 7 years for latest electronics	Faster turnover due to higher usage
	Car ownership	Mix of ownership, car as a service, ride sharing
	High fatalities	Low fatalities
Personal	Buy best car based upon activities	Order best vehicle for your activity that day
	Elderly/disabled limited mobility	Increased mobility
	Performance driving, commuting	Comfortable cabin/work environment
Personal	Car insurance extra	Car insurance included
	Walk to car	Call car

Fig. 2: Various impacts of autonomous vehicles.
Source: Semiconductor Engineering

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There is plenty of agreement on that point, and an equal amount of uncertainty. "Self-driving vehicles raise the bar significantly for automotive electronics," said Joerg Grosse, OneSpin Solutions' product manager for functional safety. "Some manufacturers will rise to this challenge. But others may not, leaving room for more innovative new players. Consumers and legislators will demand a level of functional safety and reliability previously required only for military and aerospace applications. For a start, functional verification must be much more thorough. A missed corner-case condition can easily lead to someone being killed. The use of formal-based technologies will expand greatly, since only formal provides mathematical certainty."

Correctness is not enough, though. "Owners will expect their vehicles to continue to operate safely even when a stray alpha particle flips a memory bit," said Grosse. "Automotive chips must have error detection schemes, and the coverage of these safety mechanisms must be verified by injecting faults and proving that they can be fixed or detected in time to take corrective action. Finally, automotive electronics have to conform to relevant standards, especially ISO 26262. There are many unanswered legal questions around liability for self-driving vehicles. Releasing a product without all proper standards certification would be unthinkable. Automotive manufacturers and their electronics suppliers must improve their verification, implement safety schemes with known coverage, and obtain certification. Anything less is commercial suicide."

Timing and limitations of technology rollouts

So when exactly will autonomous vehicles begin showing up on roads? That isn't clear yet, either.

Maarten Sierhaus, director of Nissan Research Center Silicon Valley, breaks it down into two pieces. "Eyes on, hands free, will happen in 2020 in cities. Eyes off, robotaxis, will show up in 202x. But we need to develop a system that is accessible to the way we drive. People behave differently in different places. In Amsterdam, bicycles rule. In San Francisco, pedestrians rule. And cars need to know the difference."

This requires a combination of social science, AI and mechanical and electrical engineering. At least three of those four specialties are new for the automotive industry.

"An AI system can negotiate with other systems or pedestrians," said Sierhaus. "But how does it let a car go or behave the way we do as human drivers? The first step is human-robot teaming, where you still want humans in the loop. Nissan has been working with NASA on the SAM concept (Seamless Autonomous Mobility), where you have one or more individuals helping multiple cars. The question is how many vehicles can one person handle. You want intelligence in the vehicle, in the cloud, and human intelligence when it's needed. That's particularly important for a fleet management system."

All of this will take time. Estimates typically range from 10 to 15 years for fully autonomous driving in place where human-driven and autonomous vehicles need to interact. It is expected to happen faster, such as more remote cities in China, where there is no existing infrastructure, and much slower in older cities that are crowded with pedestrians and bicycles, or in areas where charging is not available. Even within relatively new urban areas, infrastructure needs to be developed to charge electric vehicles. At this point, most of the electric vehicle sales are commercial fleets and suburban homes, where residents can connect a charging cable from their car to an electrical socket.

Side by side with this is a question of cost of technology. The electronics that carmakers are hoping to add into vehicles involve sensors with a range of price points, depending upon whether they include basic accelerometers or LiDAR or advanced radar. There also will be artificial intelligence systems, which will likely be developed at the latest process node and require massive compute power. And there will be a variety of processing elements, accelerators, I/O systems and memories scattered throughout these vehicles.

Economics of autonomous technology

How much all of this is supposed to cost, and how much it will likely cost, are not clear. What is clear is there is a gap in expectations between automotive OEMs and chipmakers. Chipmakers expect the costs will be in the tens of thousands of dollars, while carmakers want the cost in the range of \$3,000 to \$8,000 for cars to continue to be affordable.

But it's not clear how many autonomous vehicles actually will be sold or who the buyer will be. If it is a company such as Uber, which will run autonomous vehicles round the clock, an extra \$20,000 over the life of a car may not matter. If the same patterns in car ownership continue with autonomous vehicles, where cars basically sit idle 90% or more of the time, cost will remain an issue. But metrics for quality over time for each of those models are widely different, and may have significant implications for how quickly this technology gets adopted. So far, none of this is worked out.

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"The baseline differs, depending on who you talk to," said André Lange, group manager for quality and reliability at Fraunhofer EAS. "And with autonomous cars, the central processing unit may have to decide which information is right and from which sensor, because one or more might get dirty or stop working. What might happen to a sensor and how do you cope with it? This requires that you know where the defect is in a system."

This requires much more than a collection of inexpensive sensors, though. It requires constant communication among the various parts, with data being analyzed at the edge, in the vehicle's central logic, and in the cloud. The only way to make that work is for the entire industry to standardize on a single set of integrated technologies and to leverage economies of scale and commoditization of components.

PwC came to a similar conclusion in its 2017 Automotive Trends report: "If auto makers expanded their cooperative efforts, the industry would essentially be smart-sizing, the way the airplane manufacturing sector has over its long history." Another option, according to the consulting firm, is greater consolidation.

But either of those options make it much harder to differentiate one car from another, because with autonomous vehicles branding is no longer about horsepower or cornering ability. It is strictly limited to the body shape and the electronics and amenities inside the cabin, and even those may be of limited value if people don't actually own their cars.

Global reset button

This is what keeps automotive industry executives awake at night. BMW pitches its cars as "the ultimate driving machine." Porsche's ad for a Cayenne Turbo is "sportscar together." Volvo has built its brand on safety. General Motors describes its lineup as "a wide array of vehicles and brands to fit your individual driving needs." And Ford's home page says, "We all drive, some just for the fun of it."

None of those branding messages will work as autonomous vehicles begin rolling off the assembly lines. Past developments in mechanical engineering may be interesting from a historical standpoint, but electric motors are simpler to build, have fewer parts, and they are pretty much the same from one car to the next. That ultimately leads to consolidation and a reshaping of the entire industry.

For autonomous vehicles, even the skill sets are different. "Many of these car companies are excellent at mechanical design, but now the core competency is software," said ArterisIP's Janac. "This is changing the chip industry, too. The programmers are now programming for a specific chip. We're moving toward software-defined hardware, which means a car company will become an integrator of subsystems. But that's not why you buy a car. So there are three models emerging so far. One is the Intel/Microsoft model, where they are the provider of IP and the system assembler does not do any innovation. The second is where Tier 1s like Bosch and Denso become more important system manufacturers and build their own chips. And the third is where the car companies take back control of their architectures and everyone else operates on low margins. It's unclear at this point which one will win."

With regard to software, automotive OEMs are competing with companies such as Google, Facebook/Instagram, Microsoft, and Amazon for engineering talent, which have a reputation for higher compensation, including stock options, and greater career mobility.

It's also not clear which countries will win. The move from gasoline engines to electric motors is significant for a different reason—it reduces the number of parts to 200 from about 2,000. Moreover, almost nothing in an electric motor is difficult to master. In an gasoline engine there are various combustion modes, direct-injection technologies, or variable cam phasing, for example.

This puts companies in places such as China—latecomers to the combustion engine market—on par with automotive giants when it comes to electrification.

"China has not been a factor, but we see that they can quickly enter and possibly dominate this market," said Sundari Mitra, CEO of NetSpeed Systems. "For China, this will extend well beyond the automobile to include smart cities. They are innovating, and Chinese companies do not have a cash shortage."

Mitra noted that one of the biggest shifts underlying all of this is a verticalization of the semiconductor market, which makes it easier for smaller companies to compete. This is particularly evident in the automotive sector, where the number of companies competing for a piece of the market has grown significantly over the past year.

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"This is all about the economics of autonomous vehicles," said Mitra. "The spend on semiconductors in autonomous vehicles versus electric vehicles will double."

Redefining who wins

There are other pieces to this giant puzzle that aren't even on the horizon for most companies yet. One involves data, which today is largely limited to location-based services such as Google's Waze or Apple Maps. This whole segment of the industry is about to explode in a variety of ways, some good and some bad. On the positive side, being able to collect data is extremely useful for improving safety and identifying potential problems.

"Right now we don't see people using data for quality the way it should be used," said Michael Schuldenfrei, CTO at Optimal+. "This is all being done at the component level today, and it's not being shared across the supply chain. What we're looking at is quality protection as a service, where you can share data without exposing IP. We believe that if zero defects per million is the goal, which is what the automakers are asking for, then you have to get over this problem. You have to understand failure from the system-level versus the components. The interaction of components is critical to avoiding the 'no trouble found' syndrome."

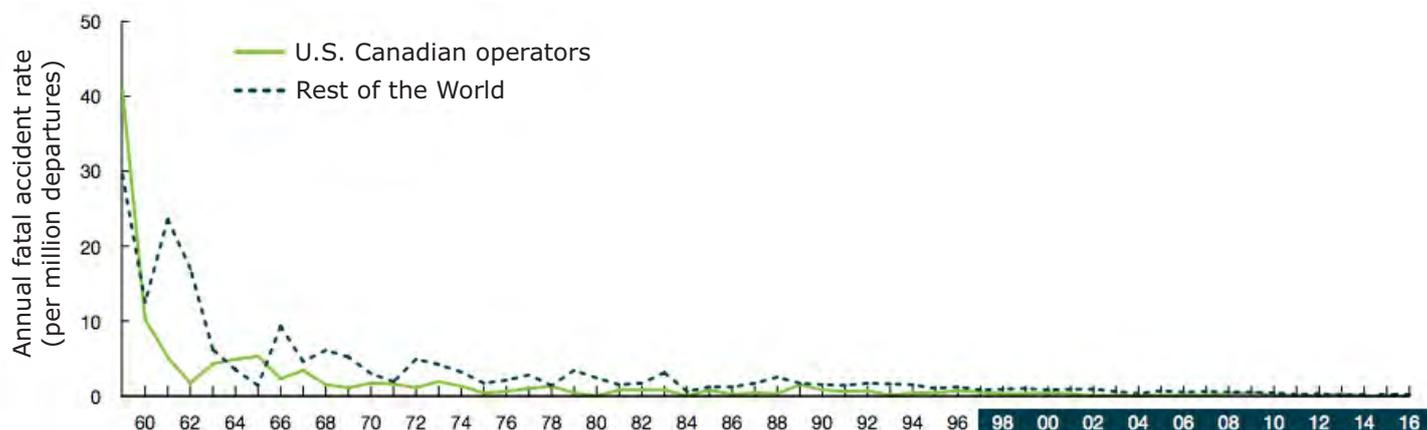
Data becomes increasingly important in this new world of autonomous vehicles, and that has broad implications, a well. "At the end of the day, this is a data-centric world, and whoever owns the data owns the landscape," said Cadence's Tan. "The key components are sensors, processing and the hyperscale cloud. So the first thing is how you collect data. Then it's how you process data, which increasingly involves edge computing. And then the entire data center and cloud are changing."

Conclusion

One of the comparisons that is often cited in conferences and presentations about autonomous vehicles-and almost every semiconductor conference today includes at least some talk about assisted and autonomous vehicle technology-involves avionics. Commercial aviation today is one of the safest forms of transportation available.

"At this point, we don't know how this will impact safety," said Louie de Luna, Aldec's director of marketing. "But what we have seen is that regulation itself has restricted the advancement of technology in avionics. There is a lot of paperwork. The avionics industry has made travel safe, but they have to document the process. The automotive industry is way more advanced when it comes to technology, though. In avionics, you're probably not going to see 10nm or 7nm chips, but in automotive you will see the same kind of intensive simulation, verification and way more testing. This requires a layered approach, and it requires not only functional coverage, but structural coverage, as well."

Put simply, there is a lot of work to be done on every level. While autonomous driving capabilities may be present in some cars in the future, it's not clear when those cars will be considered safe enough to take over completely. But once those cars do begin showing up on highways and local roads, the automotive industry -and everything it touches-will look very different than it does today.

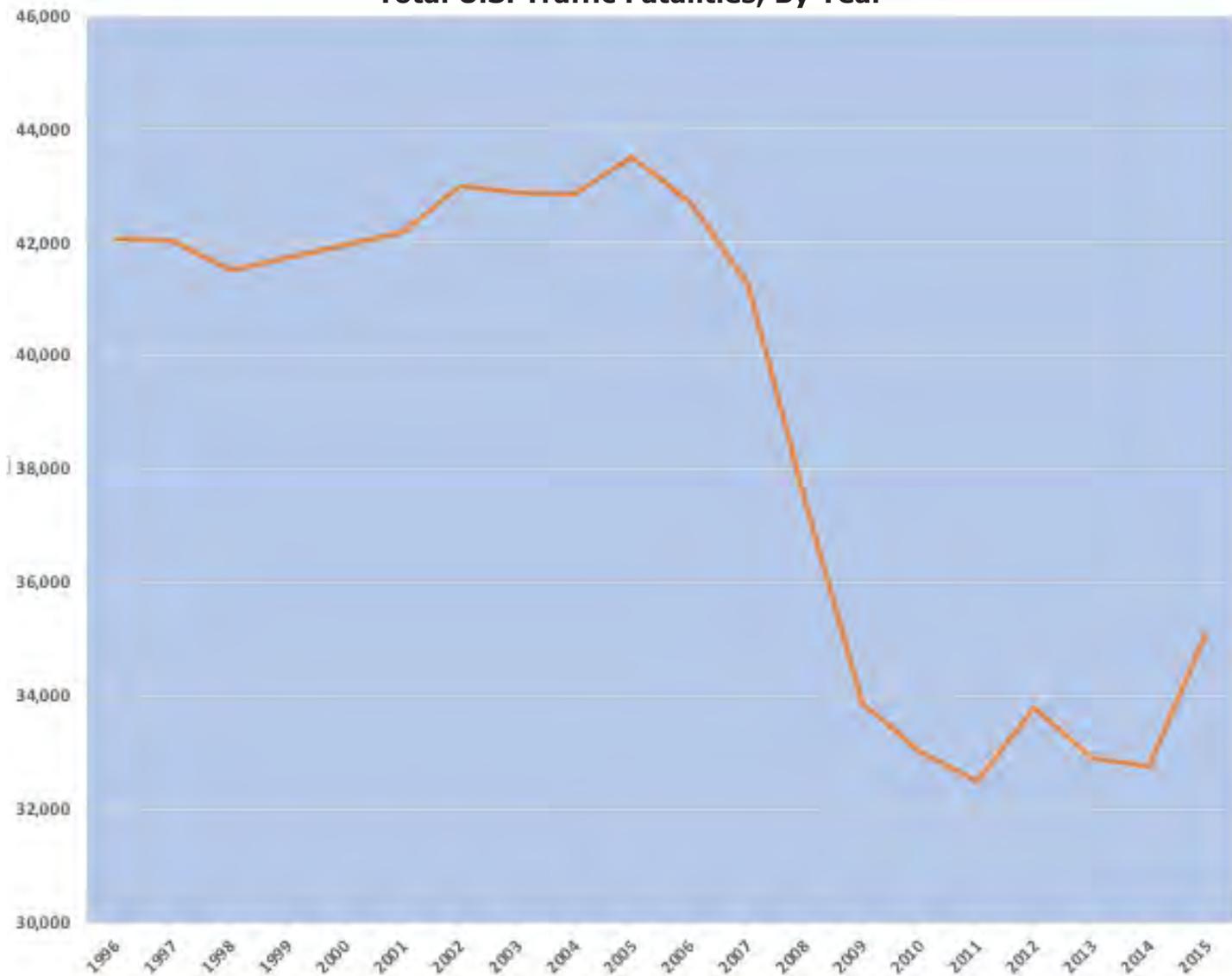


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Total U.S. Traffic Fatalities, By Year



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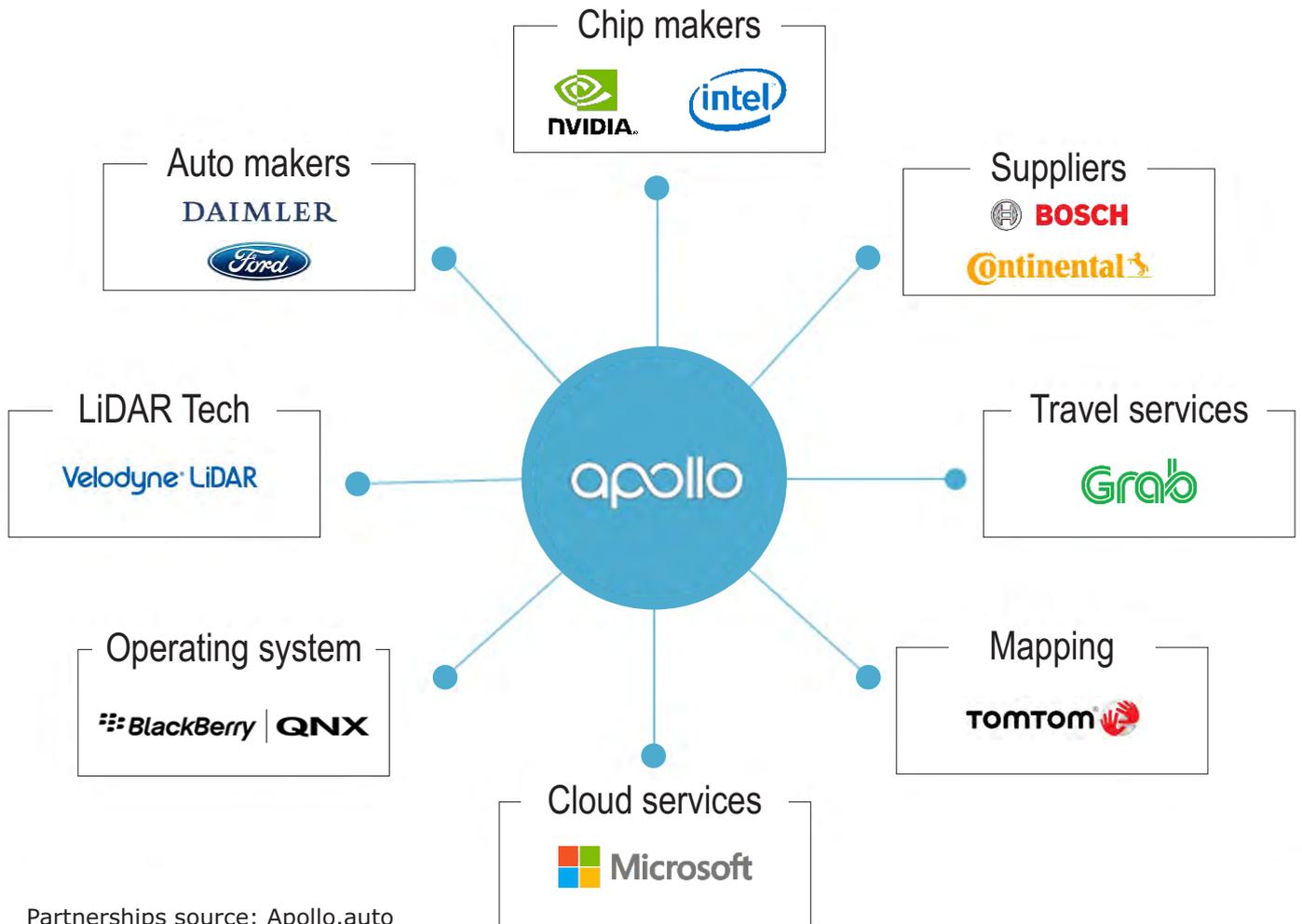
Ed Sperling is the editor in chief of Semiconductor Engineering.

Android of the Auto Industry? How Baidu May Race Ahead Of Google, Tesla, And Others In Autonomous Vehicles

Source: CB INSIGHTS -- June 11, 2018

Baidu builds global autonomous driving ecosystem

Select international partners of Baidu's Apollo project



As Baidu accelerates its capabilities in self-driving vehicle technology, we dive into the Chinese tech giant's uniquely collaborative approach.

Baidu has become the "dark horse" in the autonomous vehicle arms race.

In an effort to play catch up to frontrunners in the US and gain an edge on emerging players in China, Baidu has taken a novel approach to developing self-driving software.

The company's Apollo project, which it launched in April 2017, is an open source software platform that's designed to encourage collaboration across the auto industry to accelerate the development of self-driving cars.

Industry leaders across the auto ecosystem have since jumped on the Baidu train. In just 14 months, Baidu has amassed over 100 partners, working with major OEMs, auto suppliers, and chip manufacturers.

With this large web of partners across an array of verticals, Baidu can dedicate the majority of its time and attention to its area of expertise — AI and software development — leaving its partners to perfect the hardware and vehicle manufacturing components.

Baidu is also increasing investment in autonomous driving technology, ramping up R&D spending in 2017 and launching a \$1.5B investment fund dedicated to startups innovating in the AV space.

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Android of the Auto Industry? How Baidu May Race Ahead Of Google, Tesla, And Others In Autonomous Vehicles

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In this analysis, we take a closer look at Baidu's recent developments to assess how the company's nuanced approach compares to other leaders in autonomous vehicle technology.

REPORT Table of contents:

- The Apollo platform: Android of the auto industry?
- The China advantage
- Beyond Apollo: Baidu's outside investments
- In-house still matters: the evolution of Baidu's R&D spend
- Bringing the tech to life: testing and fleet deployment
- Concluding thoughts

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The Apollo platform: Android of the auto industry?

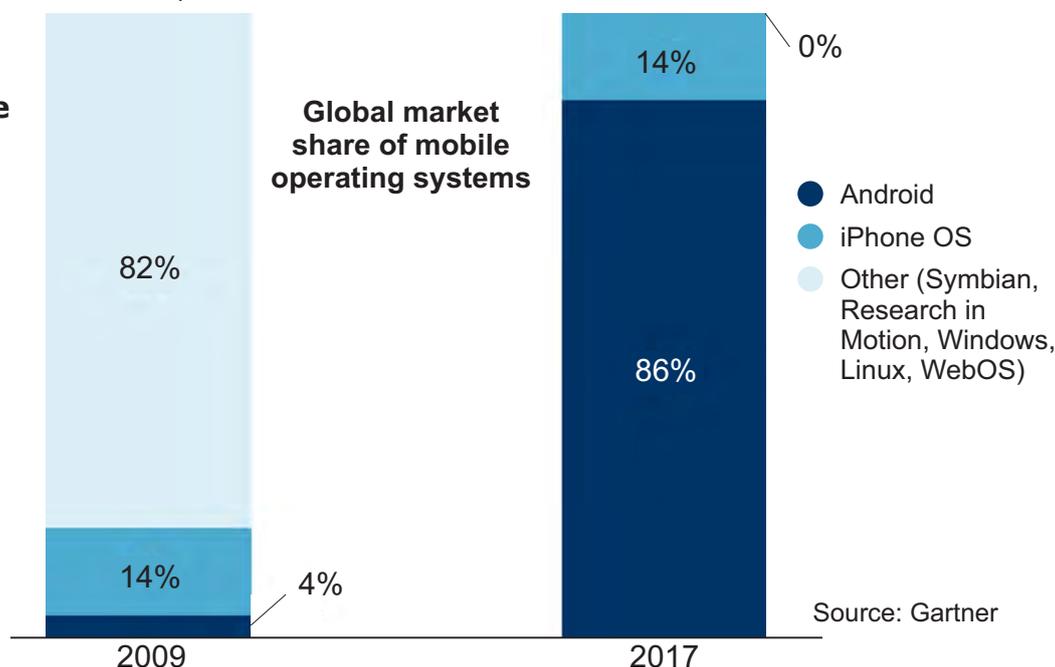
In April 2017, Baidu launched its Apollo project, an open source platform for autonomous driving software. The platform combines a number of tools — including data, APIs, and open source code — that developers can use for free to bring autonomous driving products to market.

In many ways, Apollo resembles Google's Android Open Source Project (AOSP), Google's open software platform for a mobile operating system (OS) that launched in 2007. The idea for AOSP emerged after Apple released its first iPhone, when Google decided it needed to enter the mobile realm to prevent users from switching to another search engine on their mobile devices.

Rather than launching its own smartphone, Google focused solely on software. The company used an open source platform in part to make it easier for third parties to develop compatible apps. The thought process was, the more third-party apps available, the more appealing phones running on Android software would be for consumers.

This approach helped Google scale Android rapidly. According to Gartner, Android made up 86% of the global mobile market in 2017, up substantially from 0% ten years earlier.

Android has become the dominant mobile OS globally



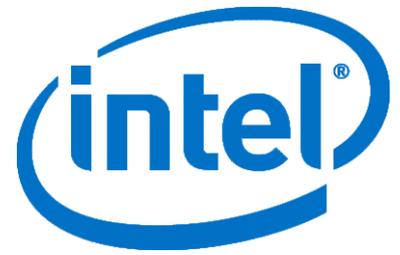
The incentive behind Baidu's Apollo platform mirrors Google's approach to Android: standardize an operating system across an industry by making it freely available to manufacturers.

With Apollo, Baidu aims to be the brains behind autonomous vehicles, allowing OEMs and auto suppliers to focus on manufacturing, branding, and the relationship with their customers rather than software engineering.

This approach is especially attractive in China's highly-fragmented automotive supplier landscape. With an open source approach, Baidu makes it possible for any of China's auto suppliers to assemble a vehicle with autonomous driving capabilities without having to hike R&D spending.

It's also worth noting that similar to Google withholding certain apps (e.g. Maps, Gmail, and Google Play) from Android's open source platform, Baidu is also reserving some of its services — such as mapping and machine learning — for an application programming interface under Baidu's control.

Intel Advances Silicon-Based Security for AI and Blockchain Workloads



Intel and Ecosystem Partners Introduce New Solutions to Secure Data in Emerging Technologies

By Rick Echevarria

The future of a trusted and secure computing environment hinges on our collective ability to deliver solutions that improve the performance across a variety of workloads, while also optimizing security.

This week, at Cyber Week in Israel, I am joined by partners, customers, and cybersecurity industry and policy leaders from across the globe. Intel is committed to providing silicon-based security solutions that address the most pressing issues. There are three key themes at the conference, highlighting the challenges and opportunities facing our industry.

Emerging Workloads Deliver More Data to Analyze and Secure

Incoming data is increasingly difficult to effectively leverage without the computing power to process and learn from its growing volume and complexity. Machine learning (ML) algorithms, and other artificial intelligence (AI) applications and capabilities, have achieved remarkable results and are being extensively used in different domains. ML algorithms often require access to sensitive data, especially as the focus on data privacy increases around the world. Limiting access to the right data may limit the outcomes that can be achieved with the use of AI. In the case of blockchain, the security and privacy of data join transaction scalability as key technical considerations.

Intel technologies provide unique capabilities that can help improve the privacy, security and scalability for data-centric workloads like AI and blockchain. We are in a position to accelerate customer success by helping protect algorithms and data for AI applications as well as digital assets and smart contract execution for blockchain solutions.

At Cyber Week, we are focused on security for these two data-centric workloads: AI and blockchain. Technologies like Intel® Software Guard Extensions (Intel® SGX) enable the ecosystem to design solutions with improved security and privacy. What makes Intel SGX compelling is that it provides a hardware trusted execution environment (TEE), allowing better protections for data in-use, at-rest and in-transit. Also, built-in CPU instructions and platform enhancements provide cryptographic assertions for the code that is permitted to access the data. If the code is altered or tampered, then access is denied and the environment disabled.

Security for AI: Efforts Focus on Securing AI Data

We see security, in the context of AI, in two implementations. First, there is security for AI, where we focus on protecting data, algorithms and parameters. Second is AI for security, where we use AI for the detection of advanced exploits. The Advanced Platform Telemetry capability in our Intel® Threat Detection Technology is a step toward improving the outcomes of AI for security.

In security for AI, a couple of usages start integrating security to improve the outcomes that AI solutions can deliver. First is multiparty machine learning, where access to critical data and the integrity of algorithms are enabled by using homomorphic encryption and hardware-based trusted execution environments, like Intel SGX. Second is federated learning, for applications where one can't move the data to a centralized location. In this usage, data owners at the edge work collaboratively to improve a shared prediction model.

At Cyber Week, we are highlighting several collaborations to add security to AI implementations. We are collaborating with Docker* to help make AI more secure, useful and shareable for federated learning, by hardening containers with Intel silicon-based security technologies.

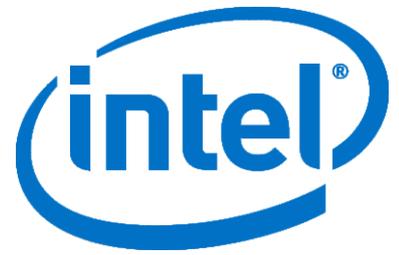
Intel researchers are making great strides toward practical methods for homomorphic encryption, a method that will allow computer systems to perform calculations on encrypted information without first decrypting. Duality* is collaborating with Intel to explore the security challenges of AI workloads using homomorphic encryption on Intel platforms. Duality* will use homomorphic encryption across every stage of an AI solution pipeline to minimize data exposure.

Fortanix* announced enhancements to its Runtime Encryption solution to help enable secure execution of ML algorithms, using Intel SGX enclaves, with support for Python and R languages commonly used in research and modeling. This, in turn, supports secure data sharing and analysis for AI training models and applications.

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Intel Advances Silicon-Based Security for AI and Blockchain Workloads

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Security for Blockchain: Industry Adoption and Collaboration

Blockchain continues to show promise in transforming business processes. Intel processor technologies offer capabilities to help improve the security, scalability and privacy of distributed ledger networks. At Cyber Week, we are introducing innovations in what we call "off-chain computing" to help address both privacy and throughput for blockchain implementations. We are also highlighting recently announced collaborations.

- Enigma* has developed a unique privacy protocol that uses Intel SGX to protect data, while allowing computation over the data. In our collaboration, we'll work together to integrate this functionality for private smart contracts on the Ethereum public ledger.
- Two weeks ago, Intel joined SAP* to formalize efforts in a blockchain consortium to construct a blockchain proof of concept to improve international shipping efficiencies on SAP's blockchain-as-a-service platform.
- Last month, the Tel Aviv Stock Exchange*, Accenture* and The Floor* announced the development of a new blockchain securities lending platform powered by Intel. This platform will transform the securities lending market in Israel by enabling direct lending among all the major financial instruments.

Security is pivotal to our company's strategy and a fundamental underpinning for all workloads, especially those that are as data-centric as AI and blockchain. We will continue to innovate and make our silicon an active participant in the threat defense lifecycle. The announcements at Cyber Week underscore the value that our investments can deliver to meet the cybersecurity needs of organizations today.

Rick Echevarria is vice president in the Software and Services Group and general manager of the Platforms Security Division at Intel Corporation.

Intel CEO Brian Krzanich Resigns; Board Appoints Bob Swan as Interim CEO

Second Quarter Revenue and Non-GAAP EPS to Exceed Prior Guidance; 2018 to be Another Record Year

SANTA CLARA, Calif. – June 21, 2018 – Intel Corporation today announced the resignation of Brian Krzanich as CEO and a member of the board of directors. The board has named Chief Financial Officer Robert Swan interim chief executive officer, effective immediately.

Intel was recently informed that Mr. Krzanich had a past consensual relationship with an Intel employee. An ongoing investigation by internal and external counsel has confirmed a violation of Intel's non-fraternization policy, which applies to all managers. Given the expectation that all employees will respect Intel's values and adhere to the company's code of conduct, the board has accepted Mr. Krzanich's resignation.

"The board believes strongly in Intel's strategy and we are confident in Bob Swan's ability to lead the company as we conduct a robust search for our next CEO. Bob has been instrumental to the development and execution of Intel's strategy, and we know the company will continue to smoothly execute. We appreciate Brian's many contributions to Intel," said Intel Chairman Andy Bryant.

Intel expects to deliver a record second quarter, with revenues of approximately \$16.9 billion and non-GAAP EPS of approximately \$0.99. With accelerating data-centric revenue, the company is off to an excellent start in the first half of the year and expects 2018 to be another record year. Intel will provide full second-quarter results and an updated outlook for the full year on the second-quarter earnings call on July 26.

As interim CEO, Swan will manage operations in close collaboration with Intel's senior leadership team. Swan has been Intel's CFO since October 2016 and leads the global finance, IT and corporate strategy organizations. He previously spent nine years as CFO of eBay Inc. Earlier, he was CFO of Electronic Data Systems Corp. and TRW Inc. He has also served as CEO of Webvan Group Inc.

Swan added, "Intel's transformation to a data-centric company is well under way and our team is producing great products, excellent growth and outstanding financial results. I look forward to Intel continuing to win in the marketplace."

The board has a robust succession planning process in place and has begun a search for a permanent CEO, including both internal and external candidates. The board will retain a leading executive search firm to assist in the process.