中國

科技行业

自动驾驶/车联网 – 勇往直前

- 7 月 1 日，北京政府发放首批 T4 自动驾驶路测牌照，而百度取得全数五张牌照。
- 虽然自动驾驶和车联网（IoV）仍处于开发阶段，但自动驾驶有望成为 5G 时代的关键下游应用之一。
- 预计在短期内，自动驾驶和车联网将是市场热话。
- 在本报告中，我们重点介绍了 TMT 板块的潜在受惠者，如 LiDAR、毫米波雷达、相机模组和 V2X 的供应商。

北京政府颁发第一批 T4 自动驾驶路测牌照

7 月 1 日，北京政府发放首批 T4 自动驾驶路测牌照，而百度取得全数五张牌照。这与 2018 年 3 月 22 日北京政府将首批五张临时自动驾驶路测牌照发给百度的情况相似。获得 T4 牌照意味着自动驾驶车辆具备了在复杂城市道路自动驾驶的能力。所谓的复杂城市道路包括不同类型的道路，例如市中心道路、住宅区道路、狭窄车道和没有交通灯的道路。据了解，T4 牌照是目前全国最高技术等级、最高标准、测试场景最难的开放道路测试资格认证。T4 比 T3 级别测试增加了 19 项高难度的复杂场景测试，要求能够通过隧道、学校等区域，应对行人违章通行、施工路段绕行等复杂场景，车辆还要准确识别多种交通要素如潮汐车道、可变导向车道、路口左转待转、临时红绿灯等特殊交通标志、标线和信号灯，并可以正确实现无障碍通行。车辆还要具备超车能力。

供应链仍处于发展阶段

自动驾驶和车联网仍处于开发阶段，但预计它们将成为 5G 时代的主要下游应用之一。正如我们在 2019 年 4 月 1 日的报告所指出，工信部负责人提到 5G 的主要应用是移动物联网（IoT），而最大的物联网市场将是车联网，而自动驾驶的车辆可能是 5G 技术的最早应用。中国政府致力于推动自动驾驶汽车的发展。IoV 需要各种连接：a）人与车辆，b）车辆与车辆，以及 c）车辆与道路。工信部正致力于推动车联网汽车网络的发展，工信部和交通部达成了一项重要共识，两部委将加快中国公路的数字化和智能化改造。北京政府发布 T4 自动驾驶路测牌照大致符合我们之前的看法。我们预计自动驾驶和车联网将在短期内再次成为市场热话，因为投资者可能会将焦点从上游 5G 设备扩展到下游应用，而百度可能会在今年晚些时候开始进行道路测试。据我们理解，百度已通过 LiDAR、毫米波雷达和相机模组达成了 T4 级别。我们还没有看到一种方法成为主导。

除了电信设备和云平台/边缘计算企业（我们在之前的报告中曾讨论过），一些硬件公司以及有涉足 LiDAR、毫米波雷达和相机模组的硬件公司也可能会受益于自动驾驶和车联网的开发。当中的通信很可能通过 V2X 和 LTE-V 实现，相关公司也将受益于最新的行业发展。百度是中国自动驾驶/ 车联网发展的领先公司之一。昂纳科技集团[0877.HK]为谷歌的 LiDAR 提供关键组件，预计将成为受益者之一。舜宇光学科技[2382.HK]是一家重要的车载镜头供应商，将受益于相机模组在自动驾驶中的广泛应用。Ams 正在寻求通过应用 3D 传感功能在汽车领域取得突破，这对于槟杰科达[1665.HK]来说是正面的。我们之前曾提到，鸿海[2317.TT]也将新能源车/车联网确定为重点发展领域之一。鸿腾六零八八精密科技[6088.HK]将成为新能源车/物联网发展的重要平台。启迪国际[0872.HK]将受益于 V2X 开发和自动驾驶道路测试。

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China

Technology - Others

Autonomous Driving/IoV – Marching ahead

- The first batch of T4-level autonomous vehicle road test licenses were issued by the Beijing government on Jul 1, 2019, and Baidu received all five licenses.
- Even though autonomous driving and the Internet of Vehicles (IoV) is still in the development stage, autonomous vehicles are expected to be one of the key downstream applications in the 5G era.
- Autonomous driving and the IoV are expected to be hot topics in the market again in the near term.
- In this report, we highlight potential beneficiaries in the TMT sector, such as suppliers of LiDAR, millimeter wave radar, camera modules and V2X.

Beijing government issues first batch of T4-level road test licenses

On Jul 1, the Beijing government issued China's first batch of T4-level autonomous vehicle road test license plates; all five were issued to Baidu. This repeats the scene on Mar 22, 2018 when the Beijing government issued the first batch of five temporary autonomous vehicle road test license plates, all of which were also issued to Baidu. Obtaining a T4-level license plate means that the autonomous vehicle has the ability to drive automatically on complex urban roads. The so-called complex urban roads include different types of roads, such as urban central roads, roads in residential areas, narrow lanes, and roads without traffic lights. It is understood that the T4-level license is currently the most difficult public road test qualification for the country's highest technical level, standards, and test scenarios. Compared with T3, T4 has added 19 difficult scenarios in special test projects, requiring vehicles to pass through tunnels, schools and other areas to deal with complex scenes such as pedestrian violations and construction roads, and vehicles must accurately identify multiple types of traffic. Elements such as tidal lanes, variable guidance lanes, left-turning at intersections, temporary traffic lights and other special traffic signs, markings and signal lights can be used to achieve barrier-free access. The test also added special contents for running tests.

The supply chain is still in the development stage

Autonomous driving and the Internet of Vehicles (IoV) are still in the development stage, but they are expected to be among the key downstream applications in the 5G era. As we discussed in our update on 1 Apr 2019, the head of MIIT mentioned that the major application of 5G will be the mobile Internet of Things (IoT), the largest IoT market will be the IoV, and autonomous or autopiloted vehicles may be the earliest application of 5G technology. The Chinese government is committed to promoting the development of autonomous vehicles. IoV requires various connections: a) human to vehicle, b) vehicle to vehicle, and c) vehicle to road. MIIT is working on the promotion of the IoV vehicle network, and MIIT and the Minister of Transport have reached an important consensus that both Ministries will speed up the digitization and intelligent transformation of highways in China. The Beijing government's issuance of T4-level road test licenses is somewhat in line with our discussion. We expect autonomous driving and the IoV to become hot topics of the market again in the near term, as investors may extend their coverage from upstream 5G equipment to downstream applications, and Baidu may start road tests later this year. Based on our understanding, Baidu has achieved T4-level through LiDAR, millimeter wave radar and camera modules. We haven't seen one dominant method yet.

In addition to telecommunications equipment and cloud platform/edge computing (which we discussed in earlier notes), hardware names and those with exposure to LiDAR, millimeter wave radar and camera modules may benefit from development of autonomous driving and the IoV. Communications are likely to be implemented through V2X and LTE-V, and related names will also benefit from latest industry developments. Baidu is one of the leading companies in autonomous driving/IoV development in China. O-Net [0877.HK], which supplies key components for Google's LiDAR, is expected to be one of the beneficiaries. Sunny Optical [2382.HK], a key auto lens supplier, will benefit from the wider application of camera modules in autonomous driving. ams is seeking a breakthrough in the auto sector by the application of 3D sensing capability, which is positive for Pentamaster [1665.HK]. We highlighted earlier that Hon Hai [2317.TT] also identified EV/IoV as one of the key development areas. FIT Hon Teng [6088.HK] will be a key platform for EV/IoV development. TUS Int [0872.HK] will benefit from V2X development and autopilot road testing.

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Baidu's Autonomous Vehicle

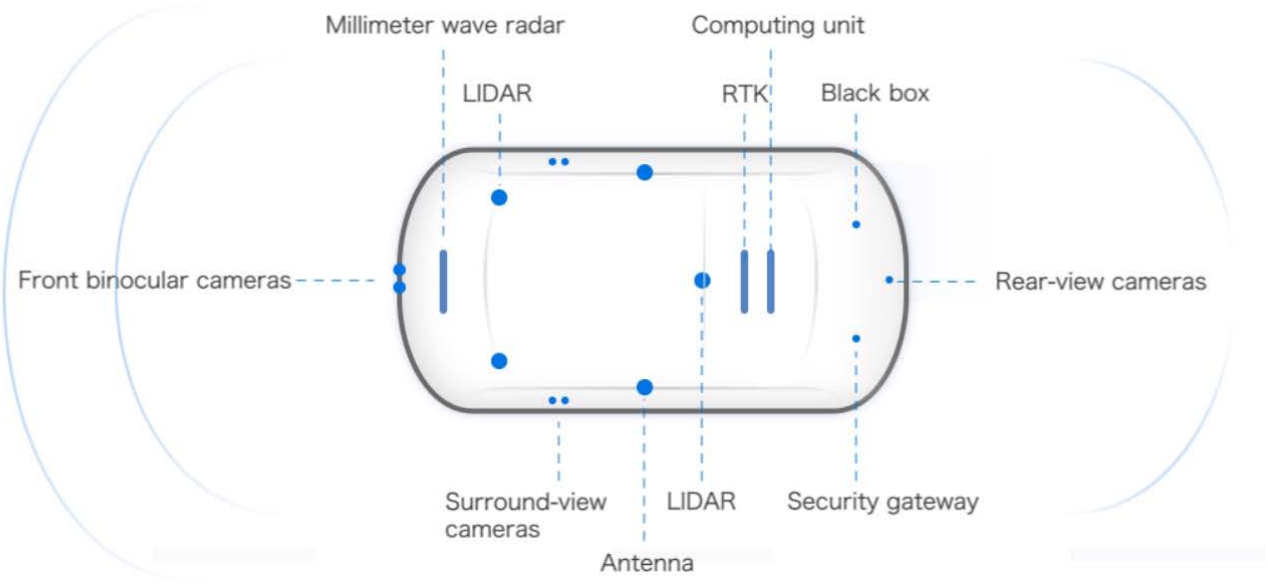
According to the inaugural Beijing Autonomous Vehicles Road Test Report for 2018 issued by the Beijing Municipal Commission of Transport, Baidu's Apollo amassed over 10 times more test miles than the next industry player in China.

Baidu is the biggest player in China and is believed to have received the largest number of open road testing licenses in China to date. In addition to the five licenses it received on July 1, 2019, on June 21, Baidu got 45 licenses from the Changsha Government. Considering the over 50 existing licenses for open-road testing for autonomous vehicles it has received from Beijing, Tianjin, Chongqing, Changsha and Baoding municipalities, as well as Fujian province, Baidu now has over 100 licenses nationwide. Baidu's Apollo was launched in Apr 2017.

As at the end of 2018, Apollo had garnered over 135 OEMs, Tier 1 parts suppliers and other strategic partners, including the recent additions of Volkswagen Automobile, China Unicom, Kalray, Quanta Computer and StarNeto Technology. According to the latest release in GitHub, it already upgraded to its version 5.0 in Jul 2019. Apollo 5.0 is an effort to support volume production for Geo-Fenced Autonomous Driving. The car now has 360-degree visibility, along with upgraded perception deep learning to handle the changing conditions of complex road scenarios, making the car more secure and aware. Scenario-based planning has been enhanced to support additional scenarios like pulling over and crossing bare intersections. Apollo has made some good achievements. For example, Baidu released Apollo L4 Pilot, in collaboration with King Long, to achieve mass production of the first L4 autonomous driving mini bus, Apolong.

Apolong driving over the Hong Kong–Zhuhai–Macau Bridge in the Spring Gala 2018 attracted a lot of attention and showed Chinese speed. On Jul 4, Baidu Creative 2018 published a milestone that Apolong had achieved mass production, indicating Apollo leads China's autonomous driving technology in the mass production era. According to Baidu, Apollo L4 Pilot can equip vehicles with L4 autonomous driving ability, incomparable security assurance, highly efficient integration tools, all-round AI interaction, and superior operation, which provides a total end-to-end solution for Apolong, from manufacturing and implementation to management. This solution can easily be applied to different types of vehicles and scenarios, and its strong capability and promising prospects will help more and more OEMs achieve mass production of autonomous driving vehicles in the future.

Figure 1: Sensor solution of Baidu's Apollo Minibus (an L4 autonomous driving mini-bus)



SOURCES: CGIS RESEARCH, BAIDU

Beijing's Autonomous Vehicle Development Review

According to the "2018 Annual Work Report of Beijing Autonomous Vehicle Road Test", in 2018, Beijing issued temporary road test licenses for 56 autonomous vehicles from 8 companies, and the road test for autonomous vehicles safely travelled more than 153,600km.

Figure 2: Beijing AV (Autonomous Vehicles) Road Test Qualification Announcement List

Autonomous Vehicle Company		Number of vehicles with license plates		Total testing kilometerage (km)
Chinese Name	English Name	2019	2018	2018
北京百度网讯科技有限公司	Beijing Baidu Netcom Science & Technology Co., LTD	45	45	139887.7
上海蔚来汽车有限公司	NIO Inc.	1	2	2415.3
北京新能源汽车股份有限公司	BAIC BJEV	0	1	235.1
戴姆勒大中华区投资有限公司	Daimler Greater China Ltd. (DGRC)	2	2	476
北京小马智行科技有限公司	Pony.ai	5	2	10132.9
腾讯大地通途（北京）科技有限公司	Tencent Dadi Tongtu (Beijing) Technology Co., Ltd	1	1	259
苏州滴滴旅行科技有限公司	Suzhou Didi Travel Technology Co., Ltd.	2	2	78.1
奥迪（中国）企业管理有限公司	Audi (China) Enterprise Management Co., Ltd.	1	1	80.9
北京智行者科技有限公司	Idriverplus Technology Co., Ltd.	2	0	0
重庆金康新能源汽车设计院有限公司	Chongqing Jinkang New Energy Automobile Co., Ltd.	1	0	0
北京四维图新科技股份有限公司	NavInfo Co., Ltd.	1	0	0

SOURCES: CGIS RESEARCH, BICMI, BMCT

One year ago, Beijing opened 33 roads, totalling 105km, for autonomous vehicle testing outside the Fifth Ring Road and away from densely populated areas. Now, Beijing has 44 open roads, totalling 123km, covering 85% of the urban, rural and high-speed traffic scenes in the Beijing–Tianjin–Hebei Region.

Key downstream application of 5G in China

The Head of MIIT, Mr. Miao Wei, discussed 5G development in China at the Baoao Forum in Mar 2019. According to Mr. Miao, human-to-human communication is expected to account for 20% of traffic in the 5G era, and 80% will be machine-to-machine communication. The major application will be the mobile Internet of Things (IoT), he said. The largest IoT market will be the Internet of Vehicles (IoV), and autonomous or autopiloted vehicles may be the earliest application of 5G technology. Therefore, China is committed to promoting the development of autonomous vehicles. IoV requires connections: a) human to vehicle, b) vehicle to vehicle, and c) vehicle to road. A fixed-line network is not capable of supporting the IoV, so the IoV must use mobile network communication, and its data traffic will be many times higher than that of human-to-human communication. Therefore, MIIT is working on the promotion of the IoV network. According to Mr. Miao, MIIT and the Minister of Transport have reached an important consensus that both Ministries will speed up the digitization and intelligent transformation of highways in China. Some of the road signs and road traffic lights, and some of the road management rules will be solidified through intelligent transformation. MIIT is researching direct communication between traffic light systems and vehicles instead of using sensor systems to identify traffic lights. Cameras will be installed on traffic lights to improve the efficiency of the road traffic system. As for other applications, there is discussion about mobile applications not just for vehicles, but also for drones, airplanes, trains and anything else that has mobile capability. Mr Miao mentioned that a general plan is required for such development. But the details of future applications will be reliant on the 5G network roll-out, and each industry will be integrated with others. This integration of industries will inspire a lot of applications which can't even be imagined today, he said.

The three application scenarios under the 5G standard, eMBB, uRLLC and mMTC, will be used for downstream applications, such as: a) smart mobile, the internet of energy, smart agriculture, smart education, smart city, the industrial internet, smart health and video entertainment. Technologies such as cloud computing, Big Data, edge computing, software defined networks, V2X, the industrial internet, IoT and IoV will be developed on the 5G network. The Chinese government has released policies to support the development of these technologies. The Chinese government's goals include: a) 50% of new car sales being smart vehicles by 2020, b) 90% coverage of LTE-V2X in major cities and highways, and c) full coverage of Beidou positioning system services by 2020. We expect the Chinese government to release related policies and a framework in the coming years to support the development of all these new technologies, which will remain a focus of the market.

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