The Role of Communication Technologies in Connected and Automated Vehicles

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China Academy of Information and Communication Technology (CAICT)
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Organization Structure

CAICT (Beijing)

Shanghai Branch Academy

Guangzhou Branch Academy

Shenzhen Branch Academy

Chongqing Branch Academy
Think Tank for Government and Platform for Industry

• A major supportive organization of MIIT and the pillar research academy in the ICT field in China
• Special role in both domestic and international standardization
• Authoritative house in test and certification
• Comprehensive consulting institution in ICT market
1. Introduction of CAICT
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The overall situation of Chinese relevant policies and measures

China attaches high importance to the integration and development of new information technology and advanced manufacturing

Propose "Using Information technology to drive industrialization, while industrialization to promote information technology"

"To develop modern industrial system, and vigorously promote the integration of information and industrialization", the concept of the integration of these two aspects.

Promote the deep integration of information and industrialization, promote the informatization of economic and social fields

Comprehensively promote the deep integration of the two.

Roadmap and main contents

2002
Propose "Using Information technology to drive industrialization, while industrialization to promote information technology"

2007
"To develop modern industrial system, and vigorously promote the integration of information and industrialization", the concept of the integration of these two aspects.

2010
Promote the deep integration of information and industrialization, promote the informatization of economic and social fields

Currently

Made in China 2025

Internet+
The key direction of "Internet+" action

"Internet+ " Guideline put forward 11 special actions, covering production, human living, innovation and others. "Internet +” Traffic put forward the application of Connected Vehicles technologies; "Internet +” Artificial intelligence put forward the product R&D and application of intelligent aided driving, environment awareness and smart vehicle device.
"Made in China 2025" is adapt to global a new round of science and technology revolution and the industrial revolution trend, to accelerate the development of Chinese manufacturing industry, to provide new impetus to the development of China and the global strategic partnership to develop, upgrade and prosper.

**Ten key areas**
- The new generation of information technology, high-end CNC machine tools and robots, aerospace equipment, etc.

**Nine tasks**
- Improve the innovation capability of the national manufacturing industry, **Promote the integration of information and industrialization**, etc.

**Five major projects**
- Manufacturing innovation center construction, intelligent manufacturing, strong industrial base, green development, high-end equipment innovation, etc.

<table>
<thead>
<tr>
<th>Promote the integration of information and industrialization</th>
<th>Intelligent manufacturing development strategy</th>
<th>Intelligent manufacturing equipment and products</th>
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<tr>
<td>Intelligent manufacturing process</td>
<td>Deepen the application of the Internet in the manufacturing field</td>
<td>Internet infrastructure construction</td>
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Relevant Projects and Funding

2012, Mega Projects III

2016, Mega Projects III
- 1-12: “Research and Demonstration of 5G Technologies for Automated Vehicles” ; 2-10: “Standardization and Development on LTE-V Wireless Technologies”

2010 High-tech Industrial Project
- “Demonstration for ITS basing on IoT Technologies”

2013 High-tech Industrial Project
- (6) Innovation and Demonstration on Broadband wireless Technologies;
- (7) Innovation and Demonstration on Big Data Technologies

2011, 863 Project “Key Technologies for C-ITS” (2011AA110400)

2012, 863 Project “Key Technologies for Connected Vehicles (2012AA111900)

2014, 863 Project “Traffic Control Technologies for City ITS” (2014AA110300)
1. Introduction of CAICT
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From 2011, start the systematic study on Connected and Automated Vehicles, including policies, standards and high technologies. Also we undertake lots of government support and national projects.

**Policies and government Support :**

- MIIT Action Plan of 《Innovation and Development of Connected Vehicles 2015-2020》
- 2014, Newsletter 《Innovation and Development of the New Generation Connected Vehicles》

**National Projects :**

- 2016, Mega Projects III, 1-12 : “Research and Demonstration of 5G Technologies for Automated Vehicles” ;
- 2016, Mega Projects III, 2-10 : “Standardization and Development on LTE-V Wireless Technologies”
- 2013 High-tech Industrial Project, “Research and Demonstration for Transportation Big Data in Mobile Networks”
- 2012, Mega Projects III, 5-4: “Research on Wireless IoT Technologies for ITS” ;
- 2012 High-tech Industrial Project, “Demonstration for ITS basing on NGNI”
**Standards and Impact**

**International Standards**
- ISO TC204 《PWI13111 the use of nomadic & mobile device to ITS service provision for travelers》

**National Standards**
- National Standard 《Cooperative intelligent transportation systems—Dedicated short range communications—Part 1: Architecture and technical requirement》
- National Standard 《Cooperative intelligent transportation systems—Dedicated short range communications—Part 2: Physical Layer and MAC Layer technical requirement》
- National Standard 《Cooperative intelligent transportation systems—Dedicated short range communications—Part 3: Network Layer and Application technical requirement》
- National Standard 《Public Mobile Network—Vehicle Gateway technical requirement》
- National Standard 《Public Mobile Network—Vehicle Gateway testing method》

**Industry and Alliance Standards**
- Two CCSA Standards
- More than ten C-ITS Alliance Standards

- Chair of TC10 CCSA
- Working Group of LTE-V, promoting LTE-V technologies, standards and industry
- Member of ITS
Safety from passive to active

Automated is the future of Vehicles

Connected and Automated Vehicles take the new requirements for Wireless Communication Technologies

- Sensor can only support short range (usual 10m) safety
- IEEE 802.11p not suitable for China Traffic environment
- Current wireless communication technologies are not enough for Connected and Automated Vehicles
- The advantage of LTE technology and industry
LTE-V Technologies and Industry Development

Lead the LTE-V Working Group, promoting LTE-V technologies, standards and industry. Currently, Huawei, ZTE, Datang and FAW are the core member, and Qualcomm, Ericsson and Tsinghua are main participants, to be extend.

- CCSA TC5 WG3 leading the research of “Overall wireless communication technologies requirements of LTE based connected vehicles”

- Apply 2016, Mega Projects III “Standardization and Development on LTE-V Wireless Technologies”

- Promote 3GPP LTE-V, currently 3GPP SA1 and RAN start the requirement and technologies research work

- CCSA TC5 WG8 Research Project “Frequen cy requirement and security”

Our Lab has already had the ability for 802.11p testing, now we can working on the setting up of the LTE-V based wireless communication testbed.
Connected and Automated vehicle is the most important scenario of 5G, and **low latency and high reliability** of 5G are the key support.

### Innovation of 5G and Automated Vehicles

- **User Mobility**
  - a) low speed: 3km/h
  - b) medium speed: 60km/h
  - c) high speed: 120km/h
  - d) super speed: 240km/h

- **Latency**
  - End-to-end delay 5ms

- **Reliability**
  - Air interface more than 99.999%

### Actions on promoting Automated Vehicles with 5G

- Lead the group of IMT-2020, promote the research of the key technologies of 5G
- Applying the 2016 Mega Projects III project “Research and Demonstration of 5G Technologies for Automated Vehicles”;
- Undertake the programming of 5G integration innovation experiment, including 5G and automated vehicles
## Testing

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<td>• Recommendation</td>
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CAICT eager to lead or join in the organization and alliances, cooperation with others together to promote the development of Connected and Automated Vehicles

CAICT, RIOH and Tsinghua setup the joint service platform for new technology testing
Thanks for your attention