ITS in China:
Development States and Prospects

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1. Review of ITS in China
1.1 20-Year Look Back in China

- Top View of 20-Year Picture Established by Planners, Managers, and Engineers
  - Implementation of a National ITS Strategy
  - Establishment of National ITS Architecture and National ITS Standard Framework
  - Several ITS technologies have been applied in the country and created new industries
  - National and local ITS application system promote safety, flexible, and environmentally safe movement of people and goods
  - Enterprises have become the main role in the ITS development
ITS Historical Process in China

**Starting**
1995-2000
- ITS Strategy
- ITS Architecture

**Development & Demo**
2001-2005
- Technology research
- Demo in City / Expressway

**Integrated & Application**
2006-2010
- ITS Service in Olympic, World Expo and Asia Games
- ETC in Expressway
- Expressway Management System

**Next Stage ITS**
2011-2014
- Next Stage ITS Development:
- Cooperative-ITS
- Communication in ITS
- Autonomous Car
- ITS Industry
1.2 ITS Development from 1995 to 2010

(1) ITS Start in China

- ITS became an important issue in transport development planning in 1995
  - Government was the only driving role

- ITS Development Item in MOT Plan
  - Establishing ITS Center
  - Establishing ITS Lab
  - Developing National ITS Strategic Plan (Begin in 1997)
  - Design ITS Research Plan
(2) Planning, Research & Demo (1998-2005)

- **Highlights**
  - Development of National ITS Architecture
  - Find out what works and what does not work – identify barriers to deployment
  - Research and technology development
  - Pilot project in cities and highways

- **ITS Standardization**
    - ISO/TC204 Chinese Domestic Committee (1998)
  - National ITS Standard framework and plan
  - National Standard Committee for ITS was set up in 2003 (SCA/TC268)
(3) Development and Deployment (2006-2010)

- **ITS Technology Development Program**
  - Innovation and New technology for transportation
    - New method of data collection and processing
    - Traffic Safety
    - Intelligent Car

- **Deployment**
  - ITS for urban traffic
    - Intelligent transport service for Olympic Games, World Expo, Asia Games
  - ETC in Expressway
  - National Expressway Monitoring System

- **ITS Standardization**
  - 27 national ITS standards released
  - 45 drafts of national ITS standard
1.3 Examples of ITS Application

(1) Traffic Information Service

- **Data collection**
  - Vehicle detector
  - Probe cars
    - GPS, Mobile phone

- **Information service**
  - Broadcast
  - VMS
  - Navigator
  - Website
  - Smart phone
Probe Car

- Beijing: More than 60,000 taxies
- Shanghai: More than 20,000 taxies
- Guangzhou: More than 20,000 vehicles (taxi+bus)
- ……

![Diagram of Probe Car System]

- Data Base
- Communication management system
- On Board Unit with GPS and GPRS
- Data processing system
Traffic Information Service

Road operation states

Traffic information service in web

Traffic information service by navigator and smartphone and
Traffic Information via VMS

- An integrated system
- Cover urban area
- Example: about 500 VMS in Beijing
(2) Urban Traffic Management and Control

- City Traffic Center: More than 600 cities
- Traffic Signal System
  - SCOOT, SCATS
  - Hisense
- Monitoring Camera: 51 thousand
(3) Smart Bus System

- Smart Card: more than 350 million
- Bus Rapid Transit (BRT)
- Smart Dispatching System
(4) ETC in China

- National ETC Standard: 2007
  - Based DSRC Technology
  - Frequency: 5.8 GHz
  - Semi-Active (awakening) and two pieces OBU

- National Wide Deployment from 2010

- Now
  - Cover area: 26 provinces
  - Total ETC lanes: more than 7000
  - ETC users: more than 15 million
(5) Commercial Vehicle Monitoring System

- National Platform
  - Integrated 1000 GPS Service Companies
  - Sharing information, Monitoring vehicle and driver, Management
- Online Commercial vehicle: 2 million
2. New R&D in Recent Years
2.1 Study of ITS Architecture Based Next Generation Mobile Communication

(1) Project Outline

- **Project Team**
  - RIOH, MoT
  - Research Institute of Telecommunications, Moll
  - Beijing University of Posts and Telecommunications
  - China Telecom group company
  - Datang Telecom Technology and Industry Group

- **Period of Project**
  - October of 2012 to June of 2014
(2) Main Results of the Project

① Cooperative ITS Architecture

- Framework of Vehicle-Infrastructure Cooperation System
Framework of Vehicle-Vehicle Cooperation System
② Scenarios

● For Vehicle Safety

Safety Warning

Risk Avoidance
For Passenger and Freight Transport
For Integrated Use

- **Infrastructure**
- **ETC**
- **Smart signal**
- **Enforcement**
- **Weather**
- **EFC**
- **Eco-Drive**
③ Communication in ITS

1. Communication Architecture for ITS
   - 1-1 Study of Need for Communication in ITS
   - 1-2 Study of Communication Technology Using Scene in ITS
   - 1-3 Development of Communication Architecture for ITS

2. Communication Technology in ITS
   - 2-1 Evaluation of Key Communication Technology in ITS
   - 2-2 Demo of Communication in ITS
   - 2-3 DSRC Development
DSRC for Cooperative ITS

Used for Vehicle to Roadside and Vehicle to Vehicle
Coordinating DSRC and Mobile Networks

### C-ITS DSRC
- License Band for ITS System
- Design for transportation safety and special requirements from transportation industry.
- Coverage along road and highway
- Short delay, quickly response, ms
- Simple network architecture
- Private network

### Mobile Networks
- License Band For Mobile Network
- For public service
- Coverage everywhere
- Long delay, seconds
- Complicated network Architecture
- Provide transport information services, no need to change Mobile Network.

Modules in OBU:
Location Module (GPS/Big Dipper/GLONASS) + 3G/4G(5G) Modem + DSRC(ETC/C-ITS DSRC) + Connectivity (Wi-Fi/Bluetooth) + CPU + Memory (RAM/ROM) + other Chipsets (PMU/RF……)
2.2 Vehicle and Infrastructure Cooperative System Technology

- On board system technology
- Road side system technology
- Communication and control
- Simulation
- Integration
Cooperative Active Safety Control

Car following system via v2v communication
2.3 ITS Research based on Internet

- Based mobile internet
- Data management technology
- Software
- Service Technology

National High-Tech Development Project Supported by MOST
2.4 New Standard Plan in C-ITS

- Cooperative System, DSRC
  - Part 1: General Technology Requirement
  - Part 2: Physical and MAC Layer
  - Part 3: Network and Application Layer
  - Part 4: Equipment Application

- Cooperative System, Application
  - General Technology Requirement for Telematics Service of Vehicle Monitoring and Traveler Information
  - Function Requirement of Vehicle Crash Warning

Issued by Government
Finish in the end of the year
2.5 Security of C-ITS

(1) Research

- Security Technology in C-ITS
  - Secure problem in different use scenes
  - Essential security messages of vehicle and infrastructure
  - Evaluation method for Security

- Credential management and authentication system (CMAS)
  - Requirement of security certificates
  - Define roles for management authority and auto manufacturers
  - Governance structure of C-ITS Security
(2) Regulatory Authority and Facilities

- Management Center under the MOT (plan)
- National certificates management and authentication system

Has passed national authority certification in Feb of 2013
2.6 Autonomous Car R&D

- Chang An Auto

- Military Traffic Institute
3. New Strategy for ITS
3.1 New Policy and Strategy

(1) National Transport development Policy

- Transport Must support the National Strategy and Sustainable Development
  - “One Belt, One Road” / Collaborative development of Beijing, Tianjin and Hebei
  - “Internet Plus” Action Plan/"Made in China 2025"
  - Improving the quality and efficiency of transportation
  - Improving safety and emergency management
  - Developing green transport system
  - Decreasing the usage of private car
    - More attention on Public Transport
    - More attention on Improving Convenience by ICT
(2) A New ITS Promoting Strategy

- **Driven by Market**
  - Enterprises play the leading role
  - The market points the way
  - Enterprises, universities and research institutes work together
  - Innovating new business models

- **Technology Innovation Center in Enterprise**
  (Support by government)

- Encourage enterprises to increase expenditures on research and development

- Encourage competition in the service market
3.2 ITS Technology Development

- Cooperative ITS, intelligent vehicle and intelligent service
- Integration of the internet and the transportation
- Application of the mobile communication in V2I and V2V
- Integration of new energy vehicle technology and ITS
3.3 Standardization

Key areas
- Data Management
- Communication application standard
- Interoperability
- Cyber Security in ITS
- Cooperative ITS

New Mechanisms for ITS Standardization
- National Pilot Organization in Standard
  - China National ITS Alliance
    - Members
      » More than 140 members to the end of last month
      » Most Members are from industrial community
  - Alliance Standard Working Group
Thank You!