

大唐电信集团

# LTE-V Solution for Connected Vehicles

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28<sup>th</sup> July. 2015

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**Applications and requirements of connected vehicles**

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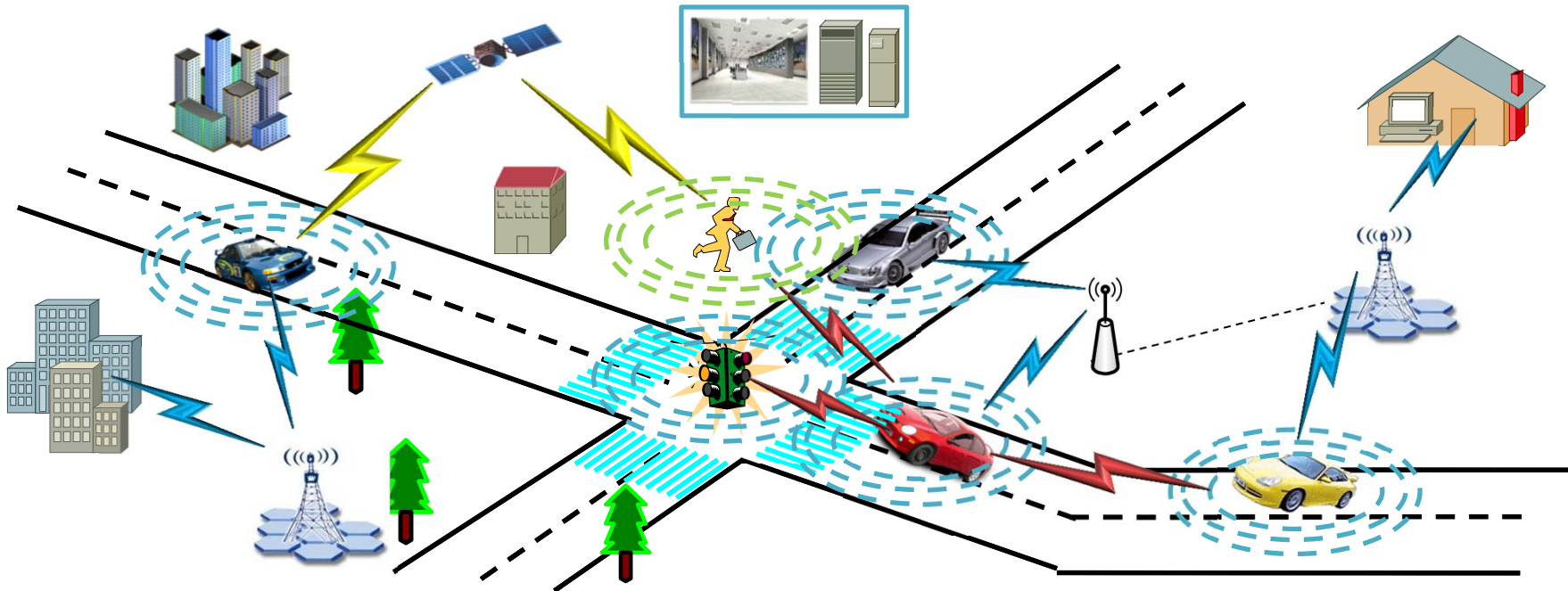
**LTE-V: system solution and prototype**

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**Datang's practice on connected vehicles**

# Connected Vehicles -- Concept

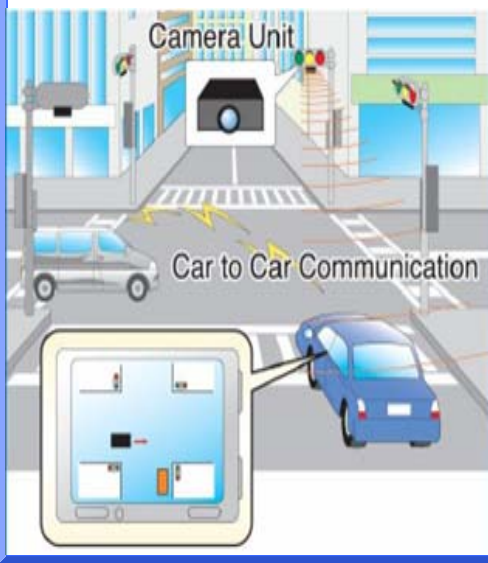
**Connected Vehicles:** Systems include advanced information, communication, sensor and control technologies, which can collect and exchange information among vehicles and roadside units. By cooperation and sharing information, the systems can improve the safety, sustainability, efficiency and convenience of our transportation network. **It is the extension of IOT in ITS field.**



# Applications of Connected Vehicles

## Road Safety

- ◆ Emergency electronic Brake Lights
- ◆ Blind spot warning
- ◆ Intersection movement assist
- ◆ Forward collision warning



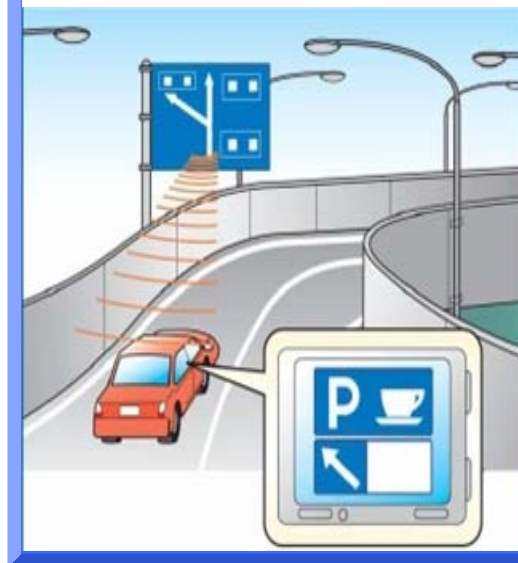
## Traffic Efficiency

- ◆ Electronic Toll Collect
- ◆ In-vehicle signage
- ◆ Traffic information and recommended itinerary
- ◆ Traffic light optimal speed advisory

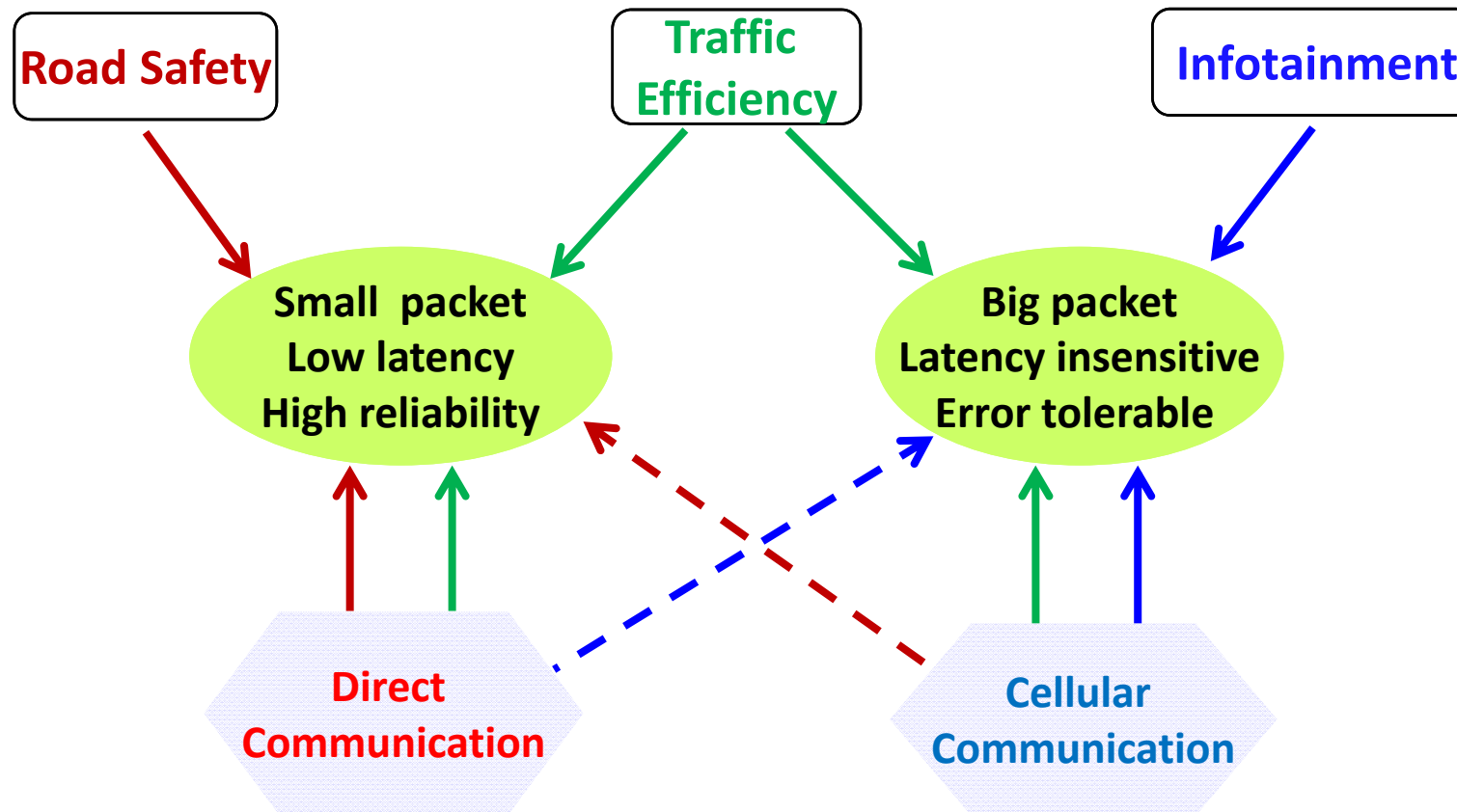


## Infotainment

- ◆ Insurance and financial Services
- ◆ Remote Diagnosis
- ◆ Media downloading
- ◆ Point of interest notification



# Communication Requirements of Applications



- Diverse applications lead to various requirements
- Single communication technology can not meet all kinds of requirements

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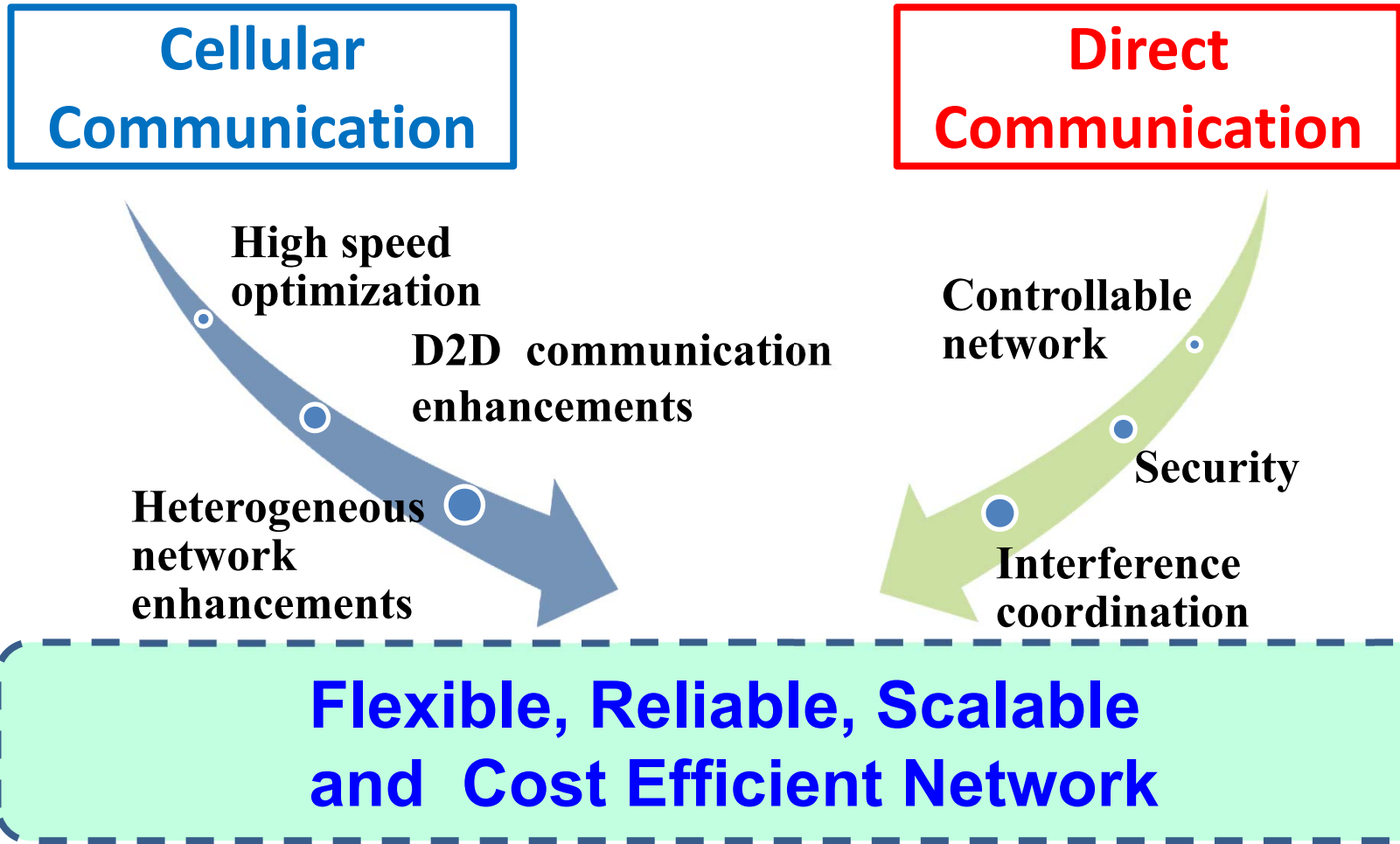
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# Evolution of Communication Technologies

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# Overview of LTE-V

Based on TD-LTE

Customized ITS solution

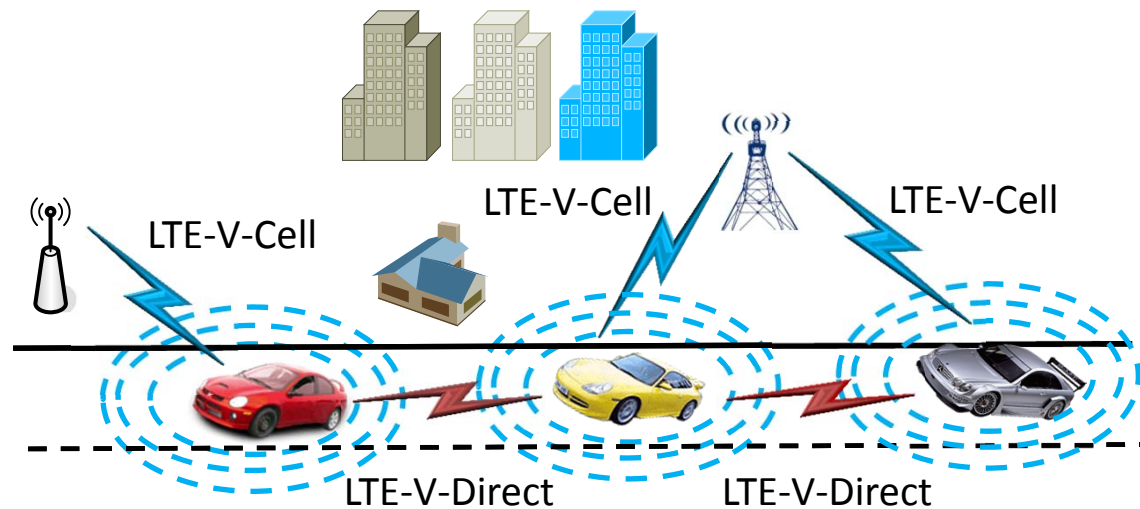
Road Safety support

**LTE-V: TD-LTE based V2X system solution for connected vehicles/ITS**

**LTE-V-Cell: TD-LTE centralized enhancements**

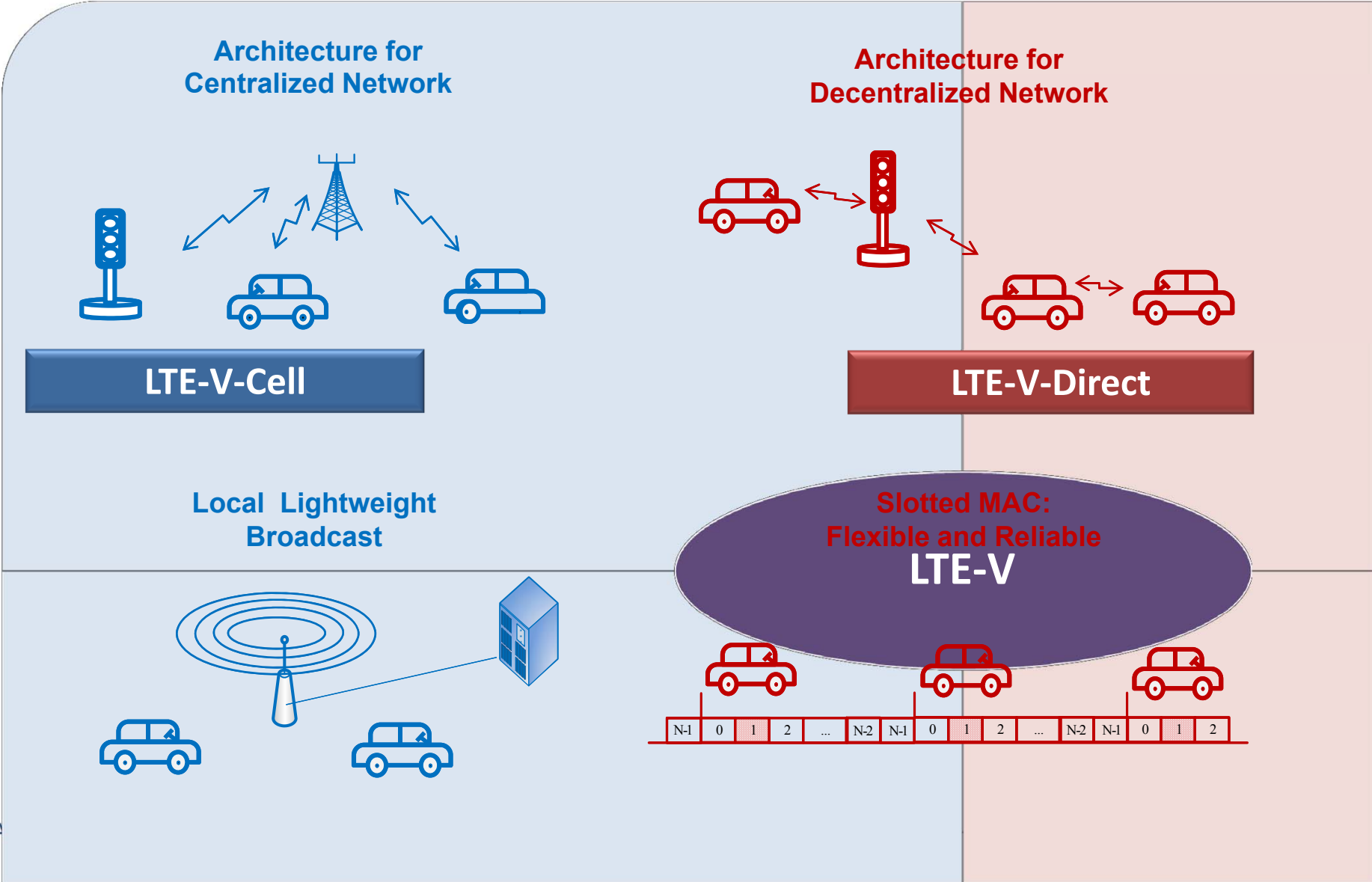


**LTE-V-Direct: TD-LTE decentralized design**



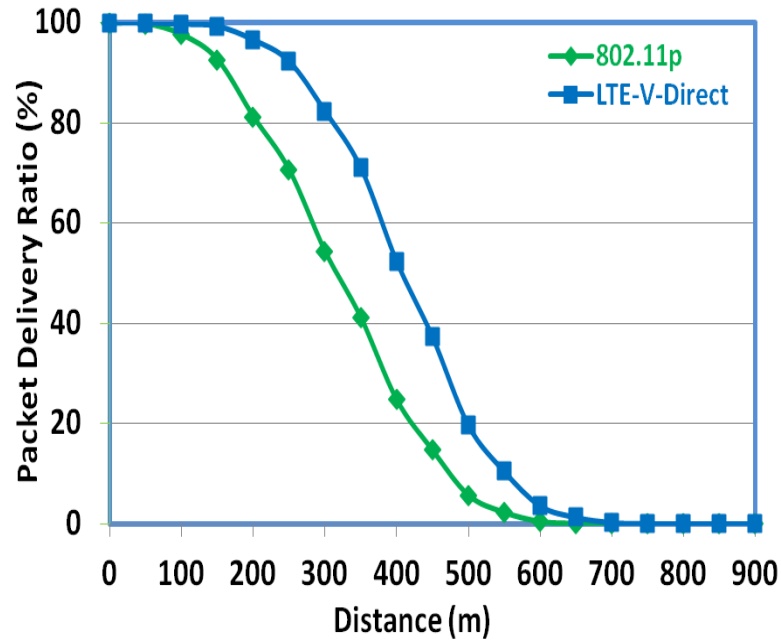


# LTE-V: Key Technologies



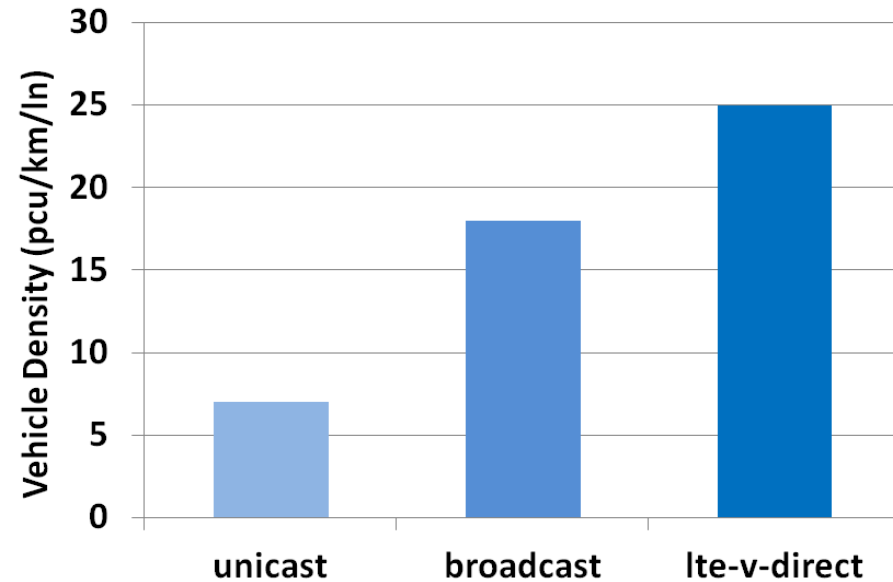
# LTE-V: Performance

## Transmission Reliability



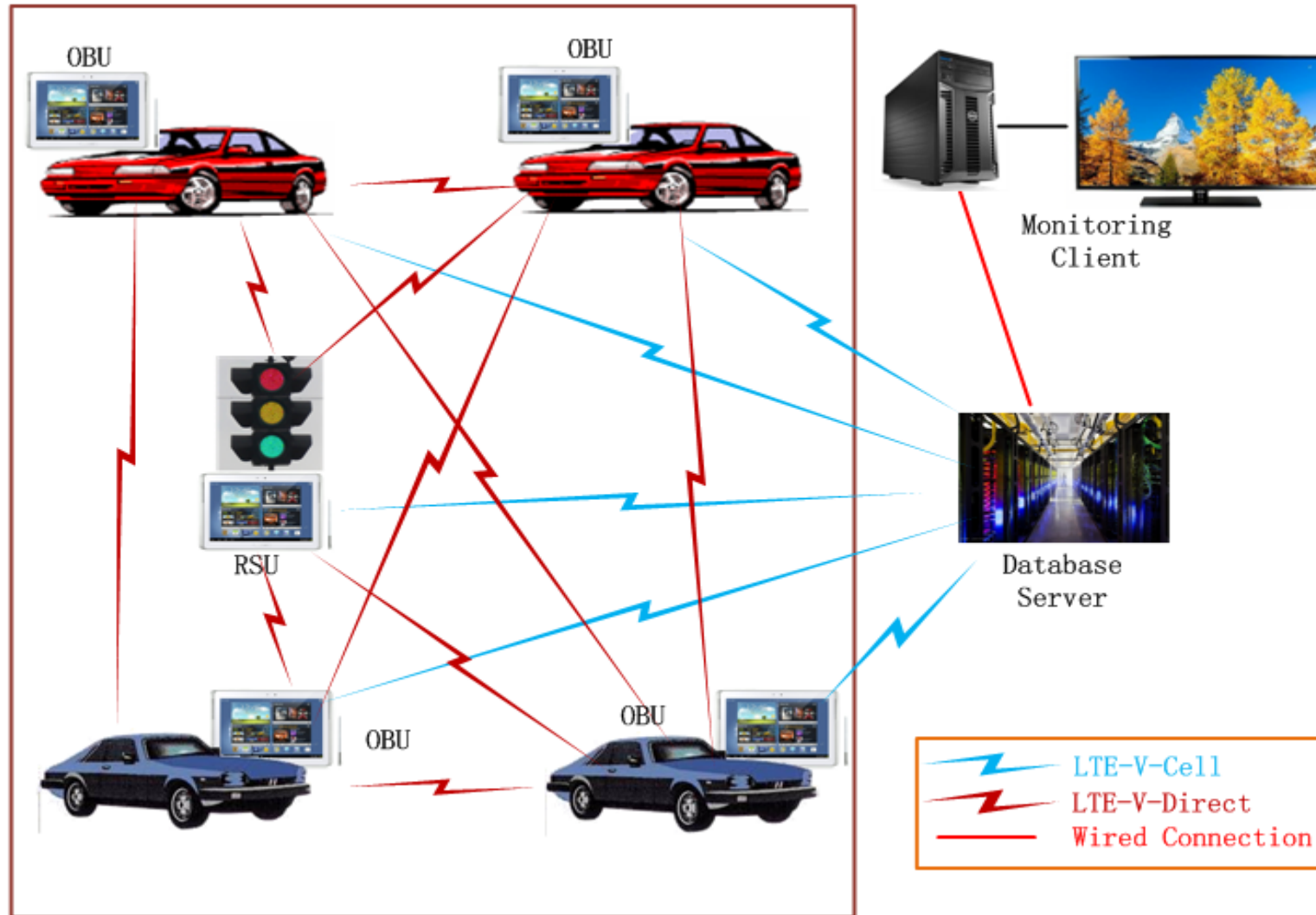
**15~25% higher than IEEE 802.11p**

## Capacity



**257% higher than unicast**  
**39% higher than broadcast**

# Architecture of Prototype System



# LTE-V Demo



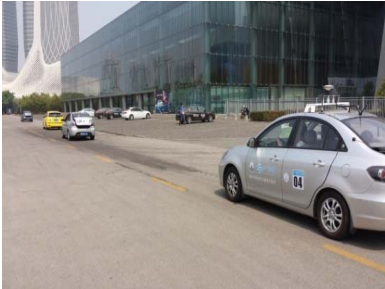
## Demo

- **Partners:** Tsinghua university, Chang An automaker
- **Equipments:** 9 OBU nodes and 3 RSU nodes with LTE-V devices

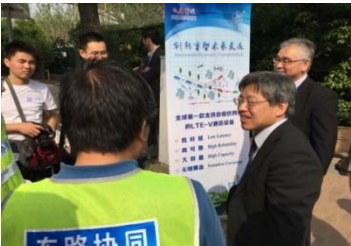
OBU



RSU



Real Road Demo



# Use cases supported by LTE-V Demo

| Cat | Use cases                                                                                                                                                      |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| V2V | <ul style="list-style-type: none"> <li>■ Lane change assistance</li> <li>■ Co-operative forward collision warning</li> </ul>                                   |
|     | <ul style="list-style-type: none"> <li>■ Crash avoidance at the intersection without traffic light</li> <li>■ Approaching Emergency Vehicle Warning</li> </ul> |
|     | <ul style="list-style-type: none"> <li>■ Traffic light optimal speed advisory</li> </ul>                                                                       |
| V2I | <ul style="list-style-type: none"> <li>■ Roadwork warning and Hazardous location notification</li> </ul>                                                       |
|     | <ul style="list-style-type: none"> <li>■ Collision Risk Warning from RSU</li> </ul>                                                                            |
|     | <ul style="list-style-type: none"> <li>■ Vulnerable road user Warning based on detection by RSU</li> </ul>                                                     |
|     | <ul style="list-style-type: none"> <li>■ Special group warning based on detection by RSU</li> </ul>                                                            |



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# Overview of Datang Group

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- **A Chinese high-tech enterprise, focusing on information communications technology, equipment and solutions;**
- **Three Subsidiaries are listed on Shanghai, Shenzhen, New York & Hong Kong stock exchanges;**
- **Total number of patents is over 14000, with annual growth rate of 38%;**
- **Proposed TD-SCDMA international 3G standard, leading TD-LTE/TD-LTE-Advanced international 4G standard and future 5G research.**



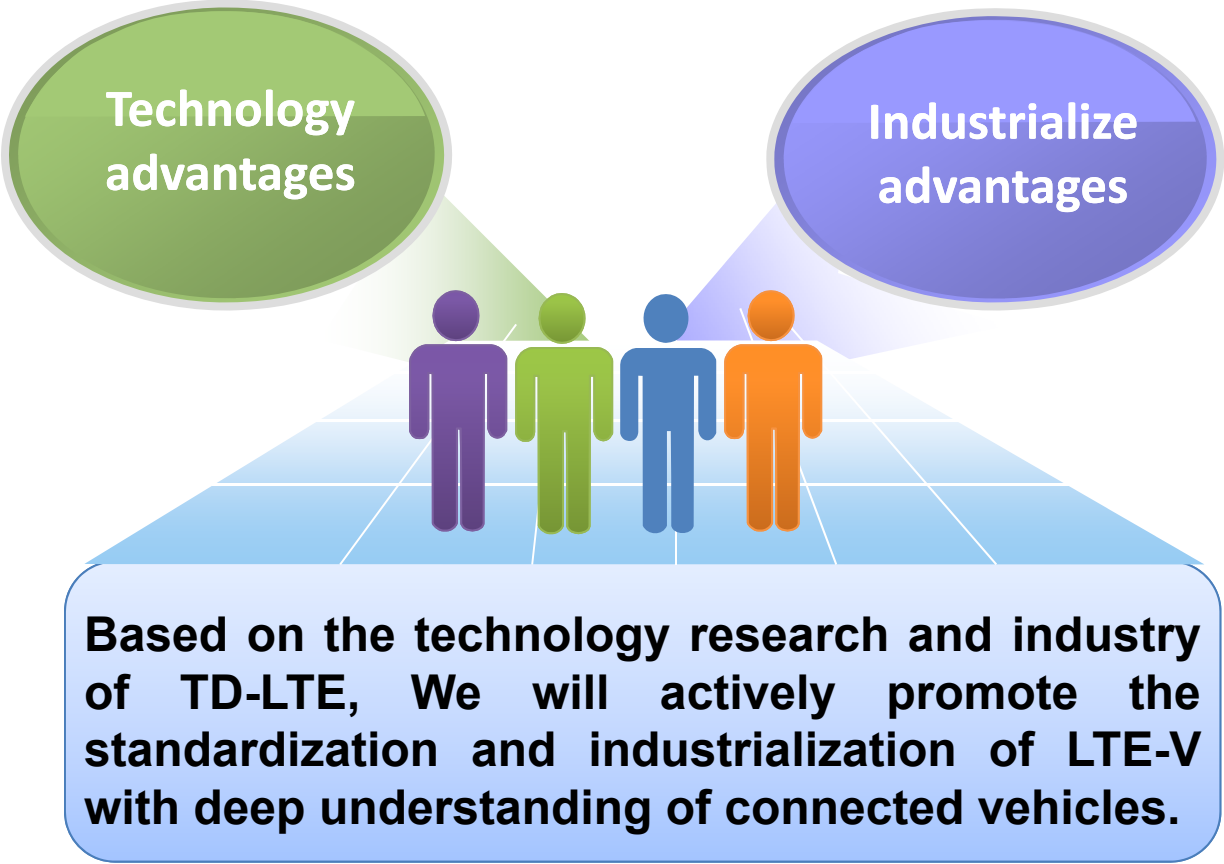


# Products of connected vehicles



# Promoting Standardization and industrialization of LTE-V

## Organizations



**THANK YOU**

