FATRI

Intelligent Vehicle Infrastructure Cooperative System

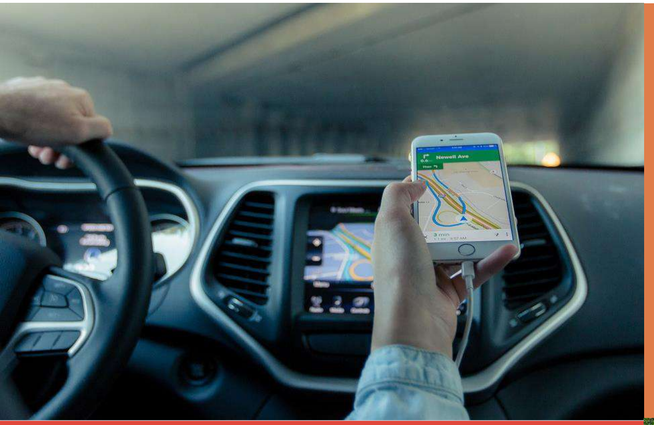
FATRI United Testing & Control (Quanzhou) Technologies Co., Ltd.

CONTENTS

SECTION 01

Industry Demand Analysis

Paint Points of ITS

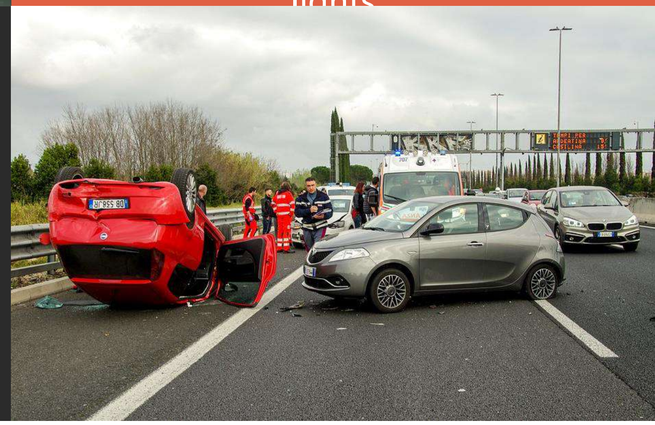


The shortage of parking resources aggravates traffic congestion;
Parking space with charging pile is scarce and occupied by fuel vehicles which results in waste of resources

Laser sensors are expensive;
Millimeter-wave radar is easily interfered and low near-field resolution;
Misjudgment of camera for traffic lights

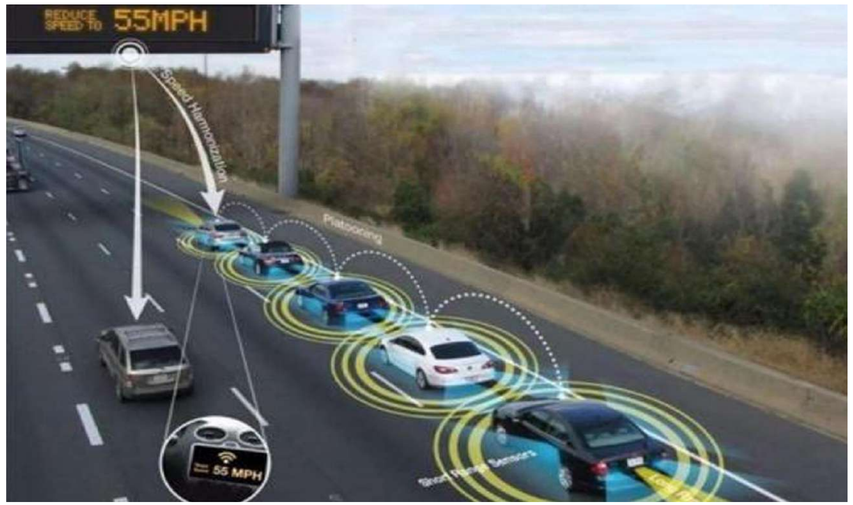
Road navigation highly depends on GPS; Not enough accuracy of civil system;
Can't form a high-precision map;
The system is affected by climatic conditions and power supply

Read OBU Bus Data;
Can't unify all kinds of vehicle models;
Being both a referee and an athlete is easy to judge wrongly



Vehicle-Road Collaboration & Single Intelligent Vehicle

Intelligent Vehicle Infrastructure Cooperative System



Vehicle-Road Collaboration
Unmanned Driving

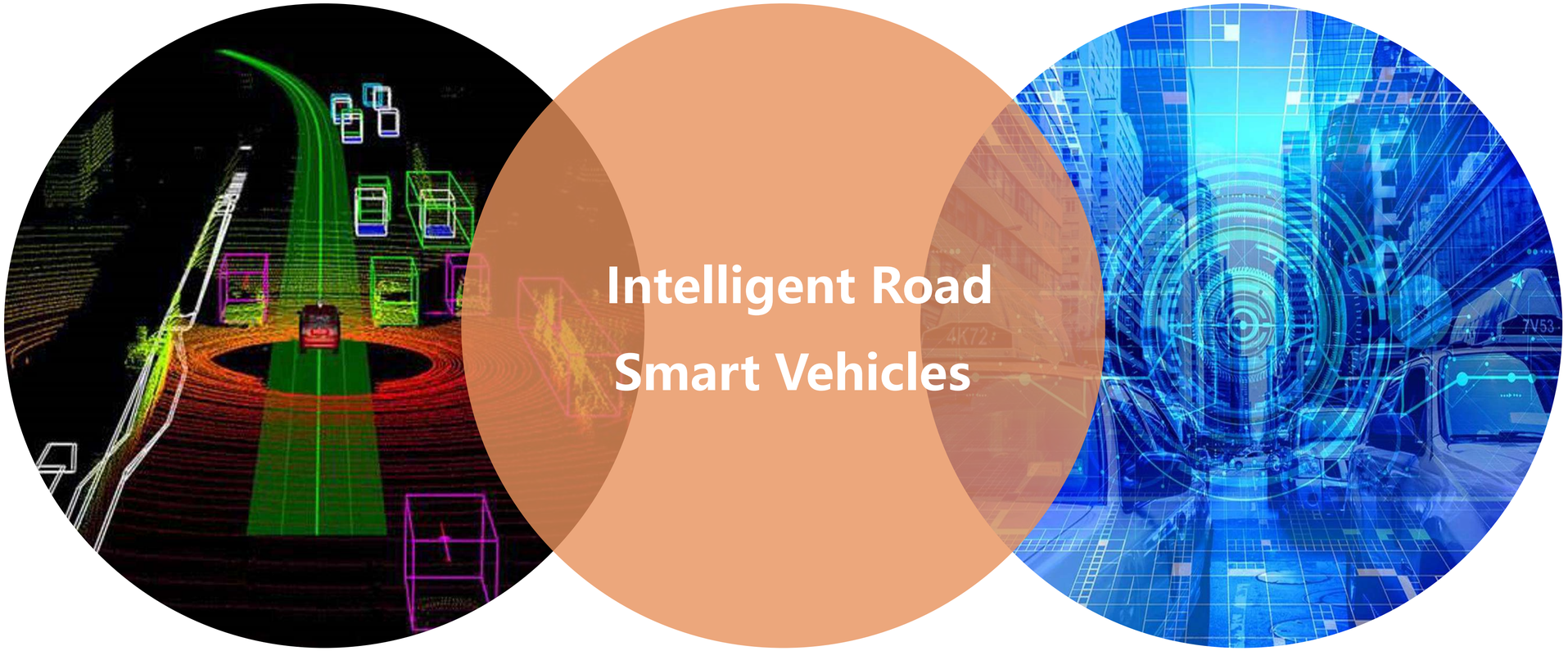
Unmanned Driving for Single Intelligent Vehicle

FATRI

U-MKT-001-EN Rev.01

Intelligent Vehicle Infrastructure Cooperative System

Building IVICS



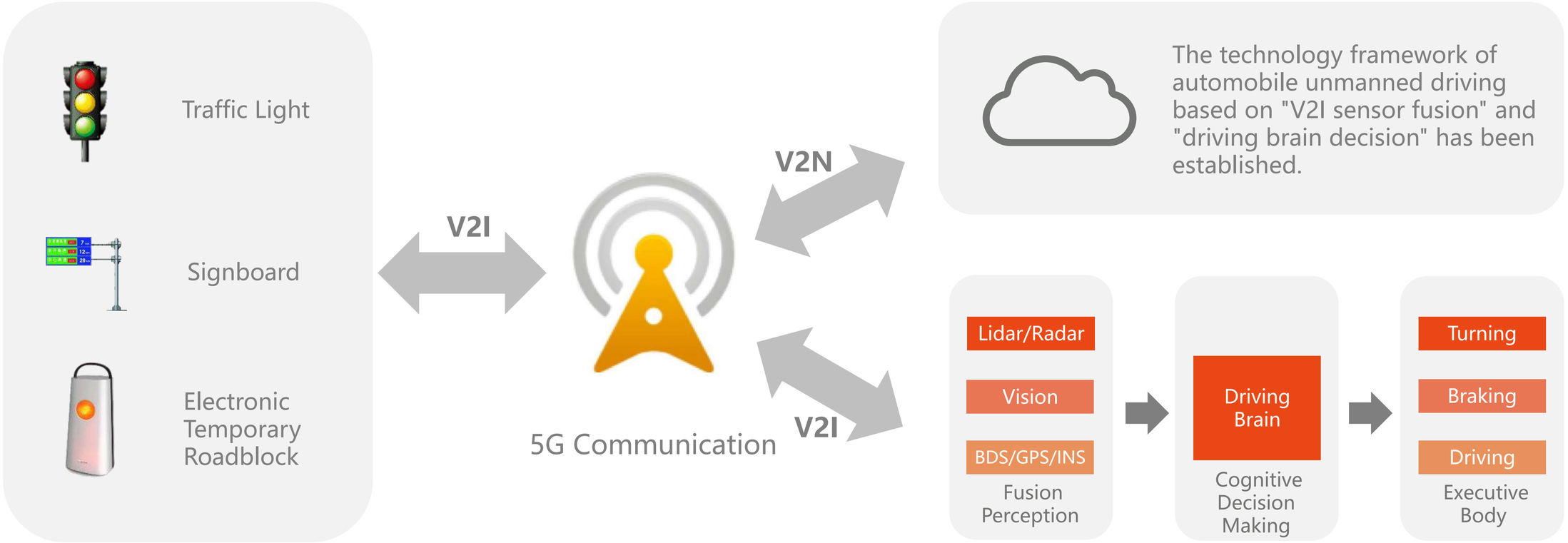
Building Intelligent Transportation Based on Full Digital Road Integrated Information Platform

FATRI

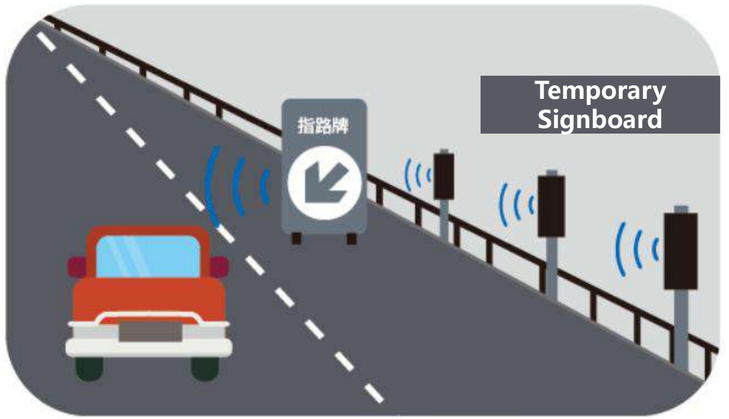
SECTION 02

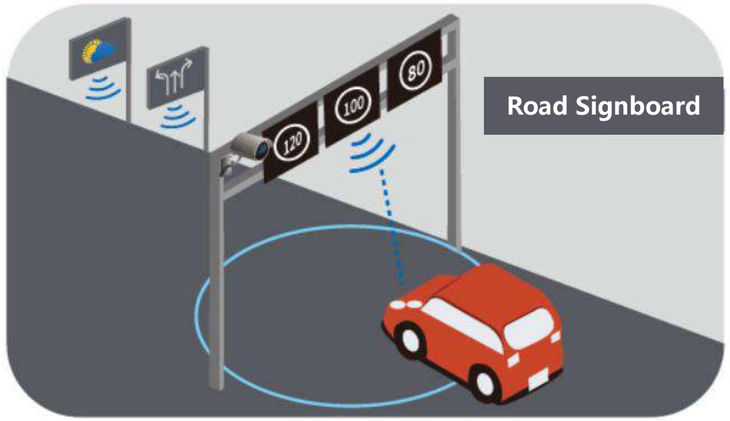
System Introduction

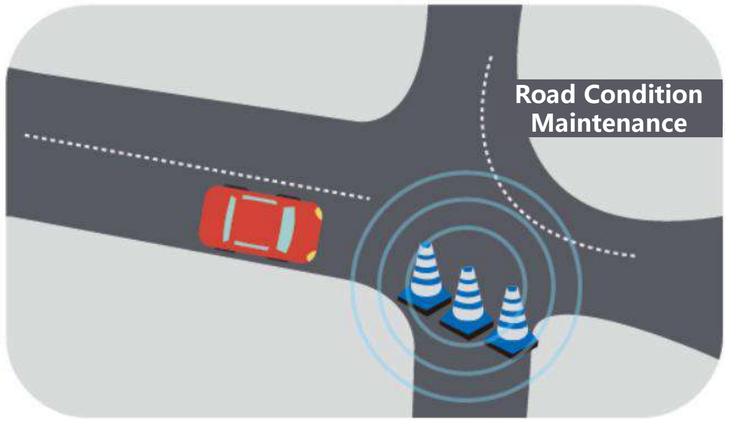
Functional Narrative Characteristics



V2I Sensor Fusion



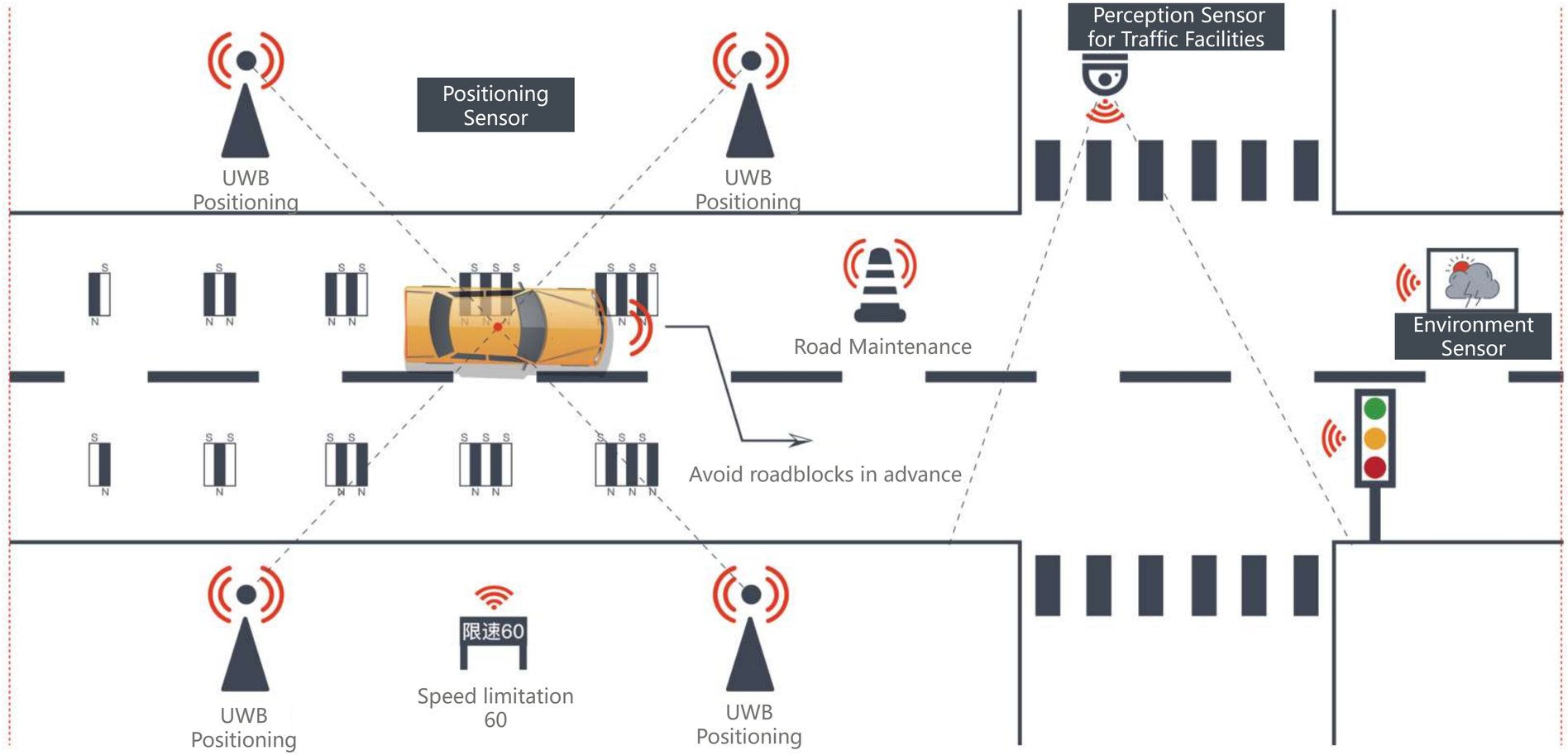




1. UWB positioning assistance
2. Signal light, road signboard
3. Temporary obstacles
4. Road environment sensor

Application Diagram of IVICS

Intelligent Vehicle Infrastructure Cooperative System

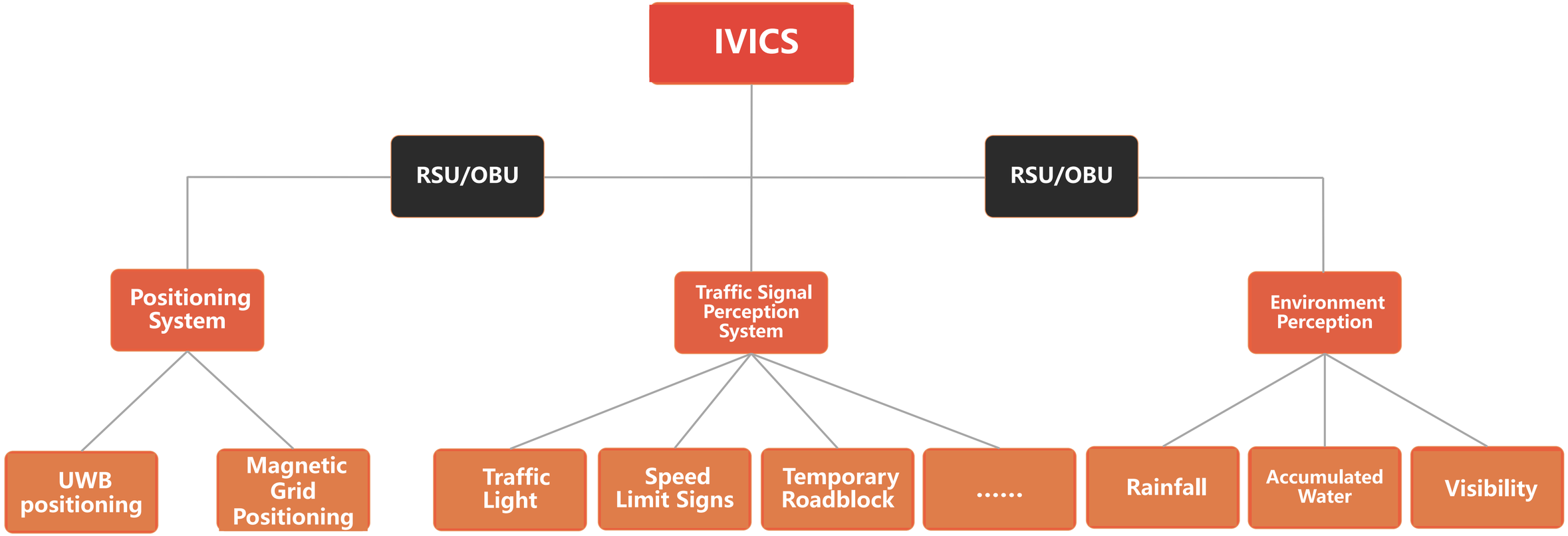


FATRI

U-MKT-001-EN Rev.01

Intelligent Vehicle Infrastructure Cooperative System

System Structure



FATRI

SECTION 03

System Hardware List

Hardware List of System

Classification	Name	Code
Products of Internet of Vehicles	(RSU) Road Side Unit	SS03-005-01
	(OBU) On-Board Unit	SS03-005-02
	Electronic Temporary Roadblock	SS03-007-01
	Electronic Speed limit	SS03-007-02
UWB Positioning Product	Outdoor Type UWB Base Station	SS03-001-03
Environment Sensor	Visibility Sensor	GGXI01
	Rainfall Gauge	EGXV01
	Immersion Type Water Level Sensor	TYZI01
Intelligent Data Acquisition	Intelligent Data Acquisition	SV0218
Magnetic Grid	Road Type Magnetic Grid	SS03-001-01

Intelligent Vehicle Infrastructure Cooperative System

Products of Internet of Vehicles

Parameters	
Supporting Speed	[0，250] km/h
Max. Supporting Users	200个
Wider Coverage	800m
Max. Transmitting Power	23dBm
Bandwidth	10M/20M
Working Temperature	-40℃～ +60℃
Humidity	Relative humidity 5%~95%
Vibration/Shock	Meet ETSI EN300019-1-4 Standard
Salt Spray	Meet IEC60068-2-11 Standard
Lightning Stroke	IEC61000-4-5 Standard
IP Grade	IP65
Flexible Installation Ways	Pole-holding Type, Wall-mounted Type

Road Side Unit(RSU)
SS03-005-01

Electronic Temporary Roadblock
SS03-007-01

On Board Unit(OBU)
SS03-005-02

Electronic Speed Limit
SS03-007-02

FATRI

UWB Positioning Base Station

Parameters	
Low Power consumption	Less than 1W
Coverage	40m-60m
Supply	220VAC
Weight	≤0.5kg
Working Temperature	-40℃~+60℃
Flexible Installation Ways	Pole-holding Type, Wall-mounted Type
IP66 Grade	Outdoor Working Environment
Vibration/Shock	Meet ETSI EN300019-1-4 Standard
Salt Spray	Meet IEC60068-2-11 Standard
Lightning Stroke	Meet IEC61000-4-5 Standard

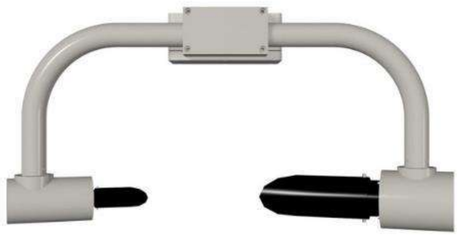
UWB Positioning Base Station
SS03-001-03

FATRI

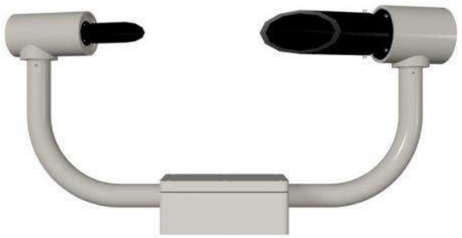
Intelligent Vehicle Infrastructure Cooperative System

Visibility Sensor

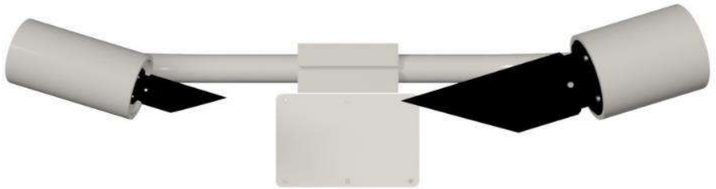
Parameters	
Power Supply	DC12V
Measurement Range	A: 5m~10km | B: 5m~30km | C: 5m~80km
Accuracy	±2%(≤1000m)； ±10%(＞1000m)
Resolution	1m
Output Interval	60 Seconds
Connector	RS485/RS232（ or 4-20mA）
Light Source Wavelength	940nm
Forward Scattering Angle Measurement	33°
Data Update Rate	1/min
Dimension	720mm×370mm×185mm
Power Consumption	≤10W
Weight	≤15 kg
Environment Temperature	- 45~+50℃
Air Humidity	0~100%
Atmospheric Pressure	≥650hPa



Top view



Bottom view



Front view

Visibility Sensor GGXI01

FATRI

U-MKT-001-EN Rev.01

Rainfall Gauge

Rainfall Gauge EGXV01

Parameters					
Standard	Condition	Min.	Standard	Max.	Unit
Measurement Accuracy(Range)		0.01	0.2	0.4	mm
Measurement Range	Light rain to heavy rain	0.01	0.07	0.1	mm/min

Intelligent Vehicle Infrastructure Cooperative System

Immersion Type Water Level Sensor

Parameters	
Measuring Medium	Water (H2O) or compatible with contact materials
Integral Material	Diaphragm 316L Stainless Steel (Contact) Shell 304 Stainless Steel (Contact) Sealing Fluor rubber Seals (Contact) Cable polyurethane, etc. (Contact)
Measurement Range	0~1~50mH20 (See Range Selection Table for more details)
Output Signal	4~20mA、RS485 (Standard Mobus-RTU Protocol) (0~10VDC、0~5VDC、1~5VDC、0.5~2.5VDC)
Power Supply Voltage	12~36VDC Routine 15~36VDC Routine (Output 0~10VDC) 3~5VDC Bespoke (Output 0.5~2.5VDC)
Accuracy Class	0.1%FS (≥10m Range ≥10m Bespoke) Range ≥10m Default) 1m≤Range<10m Default)
Working Condition	Medium Temperature -40~60℃
	Working Temperature -40~85℃
Temperature Compensation	-10~60℃
Seismic Capacity	200% Full range
Response Frequency	Analog signal output < 500Hz, digital signal output < 5Hz
Stability Performance	±0.1%FS/ year
Temperature Drift	±0.01%FS/℃
Overall Weight	Probe ≈290g Cable per meter≈60g
IP Grade	IP68

Immersion Type Water Level Sensor TYZI01

FATRI

Intelligent Data Acquisition

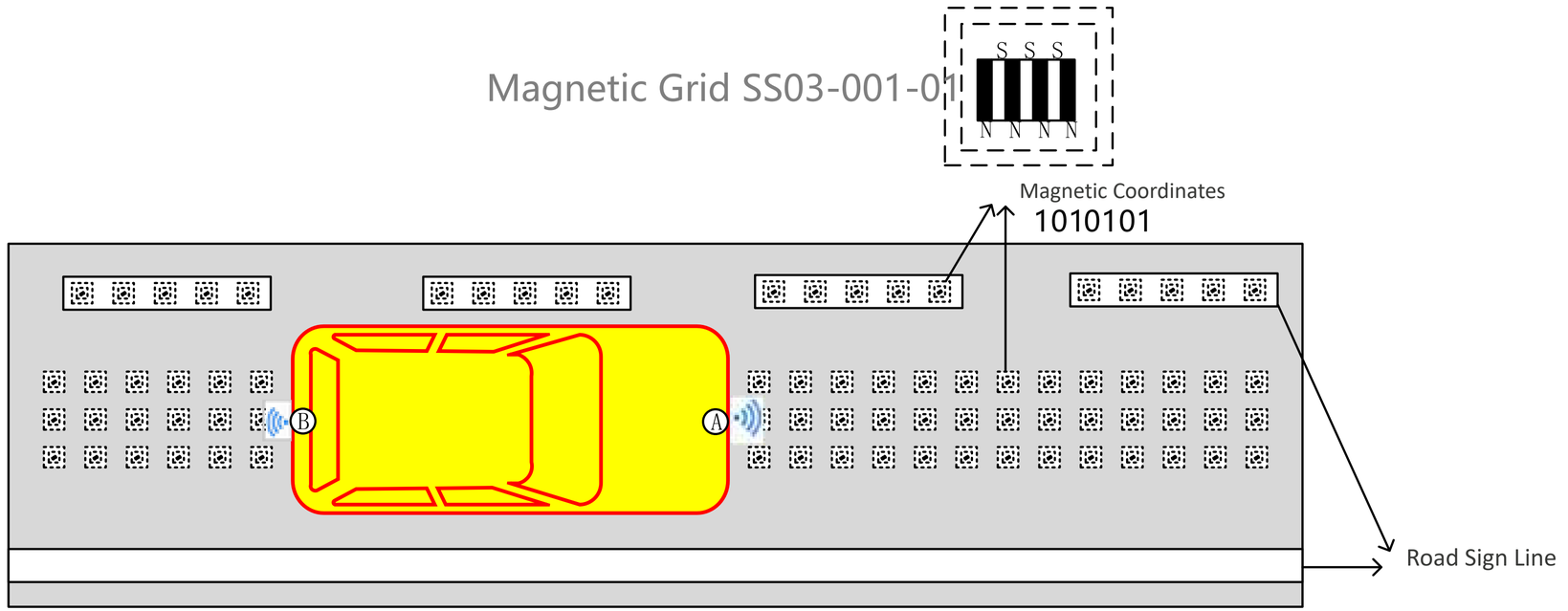
Parameters	
Environment Temperature	-10℃~55℃
Relative Humidity	10%~90% No condensation
Power Supply of Collection Node Box	220V (±22V), 220V±20V AC, Frequency 50Hz±2Hz
Control Processing Unit Box	12V（ ±1.2V) 12V±1.2V DC input
Sensor Resolution	16 bit
Sample Rate	1K ~ 10K SPS
Sensor Analog Input Voltage Range	±5V、±10V（Flexible configuration）
Hot Backup	Main and backup channels backup each other. Lossless switching.
Class	Vehicle level
Assembly Mode	Plug-and-pull combination
Appearance Size	1~6U Horizontal miniature or 13U standard vertical model

Intelligent Integrative Machine
for Data Mining and Industrial Control

- Outside I/O Slave Port Drawn from Rear Frame
- Supporting high density I/O ports
- Supporting dual power supply, with power-on control
- Supporting to allocate single machine, main equipment, load sharing and other working modes.
- Supporting switching between boards in backup mode
- Supporting cold, warm and hot standby backups
- Support software deployment
- Supporting remote upgrade
- Supporting system for cascade extension

FATRI

Magnetic Grid



- Coatings: acrylic resin; magnetic materials: nan ferrite powder, hard magnetic materials can be permanent magnetization
- Deployment is convenient and simple, without destroying the road surface.
- Coatings mixed with magnetic materials are coated on the road surface.
- The thickness of magnetic coatings is 1mm~1.5mm, which does not affect driving comfort.40 cm above the ground.
- Two sets of sensors are installed in the front center and rear center of the vehicle.

Magnetic sensor reads magnetic coordinates

↓

Positioning by reading the information carried by magnetic coordinates

↓

The front and rear magnetic sensors read the magnetic coordinates to determine the driving pose

↓

Modifying driving pose and vehicle speed to drive along reserved trajectory by Algorithms

SECTION 05

Cloud Platform and Interaction

Intelligent Vehicle Infrastructure Cooperative System

Management Cloud Platform

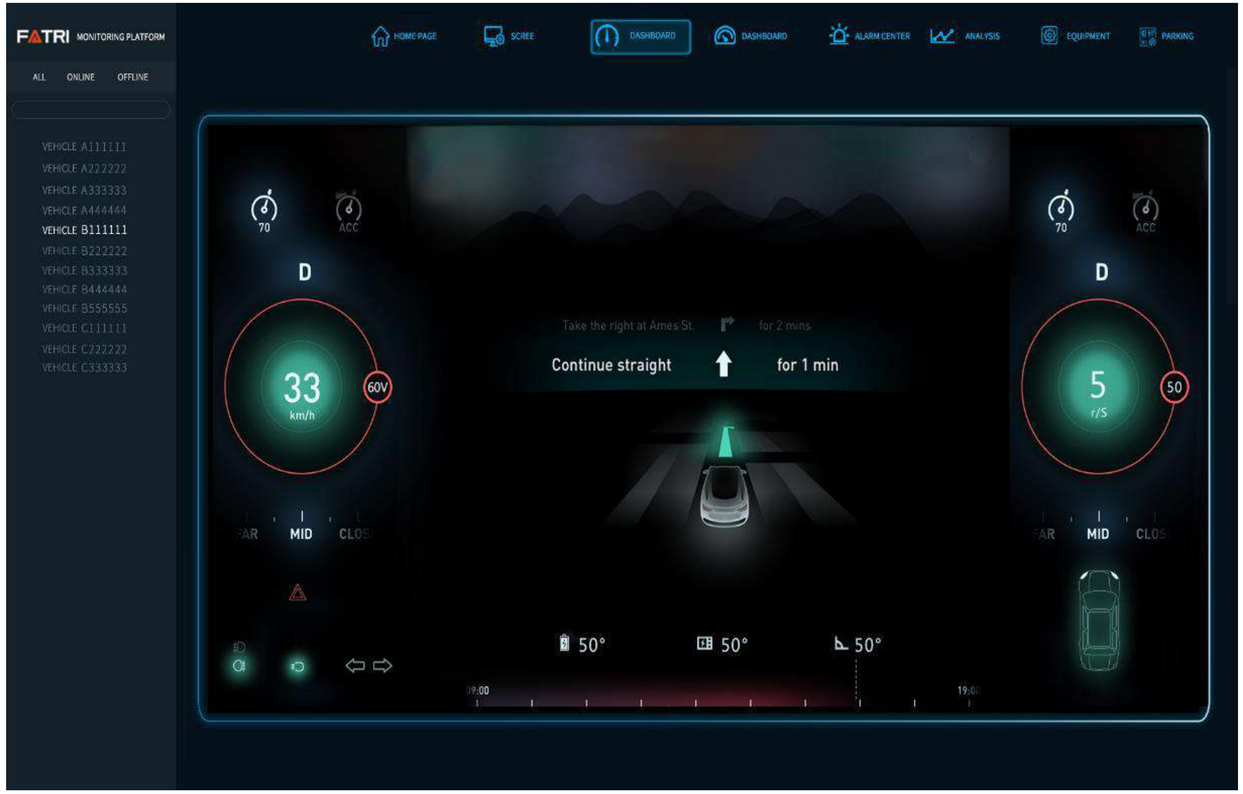
- Unified Platform
- Support for remote control support
- Parking reservation management
- Supporting vehicle dashboard monitoring
- Support real-time transmission of traffic information
- Video information of vehicle traffic recorder
- Vehicle surface radar information
- State monitoring of all UWB and RSU equipment
- Fault diagnosis and predictive maintenance of motor

FATRI

U-MKT-001-EN Rev.01

Vehicle Dashboard

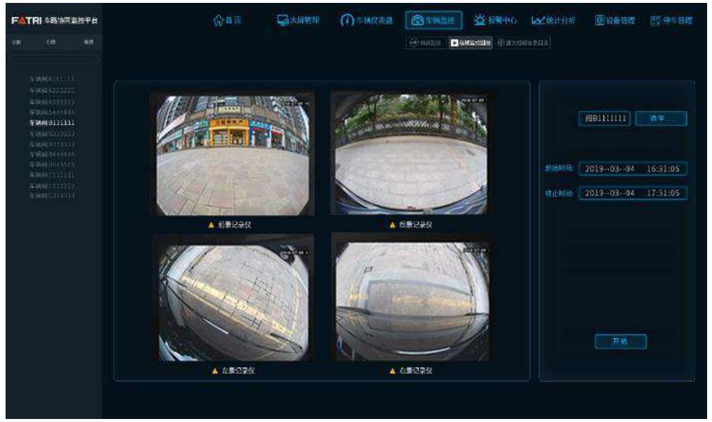
- Current speed
- Gear position
- Battery Voltage
- Motor speed
- Battery temperature
- Motor temperature
- Throttle opening
- Door condition
- Lighting condition



Vehicle Monitoring

Track Playback

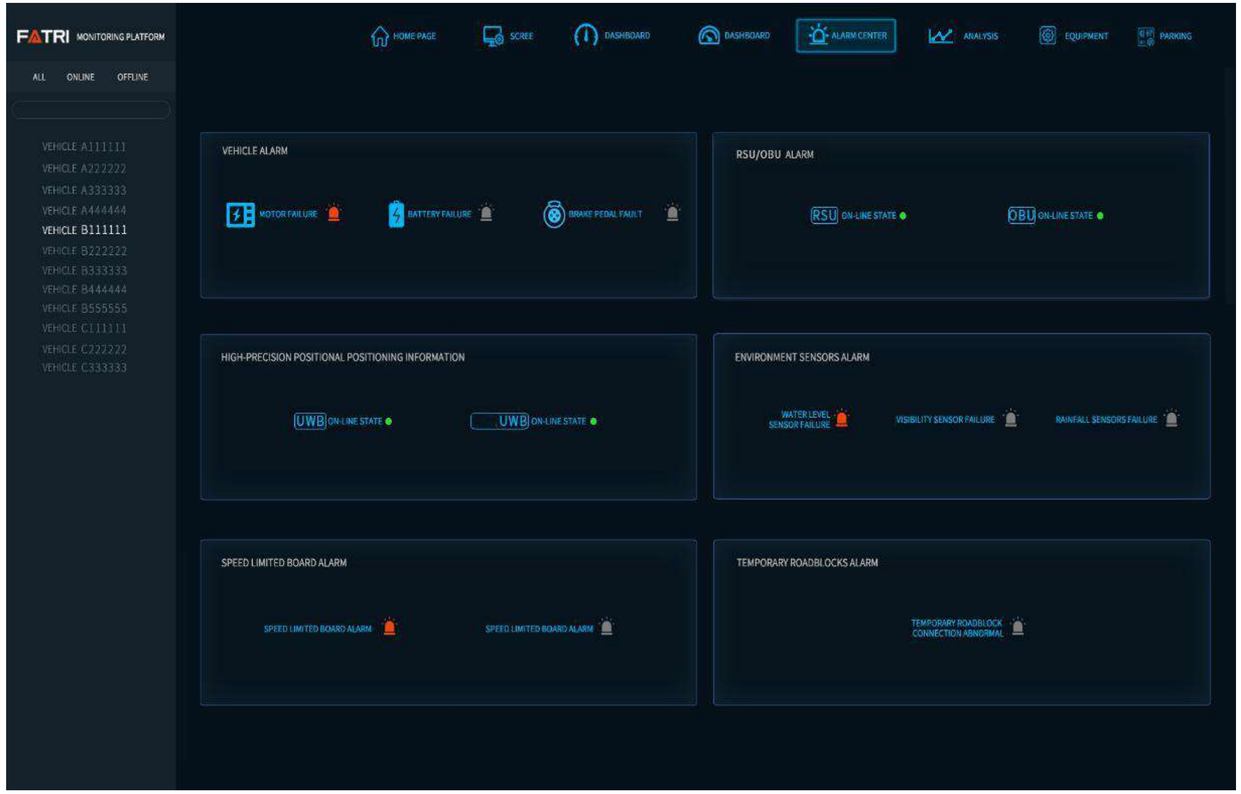
Radar Scanning Information Playback



Video Playback of Driving Records

Alarm Center

- Motor failure, battery failure, brake pedal failure
- UWB on-line status and on-Board UWB on-line status
- Abnormal connection of speed limit plate and speed limit cancellation plate
- Abnormal of water accumulation sensor, visibility sensor and rainfall gauge
- RUS Connection State, OBU Connection State



SECTION 06

Application Case

Anyuan Industrial Park in Pingxiang City, China

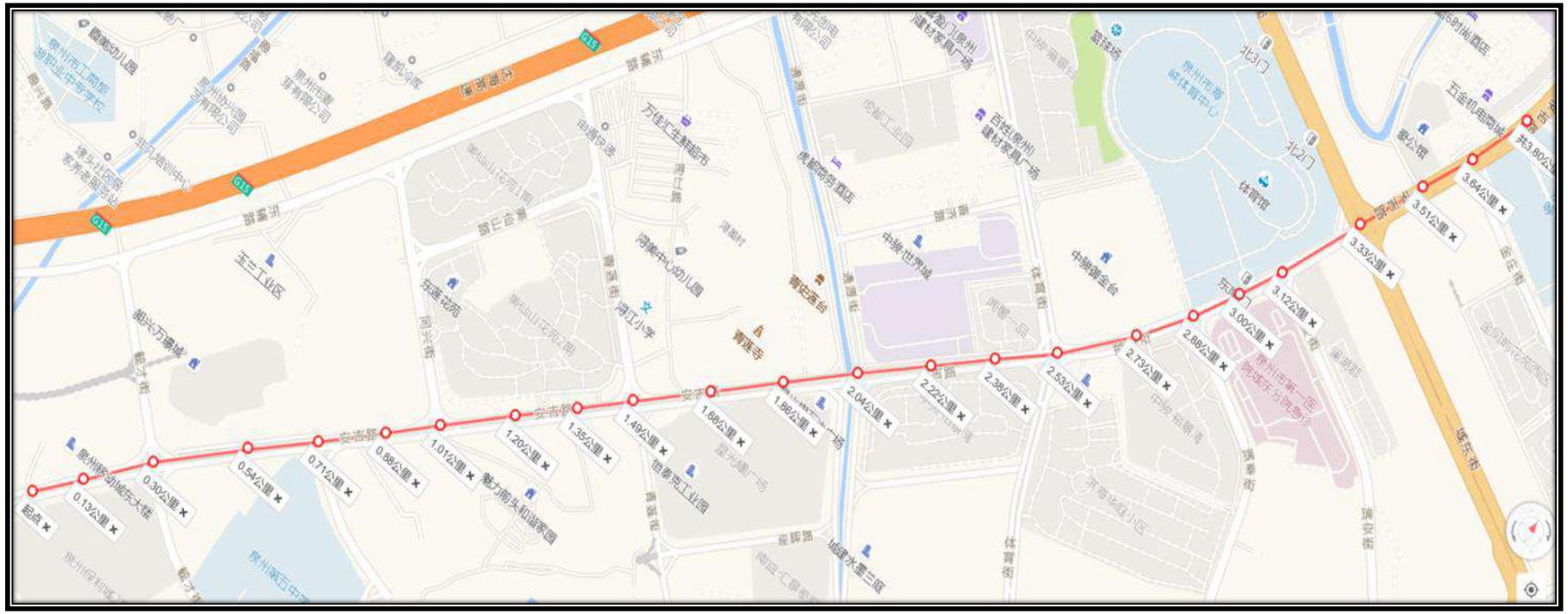
There are about **4** kilometers of road, **6** intersections and **3** traffic lights at Anyuan Industrial Park in Pingxiang City.

The project realizes automatic driving based on vehicle-road collaboration(IVICS), and provides roadside intelligent perception and prediction results information for automatic driving vehicles through intelligent V2X infrastructure, so as to enhance the safety of automatic driving.

Area Map in Anyuan Industrial Park

Intelligent Vehicle Infrastructure Cooperative System

Luojiang District, Quanzhou City, China



Reserved Project: Quanzhou Vehicle-road Collaboration (IVICS), covering the whole city from 3.7 kilometers of Yingji Road.

10 kilometers of automatic driving section is under planning in Luojiang District.

FATRI

Driving Force of Vehicle-Road Collaboration Development

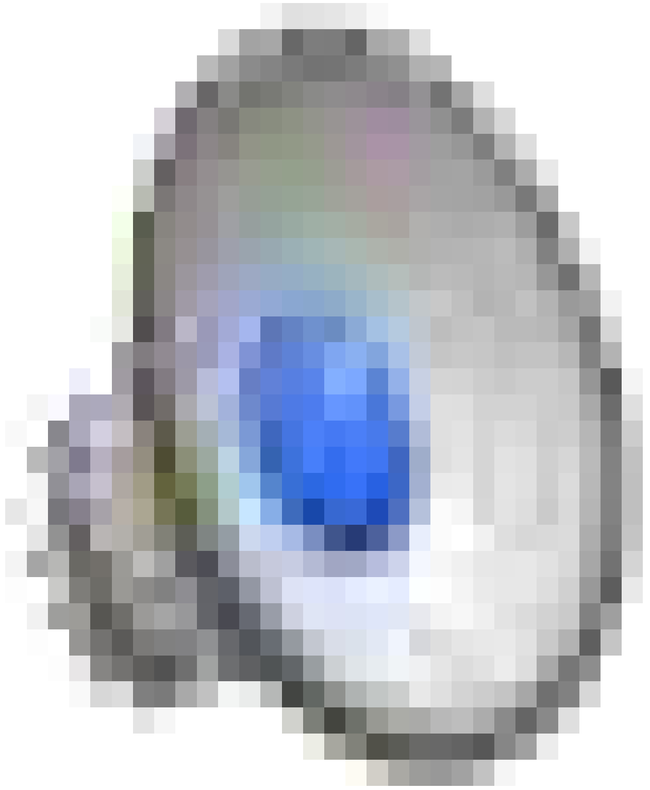
- In February 2017, the State Council promulgated the "13th Five-Year Plan for the Development of Modern Integrated Transportation System" and proposed the promotion of vehicle-road collaboration technology.
- In December 2017, the Ministry of Industry and Information Technology and the National Standardization Management Committee jointly issued the Guidelines for the Construction of National Automobile Networking Industry Standard System (Intelligent Networking Automobile).
- In January 2018, the Development and Reform Commission issued the Strategy for Innovation and Development of Intelligent Vehicles (draft for comments)

- Traffic resource allocation and traffic guidance can be achieved through vehicle-road collaboration, which can provide traffic operation efficiency, reduce congestion, reduce time waste and environmental pollution caused by congestion, etc. Vehicle-road cooperation is applied in traffic coordination control, traffic early warning, traffic law enforcement and other fields to improve traffic monitoring and traffic safety and also increase public travel safety.

- The application of new-type unmanned driving based on vehicle-road collaboration of unmanned taxis, unmanned sightseeing vehicles, unmanned logistics distribution vehicles and unmanned port transport vehicles will bring enormous economic benefits to society.

- On June 6, 2019, the Ministry of Industry and Information Technology officially issued 5G licenses to China Mobile, China Unicom, China Telecom and China Radio and Television. China has officially entered the 5G era.
- Huawei published “C-V2X White Paper on Integrative Vehicle-Road Intelligent Network System”
- China Intelligent Network United Automobile Industry Innovation Alliance released "C-V2X White Paper"

Intelligent Vehicle Infrastructure Cooperative System



FATRI

Intelligent Vehicle Infrastructure Cooperative System

THANKS FOR

WATCHING!

For more product information, please visit www.fatri.cn, or contact our sales representative.

Email address: fatri@fatri.cn, Phone: 400-668-6967

STATEMENT

FATRI is committed to abiding by all the export control laws and regulations related to company operation promulgated by the Chinese government and international relevant export control laws and regulations, including those of the United States. You should guarantee that all purchases, sales and applications or use of FATRI products comply with all relevant requirements of the Chinese government, the government of the country and the resolutions of the United Nations. You should guarantee that you will not export, re-export, transfer or transport directly or indirectly to or through any prohibited country in violation of any applicable embargo laws of the United Nations, the United States and the European Union. You should guarantee that the purchased FATRI product will not be used or resold directly to the third parties for using in nuclear, biological or chemical weapons, or missiles capable of launching such weapons. Due to upgrade to product version or other reasons, the contents of this product catalog subject to change without notice. Unless otherwise agreed, this product catalog is only used as a guide. All statements, information and suggestions in this document do not constitute any express or implied guarantee. Within the sphere permitted by law, the ultimate right of interpretation of this product catalog belongs to FATRI.

FATRI

U-MKT-001-EN Rev.01