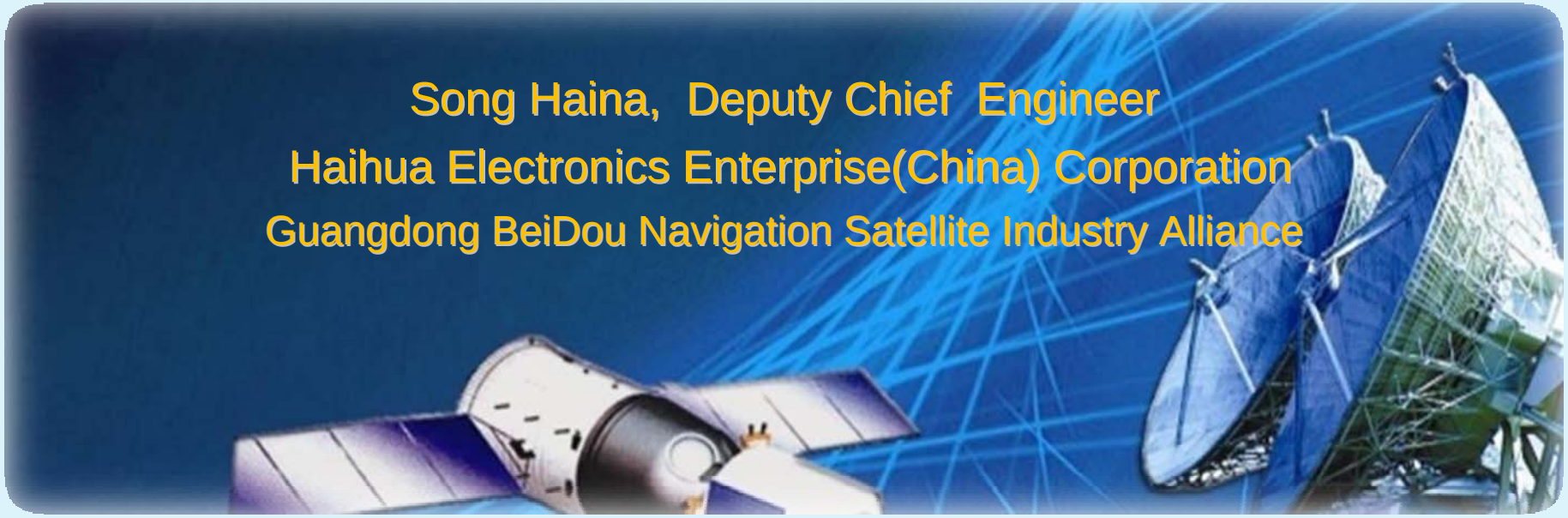
International Committee on Global Navigation Satellite Systems

The Application of GNSS in the Management of the Government Vehicles

Song Haina, Deputy Chief Engineer
Haihua Electronics Enterprise(China) Corporation
Guangdong BeiDou Navigation Satellite Industry Alliance



Application Background

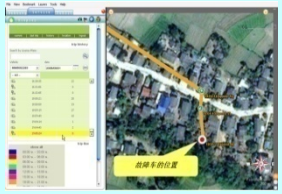
- Government Vehicles Management has become more and more important for the government to improve public service ability.
- The former management lacks effective supervision, and in urgent needs of information methods.

Government Vehicle Manegement Solution based on GNSS

BeiDou

GPS

GNSS



GIS

RFID

Management System

Vehicle Terminal | Administrator of the unit | leader | Management group of the city public service vehicles | System maintenance person

The policy of the usage of public service vehicles

The Presentation Layer

Terminal Communication | Tracing Query | Alarm System | Quantitative management | Payment Management | Statistics Report

The Application Support Layer
(Uniform identity authentication、authority, data management, Protocol analysis、system management)

Base Layer
(network, hardware platform, database,system management)

The system of alarm protection

- Vehicle Monitoring
- Real Time Vehicle Tracing
- Emergency Alarm
- Information Release

Vehicle monitoring, commanding and dispatching

Government vehicle

Logistics

School Bus

Passenger Bus

Wireless Communication 、 Network

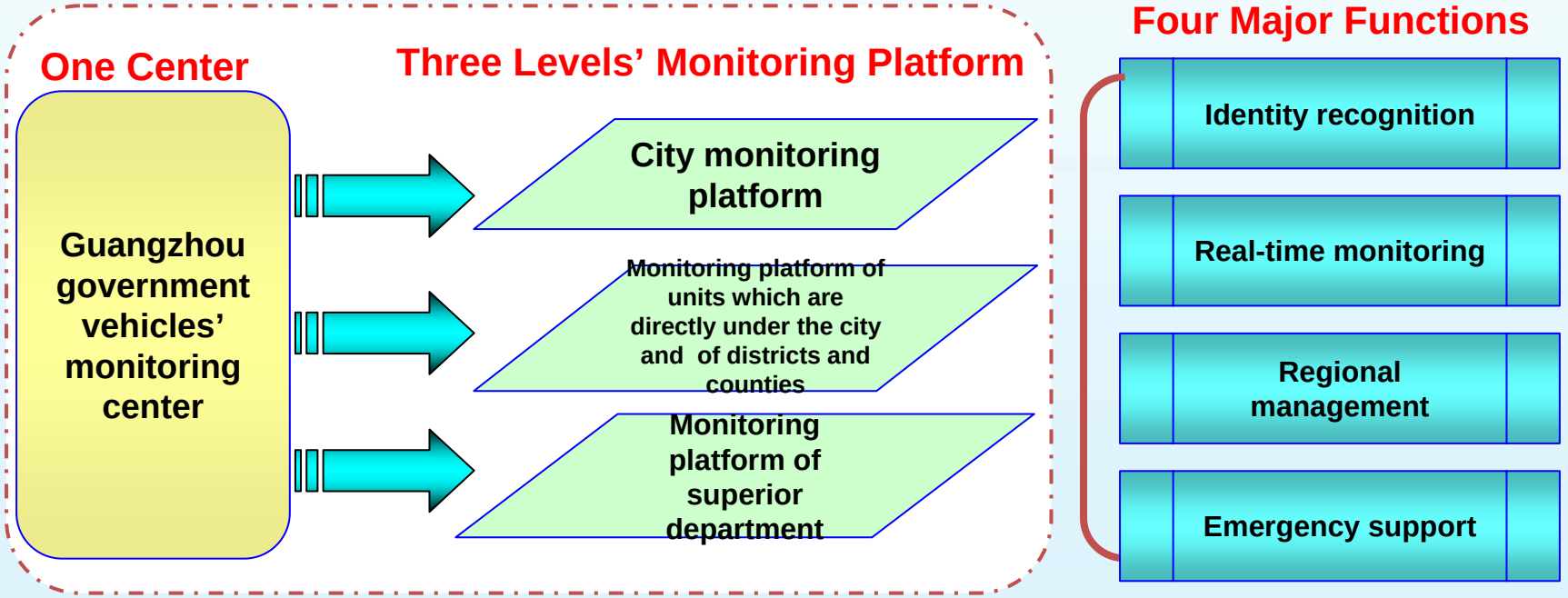
Internet

Public Wireless Network(2G/3G)

Government Vehicle Manegement Solution based on GNSS

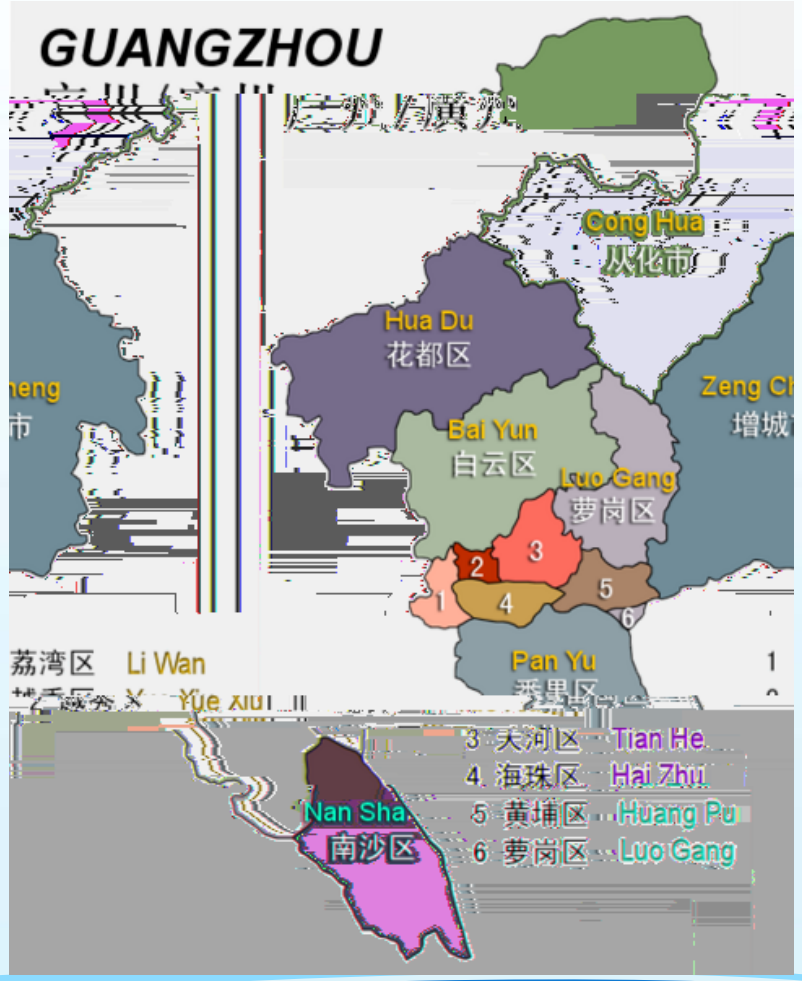
The management information system of Guangzhou government vehicles

- Base on combined BeiDou/GPS navigation
- Monitoring the vehicle's route、parking places，avoiding uneconomic running， clamping down illegal government vehicle usage

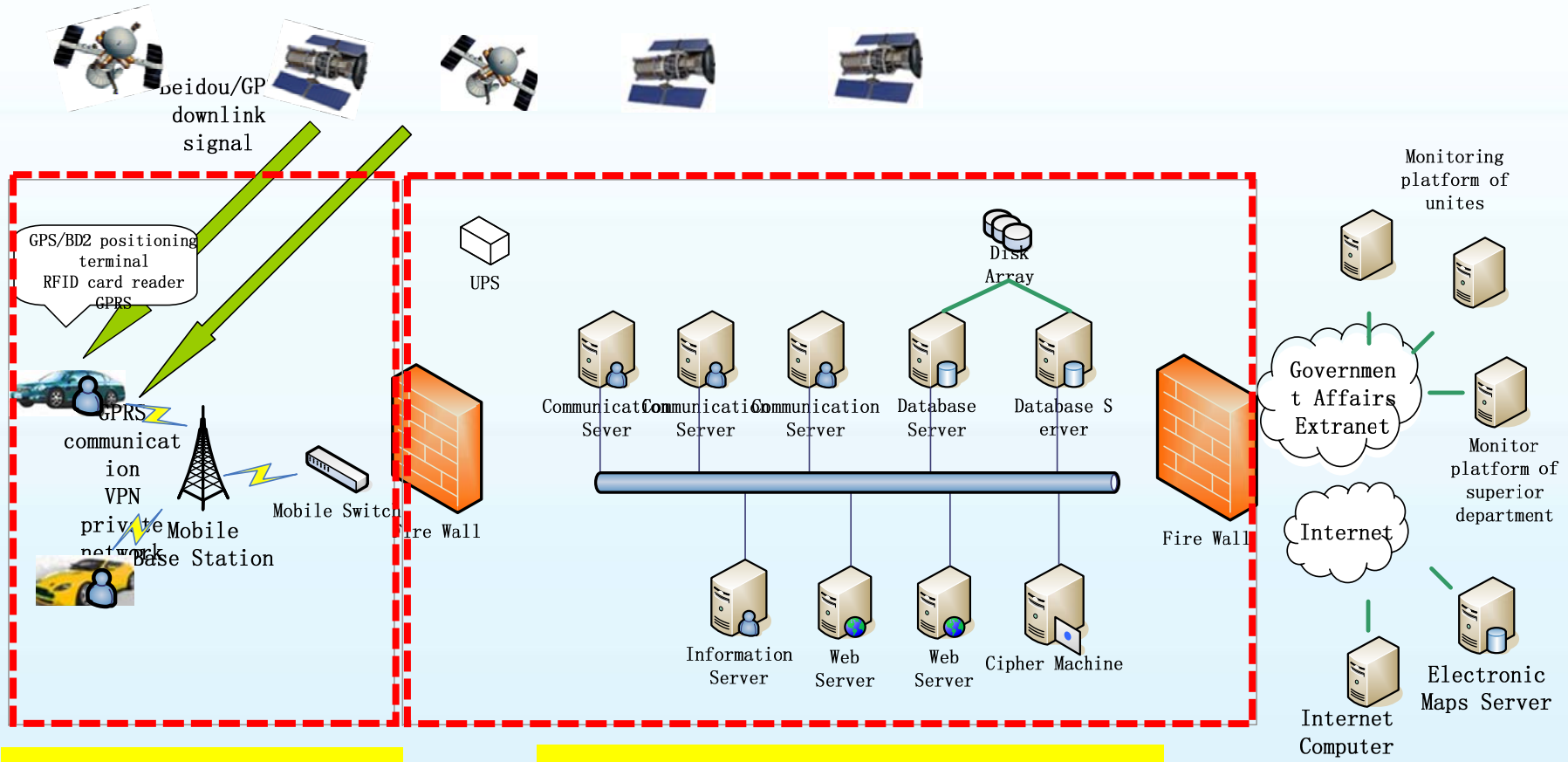


The management information system of Guangzhou government vehicles

Monitor Objective	Guangzhou government vehicles
Driving Area	Ten districts, two cities, and a few other regions
GNSS Application Mode	Positioning Velocity Measurement
Positioning Mode （could be set）	BeiDou+GPS BeiDou GPS

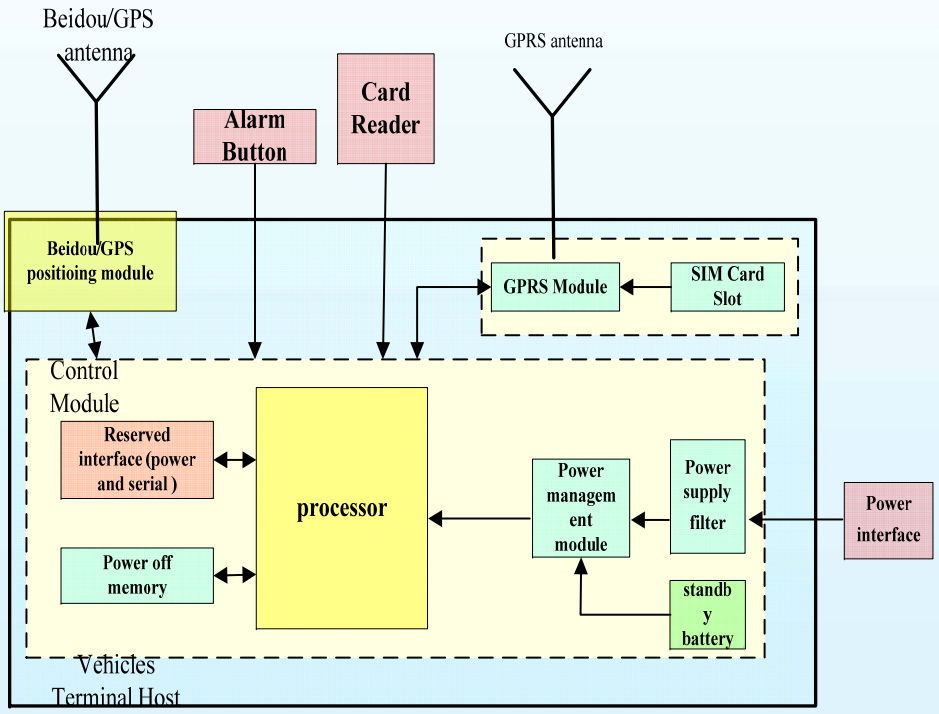


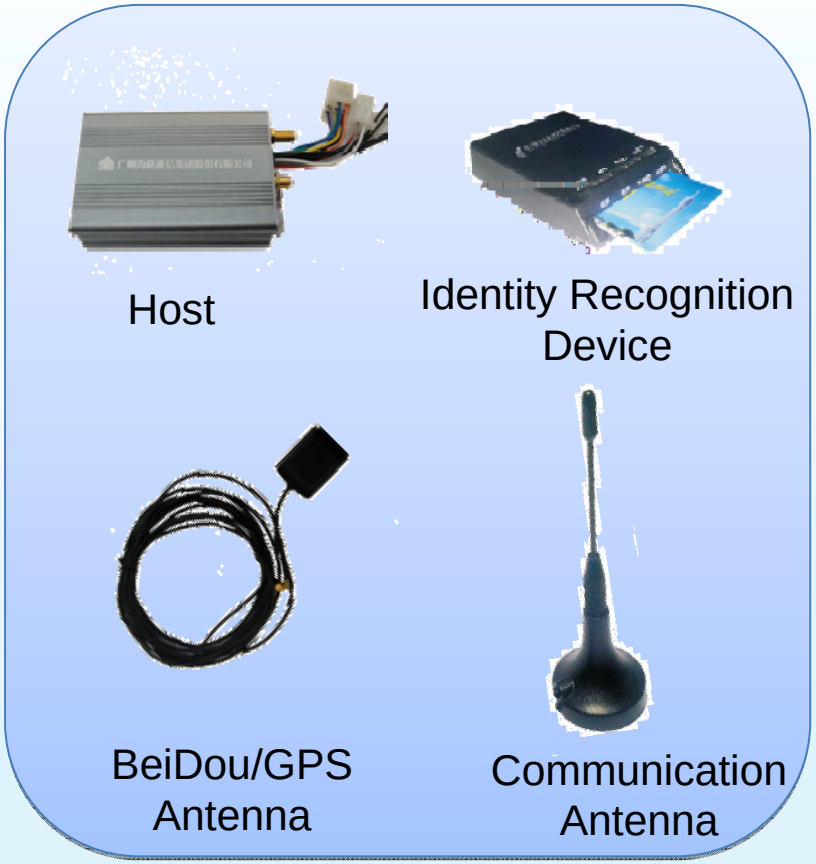
System Architecture



Vehicle Terminal

- BeiDou/GPS compatible receiver
- Identity recognition device



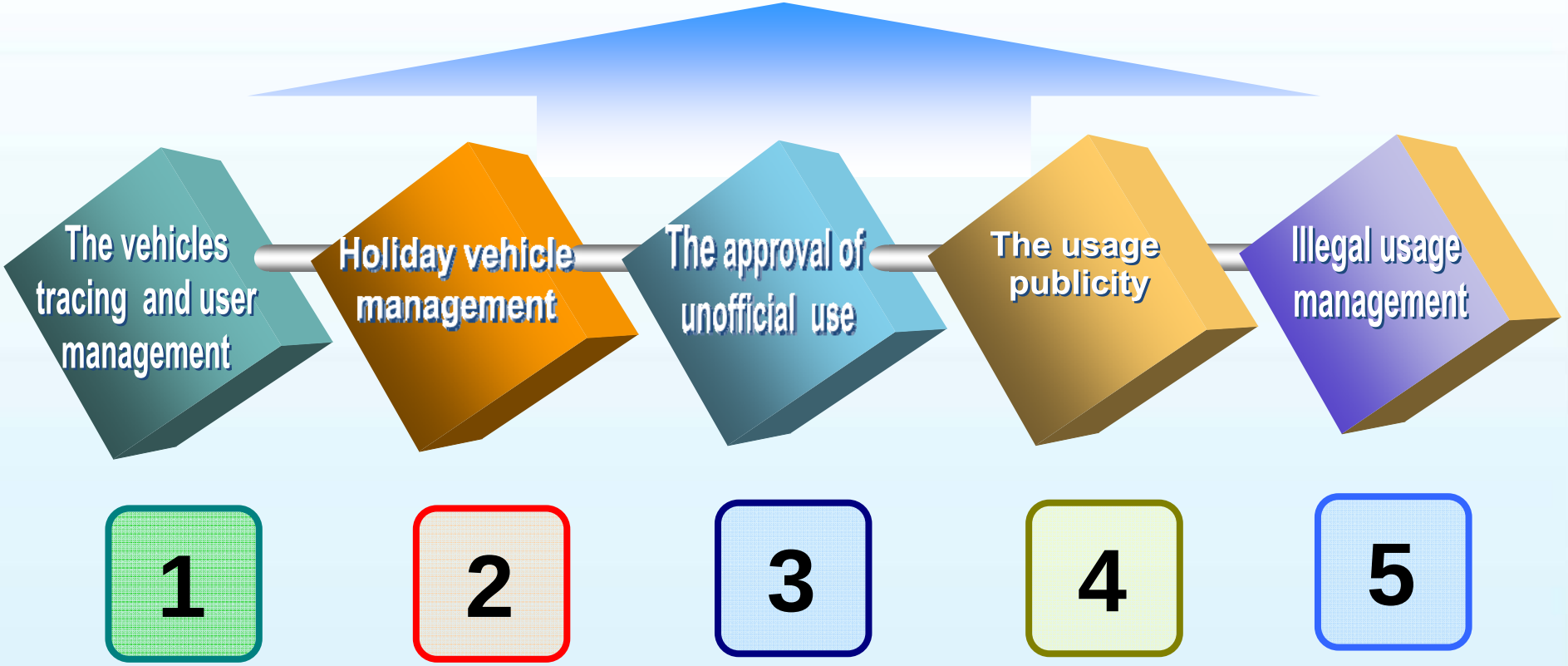


Key features and specifications

1. Vehicle status and road tracking control
2. Mileage statistics
3. Acousto-optic reminder
4. Remote upgrade
5. Remote setting
6. Communication backup
7. Road tracking compensation
8. Emergency alarm and abnormal alarm
9. Low voltage protection and alarm
10. Low power mode
11. Emergency shutdown

Accuracy Index	
Measurement Accuracy	0.1 m/s
Combined Positioning Accuracy	Level：10m， Altitude：10m
Positioning velocity update rate	1times/s
Time index	
Cold Start	37s
Warm Start	1s
Loss of lock catch	1s
Signal system and working mode	
Input Signal	B1:1561.098MHz，C Code； L1: 1575.42MHz，C/A Code
BeiDou positioning	Support
GPS positioing	Support
Dual positioing	Support

The Five Implementation of the management of government vehicles



Government Vehicle Manegement Solution based on GNSS

User Management

Identity Recognition

Reminder of forgetting to Plug in the Card

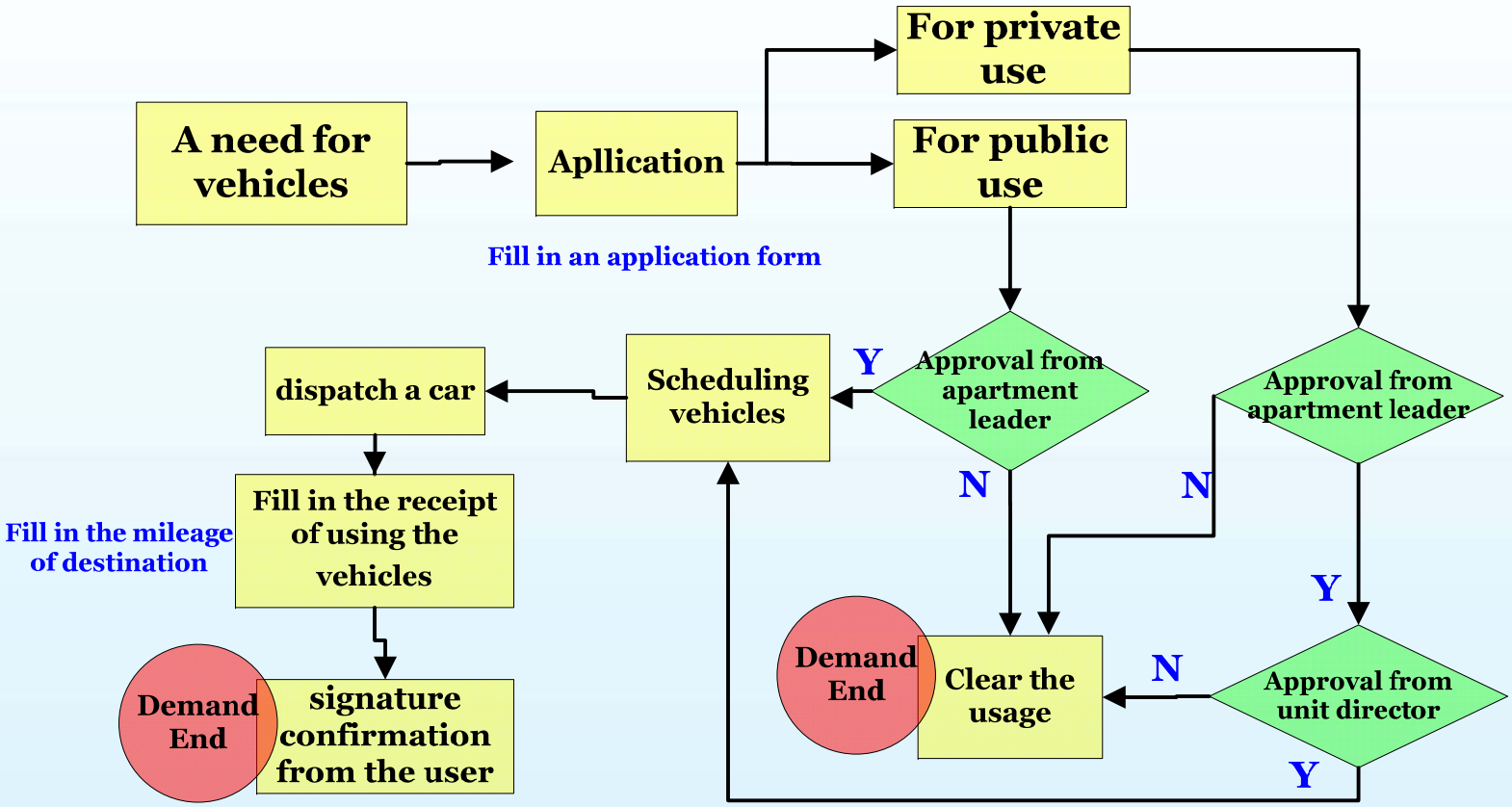
Text Message

Vehicle Tracing Management

Real-time vehicle tracking
History query

Electronic fence
cross-border alarm

Vehicle Application Process

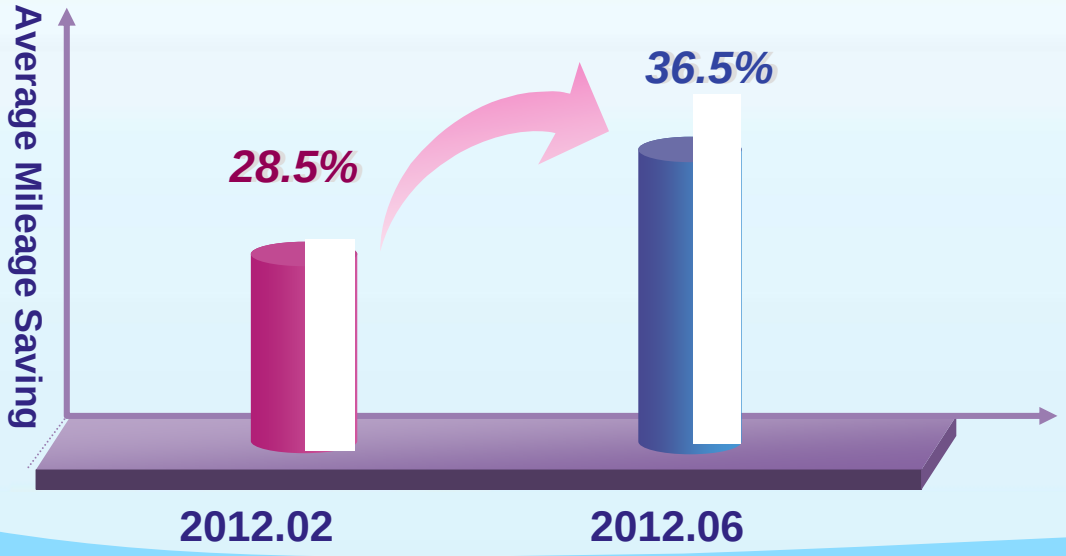


Statistics Analysis

- vehicles' status
- abnormal usage
- payment
- mileage
- ……

The Achievement of the Project

- 8440 government vehicles have been fitted with BeiDou/GPS monitoring device
- The system has been running for one year, showed reliable performance and got satisfied feedback
- Not only did vehicle management improve, cases of personal usage markedly decreased
- Reduced the cost, Improved the efficiency



Project's Social Impact

- Achieved volume applications of BeiDou in the field of civilian vehicles monitory
- Got praise from China Satellite Navigation Office, government, and industry experts
- Got media attention, and follow-ups

GNSS Application Effect

Reference: Evaluation Report of Guangzhou government vehicles project users, 2012.9

Static test

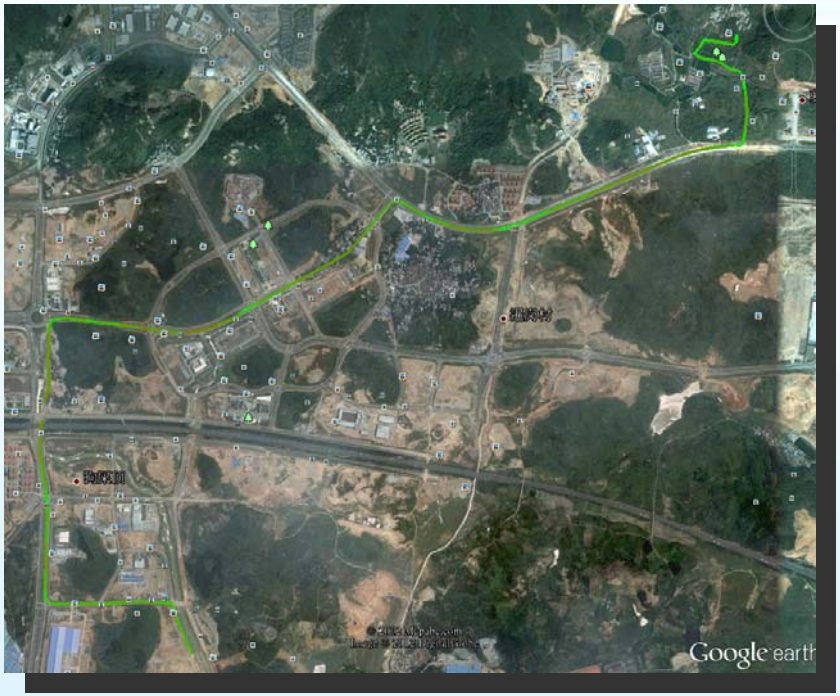
Location：
Guangzhou Science City, Roof of the 6th floor

Test Environment： Broad Vision with no obstructions

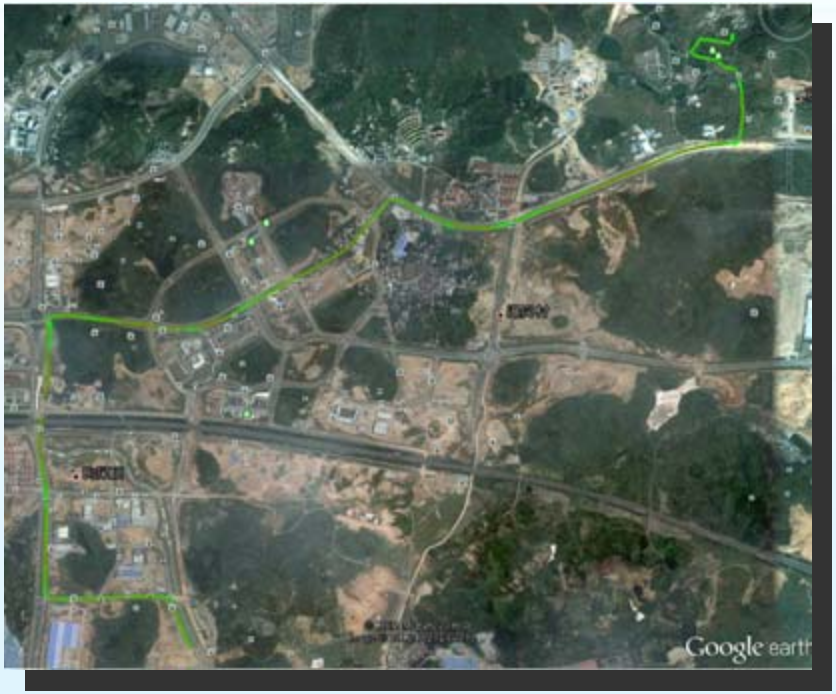
Test Group	Test date and the weather	Positioning Module/Positioning Mode	HDOP	Number of visible satellite	Positioning accuracy availability (10m，95%)
Group A	Aug.4: cloudy 11:04:11～13:19:30 Data set N=10845	T-Module BeiDou	2.181	7.04	90.8%
Group B	Aug.4:cloudy 10:28:07～13:26:05 Data set N=10715	U-Module BeiDou+GPS	0.784	15.99	100%
Group C	Aug.7: Clear 13:32:50～16:35:40 Data Set N=10971	U-Module BeiDou	1.14	9	>99.99%
Group D	Aug.7日:Clear 13:33:12～16:35:48 Data Set N=10958	H-Module BeiDou	1.39	8.04	100%
Group E	Aug.8:Clear 16:46:58～18:29:49 Data Set N=6172	U-Module BeiDou	1.43	7.29	97.7%
Group F	Aug.8:Clear 16:46:43～18:29:58 Data Set N=6182	H-Module BeiDou	1.77	6.6	100%
Group I	Aug.9:Clear 8:30:16～20:31:34 Data Set N=42662	H-Module BeiDou+GPS	0.74	15.41	100%
Group J	Aug.9:Clear 8:30:16～20:31:34 Data Set N=40141	T-Module BeiDou	2.42	7.45	94.7%

Dynamic Test

Aug.29,2012 , Guangzhou Science City, open area



BeiDou Positioning Mode

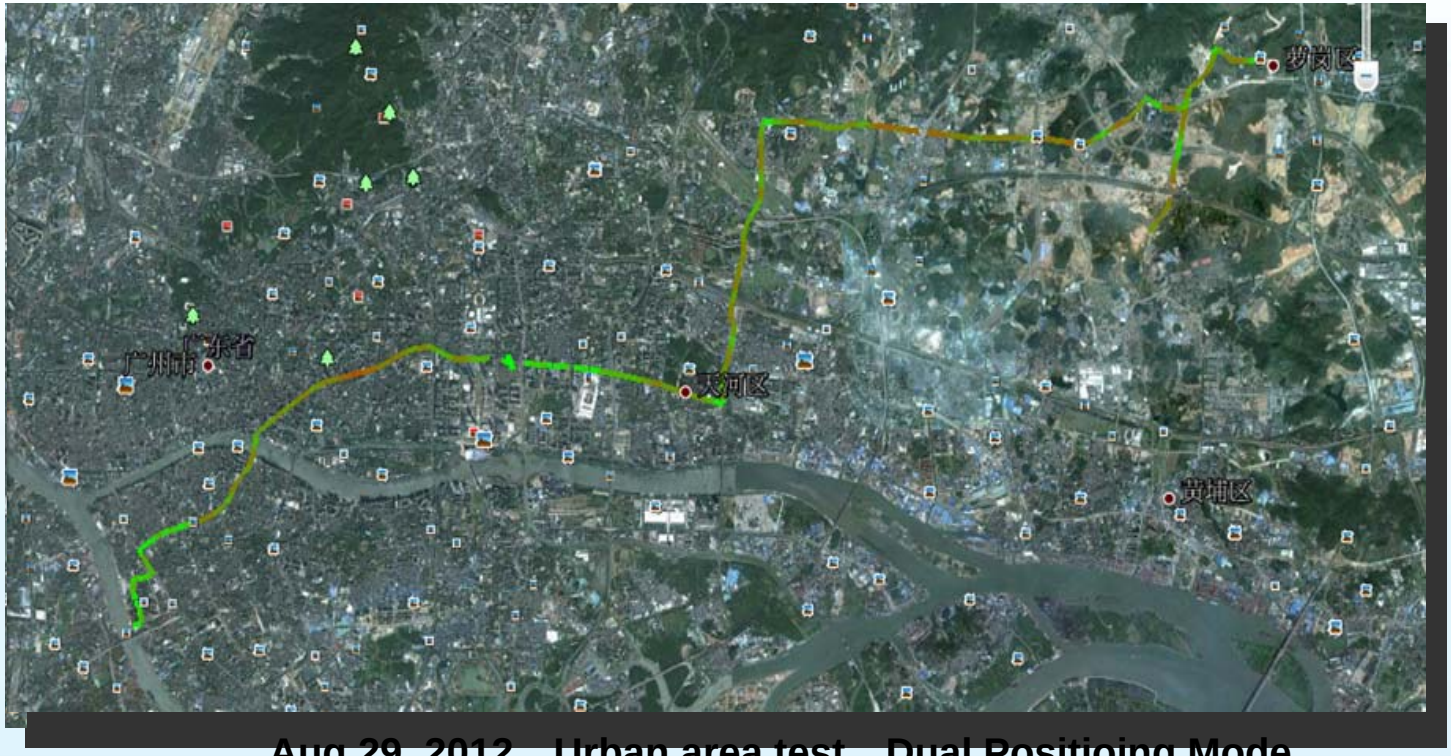


Dual Positioning Mode

Reference: Evaluation Report of Guangzhou government vehicles project users, 2012.9

GNSS Application Effect

In Guangzhou Area， the application of GPS is fine， BeiDou is usable， BeiDou+GPS has better effect



Aug.29, 2012，Urban area test，Dual Positioing Mode
Aug.29, 2012，Urban area test，BeiDou Positioing Mode

Note：Red line means failed be positioned, belonging to the linear prediction linear.

Reference: Evaluation Report of Guangzhou government vehicles project users, 2012.9

GNSS Application Effect

User experience index survey

Date: Aug.2012

Location: Guangzhou

Target: 120 vechicles

Choose one unit from each of the ten districts and two cities, totally 12 units, and 10 cars from each unit

Pattern: Dynamic Test

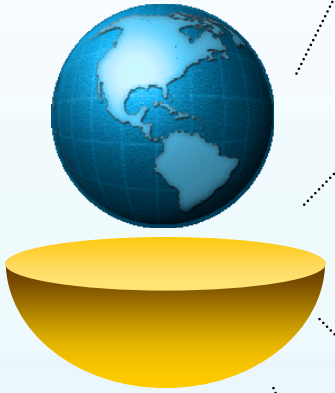
Index: Positioning Tracing Accuracy
Positioning Tracing Coherence
Positioning Results Stability

User Experience Index Questionnaire of Guangzhou Government Vehicle project

	Sum	Average	Degrees of Satisfaction
Positioning Tracing Accuracy	973	88. 5	Satisfied
Positioning Tracing Coherence	960	87.3	Satisfied
Positioning Result Stability	1017	92.5	Very Satisfied
Total Score	2950	268.2	Satisfied

Reference: Evaluation Report of Guangzhou government vehicles project users, 2012.9

Conclusions



- Guangzhou government vehicle project verified the availability of the BeiDou system
- The multi-system can effectively improve the availability of satellite navigation positioning
- The mature application of BeiDou in Guangzhou government vehicle system played a good demonstration effect in the industry
- Strengthen international technical exchanges, technical cooperation and project cooperation, and jointly promote the GNSS industry booming

Thank you for your attention!