# Introduction on
# Satellite Communication System

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国家无线电监测中心
The State Radio Monitoring Center

★ ● **General**

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● **SATCOM Products**

● **SATCOM Application Case**

## General

CETC54 is engaged in the field of Satellite Communication (short for SATCOM) in the early 1970s and now becomes one of the most authoritative and largest design, R&D, manufacture and integration institute of SATCOM system. With more than 40 years' experience, CETC54 has created a lot of firsts in SATCOM field and is at the leading position because of its excellent system design, R&D and manufacture capability in China.



National Day's Parade



Somalia Escort

## General

## CETC54's **FIRST** in SATCOM Field

- *First provider of all-digital SATCOM earth station in China;*
- *First provider of CDMA SATCOM earth station in China;*
- *First provider of large-size shipborne SATCOM earth station in China;*
- *First provider of airborne SATCOM earth station in China;*
- *First provider of satellite television transmission earth station in China;*
- *First provider of domestic TDMA system in China;*
- *......*

General

★ **Emergency Comm. System**

SATCOM Products

SATCOM Application Case

# Emergency Comm. System

□ **Application:**

When important event occurs in the area that the existing comm. facility doesn't cover or has been destroyed, Emergency Comm. System is used for establishing temporary comm. system to: 1) guarantee that the commander in emergency command center timely knows well of site situation by returned video, voice and data; 2) guarantee that video/telephone conference for commanders in command center and site staff can be held for remote consultation and decision-making; 3) guarantee personnel & resource allocation, command and dispatch comm. in the command center and the surroundings of the emergency site.

# Emergency Comm. System
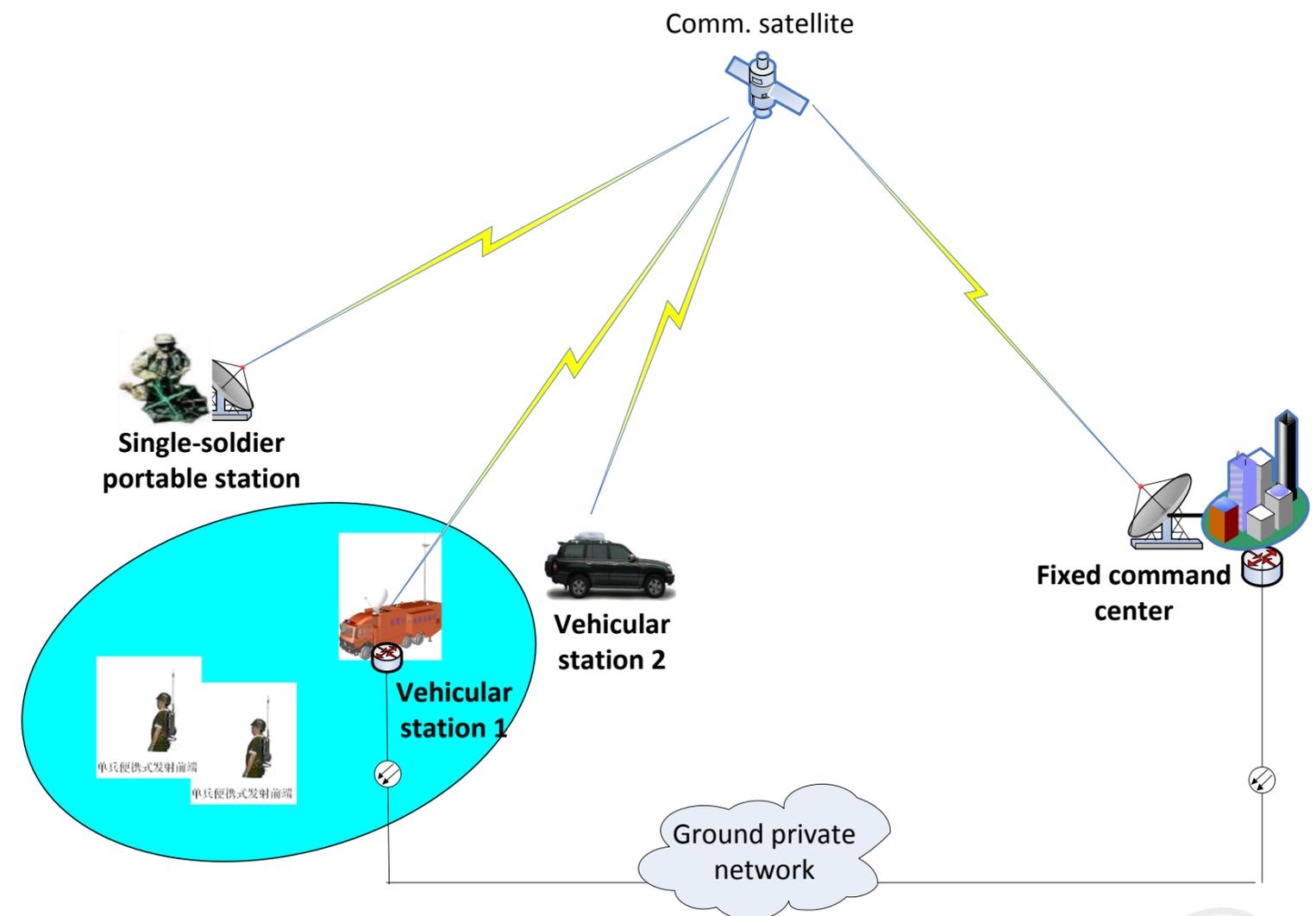
□ **Feature:**

• **Good maneuverability:**
The system can be configured on multiple mobile platforms. When emergency occurs, the system can be flexibly moved to the site and quickly establish the comm. between command center and site;

• **Multiple comm. means:**
SATCOM as main and radio/telephone as emergency are deployed to realize long-distance comm. between command center and site; trunk comm. and WLAN are used for site command & dispatch and short-distance video returned comm. between site and mobile platform;

• **Multiple services:**
Supporting video conference, telephone conference, data comm., etc.

Comm. satellite

Single-soldier portable station

单兵便携式发射前端
单兵便携式发射前端

Vehicular station 1

Vehicular station 2

Fixed command center

Ground private network

## Emergency Comm. System

❑ **Function:**

- **Fixed Center Station**

  as the comm. hub and management center of the system, is mainly used for information collection, information exchange, connection with ground network and operation management of the whole network;

- **Vehicular Station**

  is used for command and communication of emergency site and realizes on-the-move voice, data and image transmission;
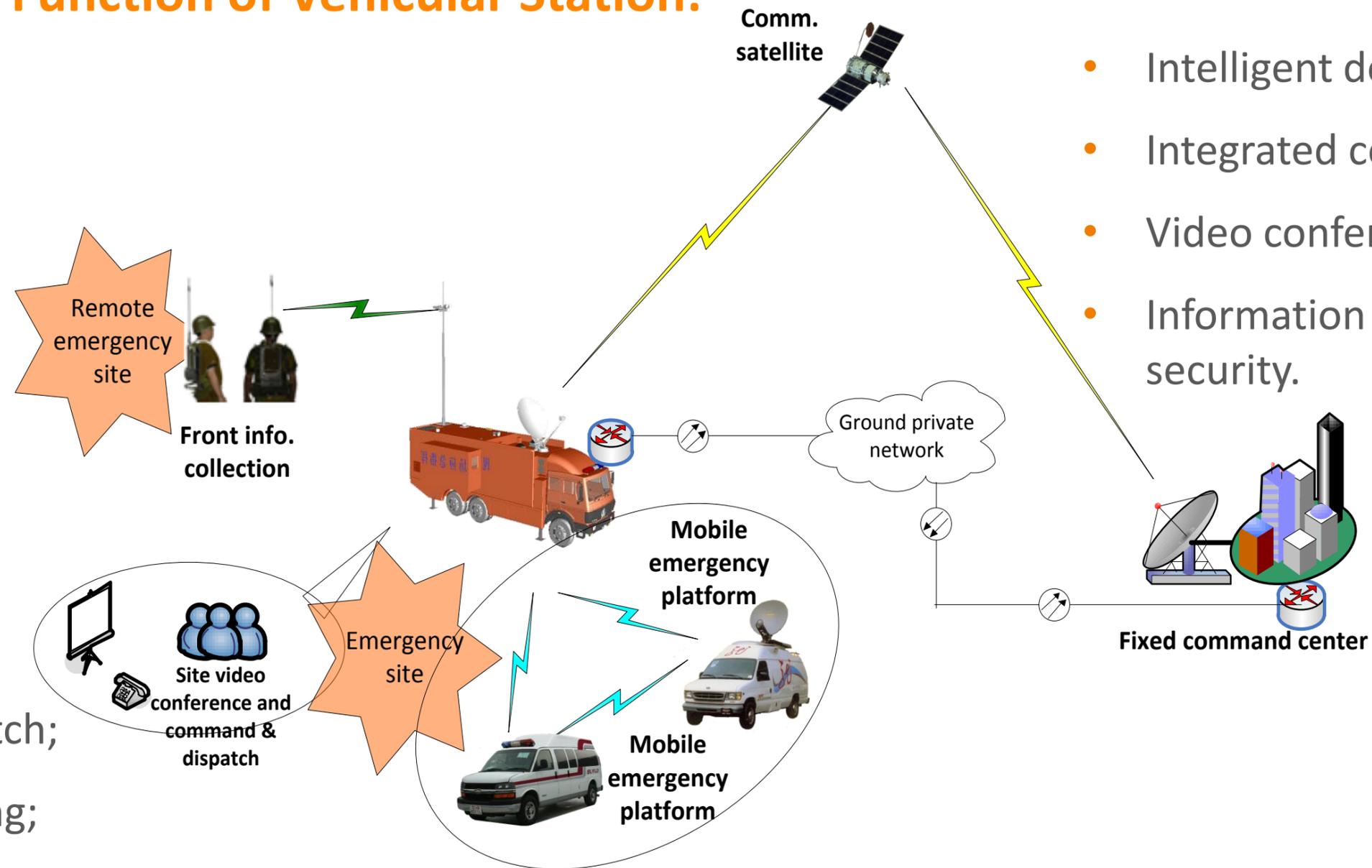
- **Portable Station**

  can reach to emergency site by various vehicle or man-packed and is used for voice, data and image transmission.

# Emergency Comm. System

□ **Composition and Function of Vehicular Station:**

**Comm. satellite**

- Intelligent decision-making;
- Integrated centralized control;
- Video conference;
- Information safety and security.

Remote emergency site

**Front info. collection**

Ground private network

Mobile emergency platform

**Site video conference and command & dispatch**

Emergency site

**Mobile emergency platform**

**Fixed command center**

- Site information collection and transmission;
- Site integrated dispatch;
- Site WLAN networking;
- Emergency comm.

## Emergency Comm. System

❑ **Technical Feature:**

✓ On-the-move middle/long-distance comm.;

✓ All-weather and seamless coverage;

✓ Large-capacity comm.;

✓ Multi-media comm.;

✓ Information safety and security;

✓ Site "last 1km" non-LOS comm.;

✓ Site wired and wireless comm. means interconnection;

✓ One-button rapid site dispatch.

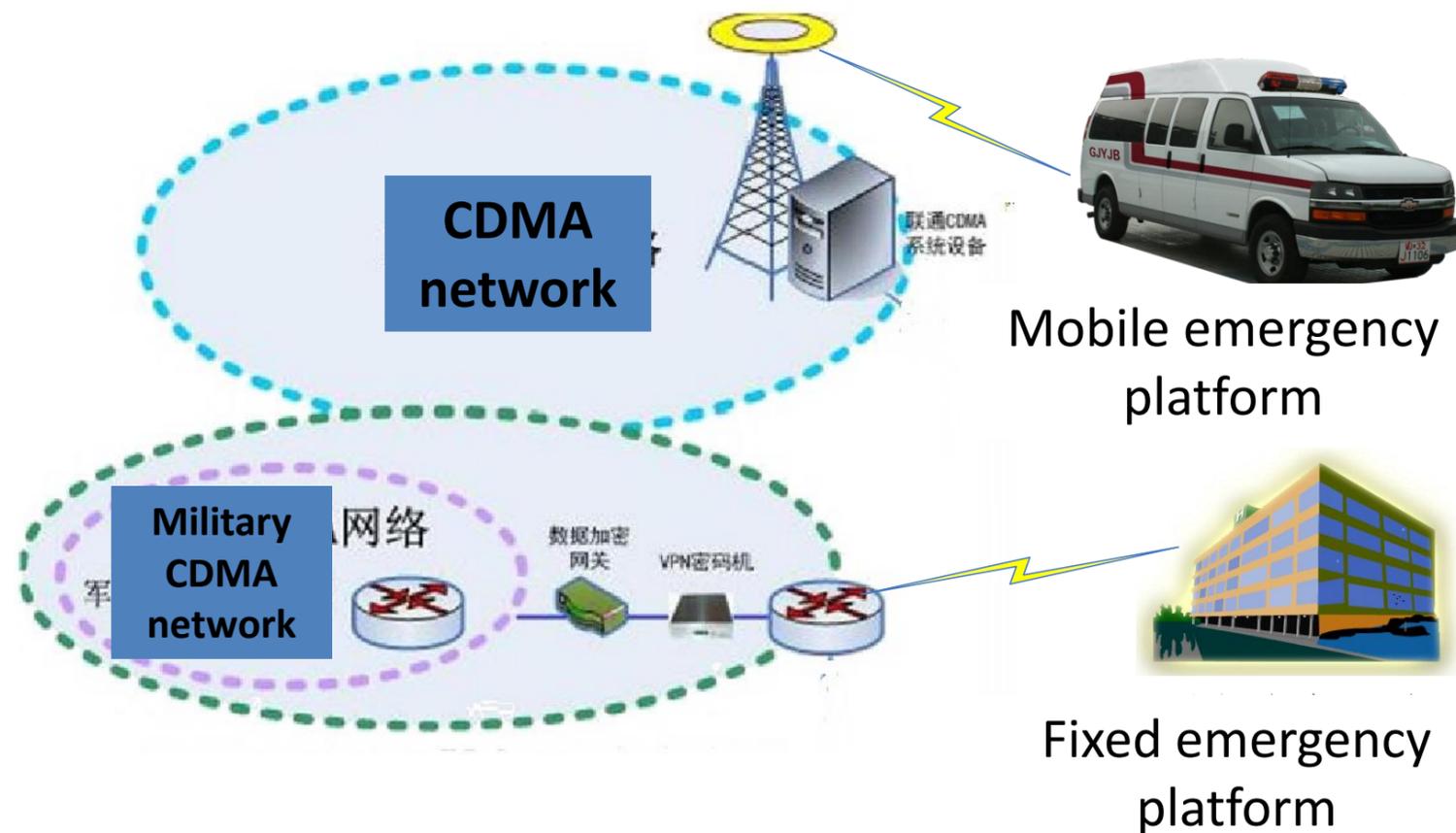# Emergency Comm. System

## ❑ SATCOM Means

Satellite comm. will not be influenced by geographic, climate and natural condition (i.e. earthquake, flood) and has the features of good comm. quality, reliability and maneuverability. Thus, SATCOM is used as main transmission passage with the external of mobile emergency platform. The antenna can be optionally configured with on-the=move or on-the-pause.

## Emergency Comm. System

❏ **Other Comm. means:**

• Public cellular mobile comm.

As standby and supplement of SATCOM system, it is used for discontinuous, burst, frequent and small-amount data transmission. Meantime, it is configured with military CDMA-network security terminal to ensure data secured transmission in emergency site with the existing CDMA network.

**CDMA network**

**Military CDMA network**

Mobile emergency platform

Fixed emergency platform

• Mobile satellite telephone

Used for minimum voice comm. in severe environment.

• Wideband comm. network (i.e. mobile base station or ground wideband network of GSM/WCDMA)of site operators can be fully used with multiple comm. interfaces.
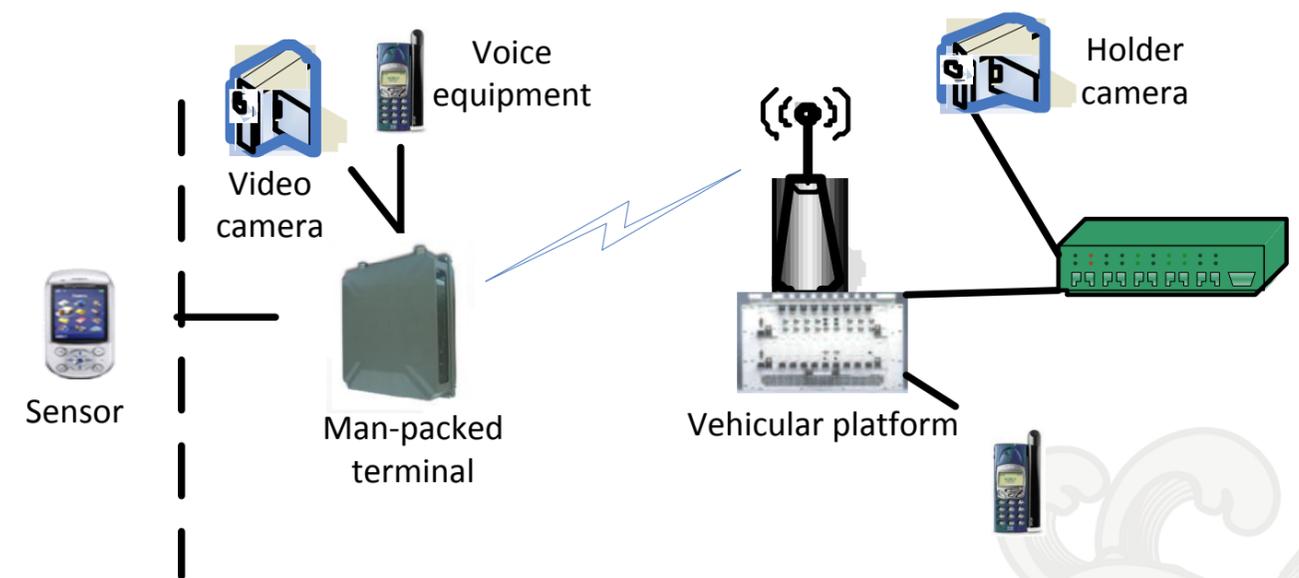
# Emergency Comm. System

□ **Site Information Collection:**

Video camera on vehicle top, portable camera or other professional collecting equipment are used for collecting site information.

★ If mobile emergency platform cannot be moved to the site, wireless image transmission equipment is used for BLOS connection between site and mobile emergency platform.

• Employed with COFDM transmission system;

• With diffraction and penetration effect, comm. distance is around 3~5km in normal occluded environment;

• Operated in Omni-directional Tx & Rx mode.



Voice equipment

Holder camera

Video camera

Sensor

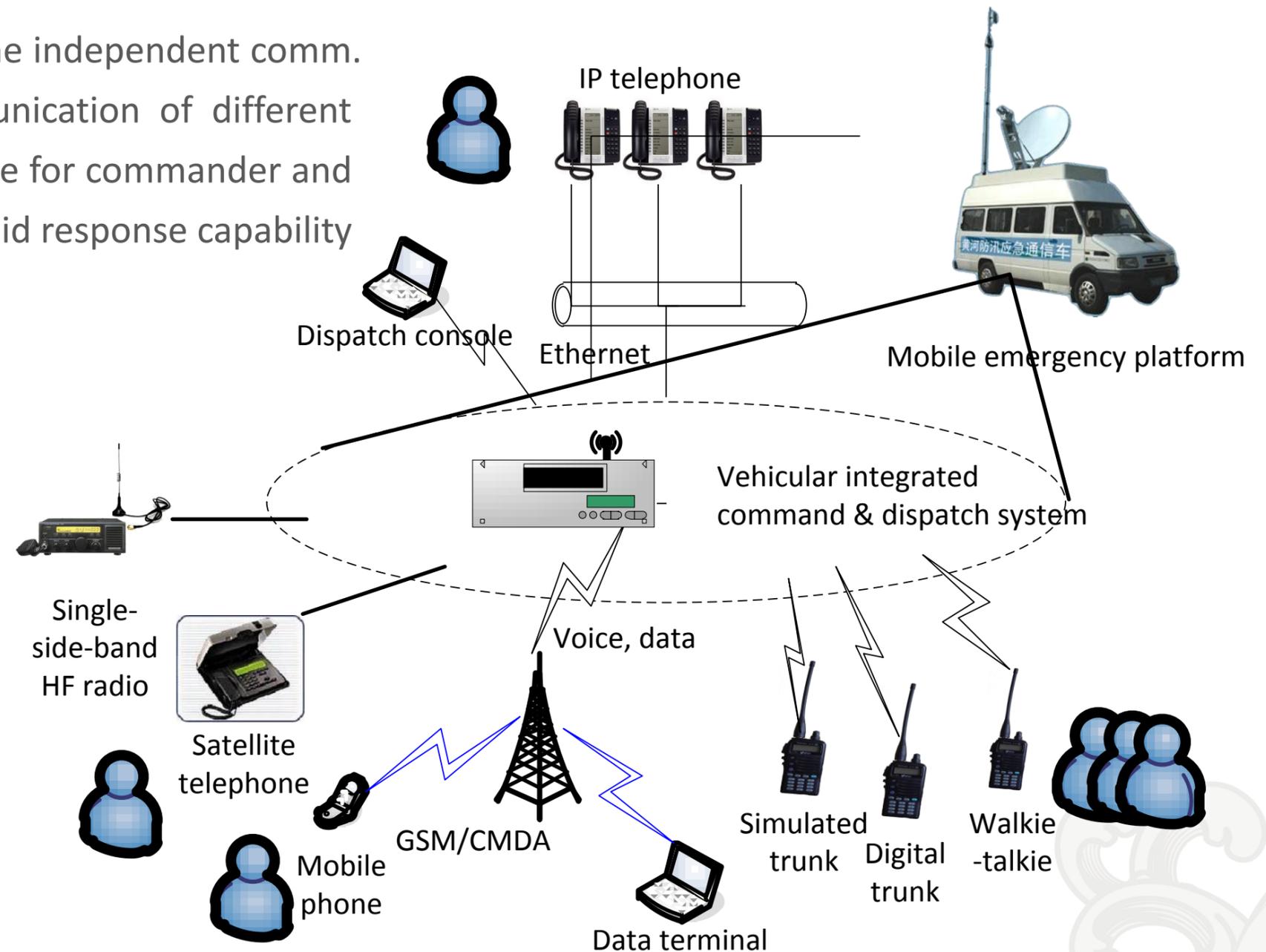Man-packed terminal

Vehicular platform

# Emergency Comm. System

## □ Site Integrated Comm. Dispatch:

Integrated comm. controller is used for integrating all the independent comm. systems and realizes interconnection and intercommunication of different comm. systems, which provides unified application mode for commander and improves the speed of command & dispatch and the rapid response capability of emergency.
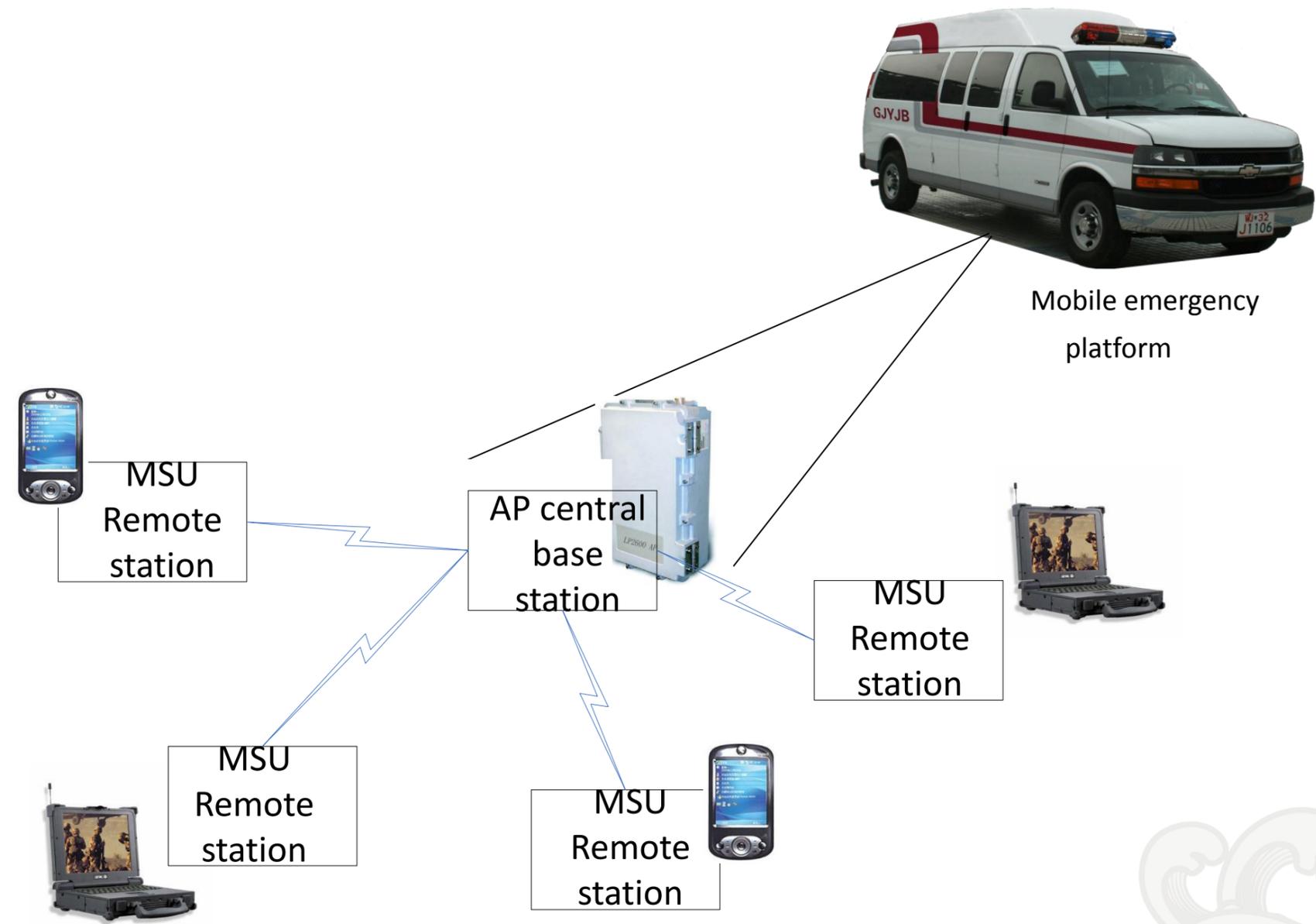
- **Call transfer;**
- **Automatic sound hint;**
- **Monitoring and interrupt call;**
- **Wired and wireless interconnection;**
- **Mixed conference;**
- **Short message and short data;**
- **Wireless data access;**
- **AV output (sound console);**
- **Recording;**
- **Sound automatic gain balance;**
- **Call history record.**

IP telephone

Dispatch console
Ethernet

Mobile emergency platform

Vehicular integrated command & dispatch system

Single-side-band HF radio

Satellite telephone

Voice, data

Mobile phone

GSM/CMDA

Data terminal

Simulated trunk

Digital trunk

Walkie-talkie

# Emergency Comm. System

## □ Site WLAN Networking:

Mobile platform is used as central base station of site WLAN, realizes user terminal access of remote station and provides data transmission service. User terminal can be accessed by multi-media access terminal or compatible equipment and provides telephone, audio/video service.
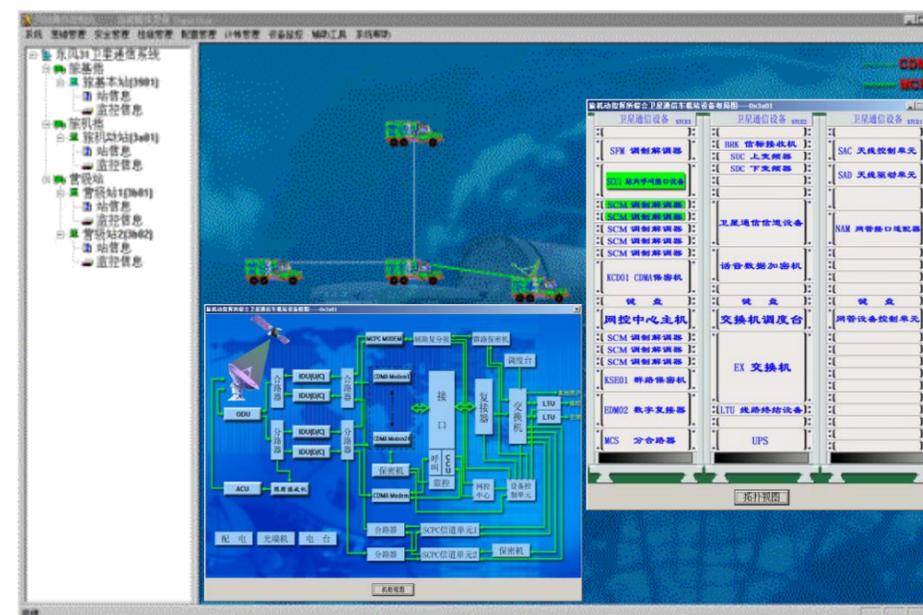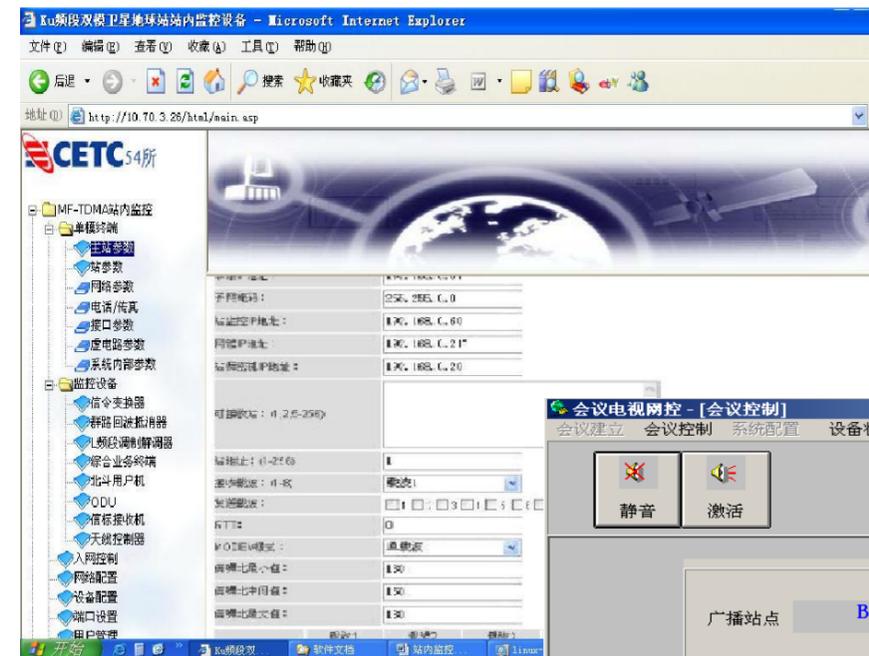
Mobile emergency platform

MSU Remote station

AP central base station

MSU Remote station

MSU Remote station

MSU Remote station

# Emergency Comm. System

□ **Integrated Application and Network Monitor & Control Management:**

- Network configuration management;

- Centralized control function;

- Service access function;

- Data and plan retrieval;

- Database inquiry and searching;

- Networking function.

## Emergency Comm. System

☐ **Service Terminal:**

Service terminal subsystem provides hardware support for realizing voice, image and video conference function of mobile emergency platform.

- Voice comm.;

- Image switch and display;

- Video conference;

- Site office;

- Satellite navigation and location.

General

Emergency Comm. System

★ SATCOM Products

SATCOM Application Case

## SATCOM Products
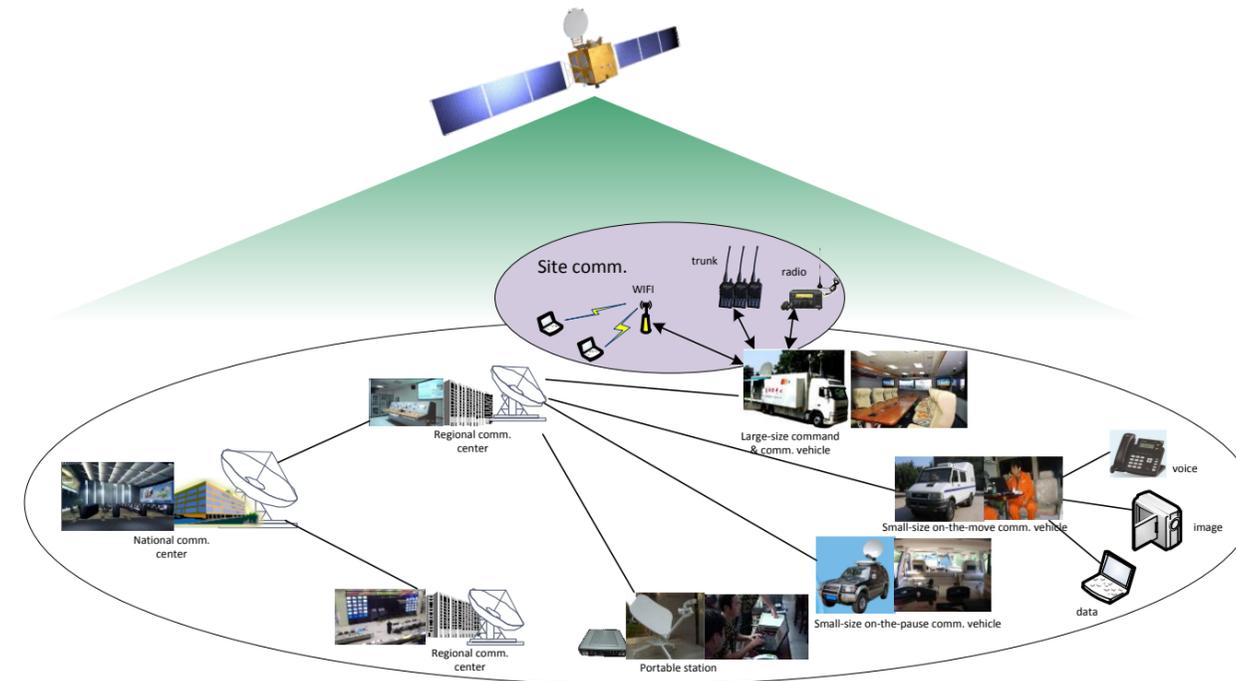
☆ **FDMA/DAMA SATCOM System**

☆ **MF-TDMA SATCOM System**

☆ **CDMA SATCOM System**

☆ **TDM/TDMA Wideband SATCOM System**

## SATCOM Products

## FDMA/DAMA SATCOM System

FDMA/DAMA SATCOM system developed by CETC54 is the first full-IP FDMA SATCOM system in China. It provides DAMA access system based on IP, effectively saves satellite resource and is especially suitable in emergency comm. of rescue and relief operations, which is regarded as SATCOM system with higher cost performance.
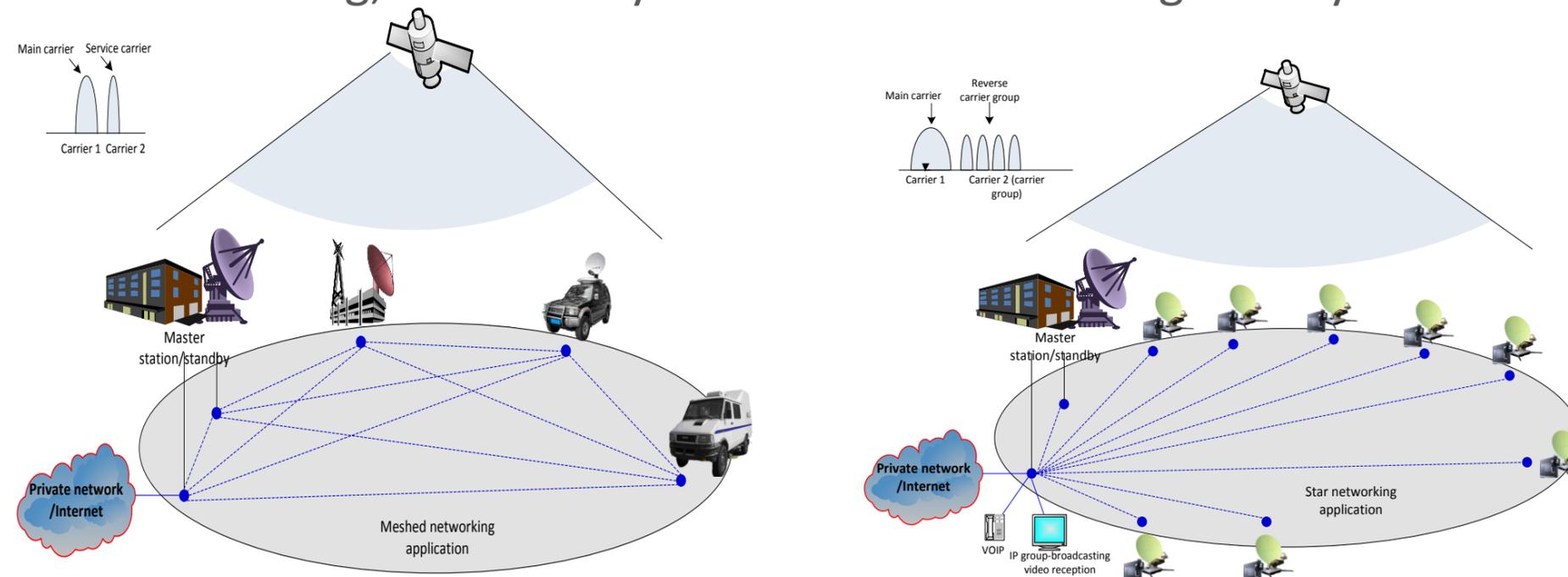
## SATCOM Products

### MF-TDMA SATCOM System

MF-TDMA SATCOM system developed by CETC54, with autonomous & controllable, safe & reliable and effective & useful feature, is the FIRST independent-developed TDMA SATCOM system with independent intellectual property in China. It is applied for constituting wide-area enterprise network, government network, operation network and national defense network. It is a flexible and multi-function VSAT SATCOM system, employed with FDMA and TDMA two-dimensional multi-address mode, has the good features of FDMA and TDMA, i.e. expandable user quantity and service capacity, flexible networking, resource dynamic allocation and high utility.
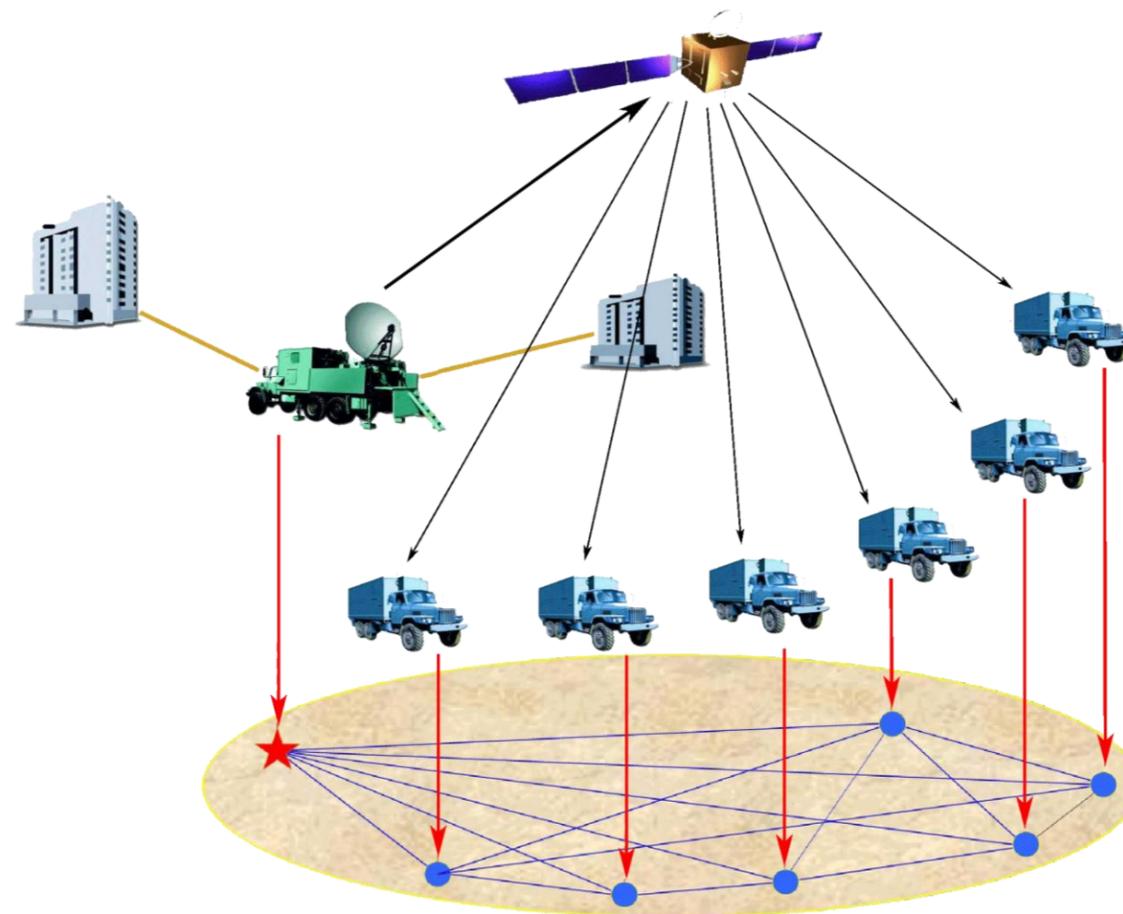
## SATCOM Products

## CDMA SATCOM System

CDMA SATCOM system developed by CETC54 is adopted of direct-sequence spread-spectrum technique and realizes multi-address communication. It is featured by good concealment, good anti-jamming and anti-interception capability.

# SATCOM Products
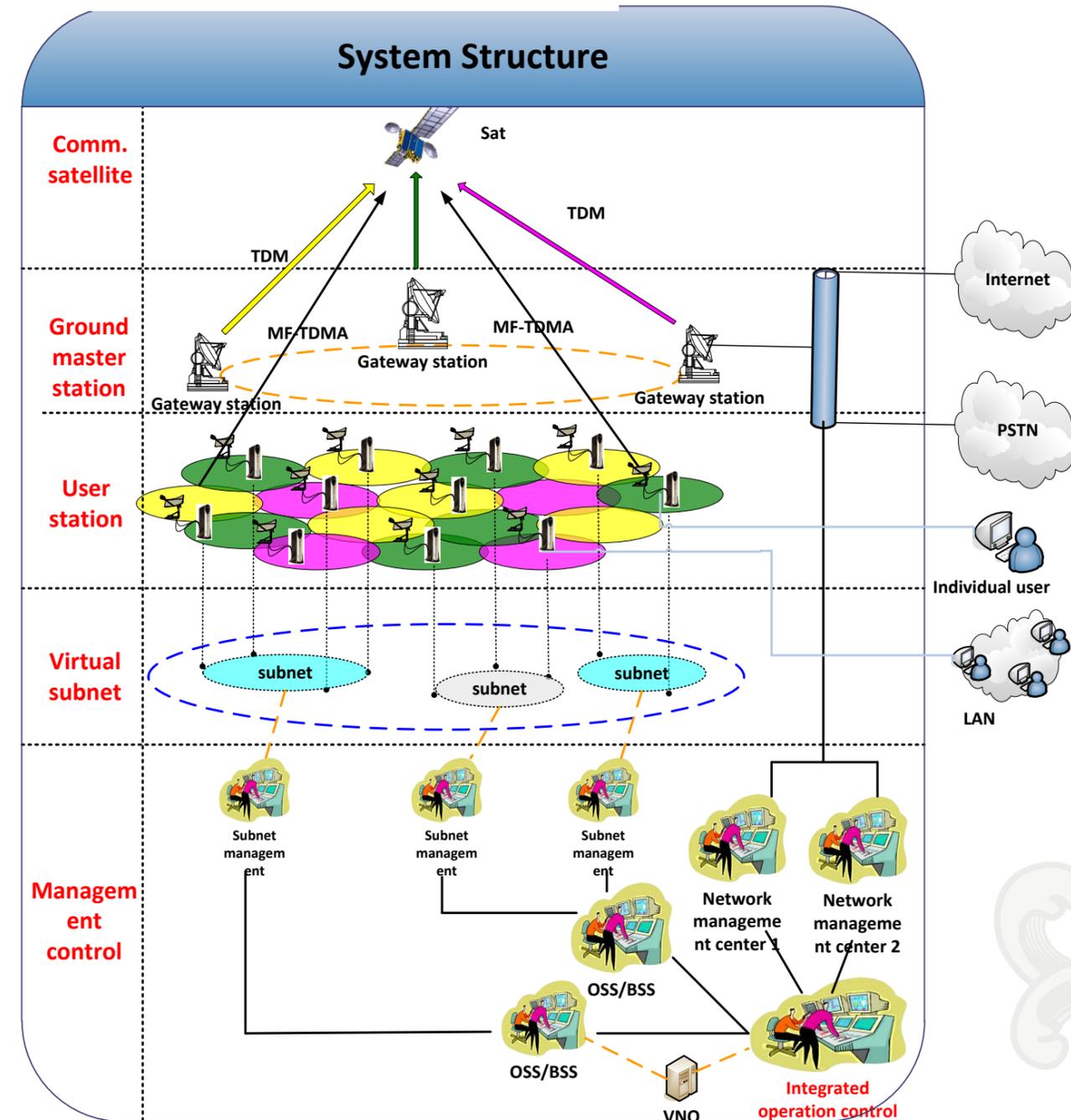
## TDM/TDMA Wideband SATCOM System

The system is targeted to voice, data, image and video processing and transmission by satellite, provides comm. means for multi-media and high-data-rate Internet application. The difference of wideband comm. satellite and previous comm. satellites is the service from low-speed service and voice service to Internet and multi-media serice.



System Structure

# SATCOM Products

## SATCOM Station Type:

☆ **fixed station**

☆ **on-the-pause vehicular station**

☆ **on-the-move vehicular station**

☆ **airborne station**

☆ **portable station**

☆ **shipborne station**

## SATCOM Products

### Fixed SATCOM Station

It is non-transportable satellite comm. ground station and can be used for satellite broadcasting, civil comm., meteorological satellites comm. and satellite telemetry & telecontrol.



■ **Function:**

- Supporting services including voice, data and image;
- Uninterrupted comm.;
- Capable to be used as large fixed central station or as small fixed terminal station;
- Capable to be used as backup channel of ground lines.

■ **Features:**

- Large transmission capacity, multiple-channel high-rate carriers can be transmitted simultaneously;
- BLOS, multiple-service, large-capacity and high quality transmission service;
- Flexible antenna configuration, choice of antenna aperture from 1.2m to 13m.

# SATCOM Products

## SATCOM On-the-pause Vehicular Station

It is a vehicular SATCOM ground station, used as an integrated comm. platform for emergency comm. support, video live and emergency broadcasting, and also used for on-site integrated comm. and dispatching.



### ■ Function:

- On-the-pause remote comm. with base site by satellite, supporting transmission of voice, data and image;
- Area mobile comm. can be supported on the move by PMR, wireless LAN and V/UHF radio.

### ■ Features:

- On-the-pause transmission of BLOS, multiple-service, large capacity and high quality service;
- Three types of stations: large, medium and small, optional antenna apertures;
- Capable to be used as an important emergency comm. means with good mobility, and fast deployment and commissioning.

## SATCOM Products

### SATCOM On-the-move Vehicular Station

It supports maneuverable continuous satellite comm., which is applied for coordination of official escorts, emergency command comm. support and on-the-move comm. in peace-keeping and anti-terrorism operation.



■ **Function:**

- Remote on-the-move comm. with home site by satellite, including voice, data and image transmission;
- Mobile comm. in an area can be supported on the move by PMR, wireless LAN, and V/UHF radio.

■ **Features:**

- On-the-move transmission of BLOS, multiple-service, large capacity and high quality service;
- Three station types: large, medium and small type; antenna aperture is optional.

## SATCOM Products

### SATCOM Airborne Station

It is SATCOM station installed on the airplane and used for on-the-move comm. between airplane and ground and among the airplanes. The airborne platform can be UAV, helicopter, etc.



■ **Function:**

- On-the-move service transmission including voice, data and image;
- Main BLOS and wideband transmission comm. means on the airplane.



■ **Features:**

- On-the-move transmission of BLOS, multiple-service, large capacity and high quality service;
- Antenna aperture is for option according to the airborne platform.

# SATCOM Products

## SATCOM Portable Station

Featured by compact size, minimal weight, rapid deployment and ease of transportation, the portable SATCOM station can be used in special areas and in special situations such as disaster relied and emergency comm.

■ **Function:**

- Manual or automatic satellite tracking, easy to carry and transport, fast deployment and commissioning;
- Supporting voice, data and image.

■ **Features:**

- Simple and convenient, it can be carried by hand or on various transportation platforms;
- Capable to be accessed by existing SATCOM networks of the same type, and all the operation services are managed by NMC;
- Capable to be built into an FDMA point-to-point comm. system with other stations of the same type.

## SATCOM Products

### SATCOM Shipborne Station

It is used for on-the-move comm. between coast stations and ships as well as between ships.



■ **Function:**

- On-the-move transmission of voice, data and image.

■ **Features:**

- On-the-move transmission of BLOS, multiple-service of large capacity and high quality;
- Various antenna apertures are optional in accordance with ship size.

**General**

**Emergency Comm. System**

**SATCOM Products**

★ **SATCOM Application Case**

## SATCOM Application Case

☆ **Emergency Comm. Command System of All Industries and Departments in China**

☆ **X-department Mobile Emergency Command System**

☆ **Site Command Comm. System of State Earthquake Bureau in China**

☆ **Mobile Emergency Command Platform of Ministry of Communications in China**

☆ **SATCOM Teleport of Venezuela**

☆ **CDMA SATCOM System of X-country**

☆ **SATCOM System of Telemetry & Telecontrol Station in Nigeria**

☆ **SATCOM System of XXXX 422 Project**

# SATCOM Application Case

## X-department Emergency Comm. Command System



The system is mainly used for communication between command center and remote mobile emergency comm. vehicles. It supports service including data, voice, fax and dynamic image.

## SATCOM Application Case

It also undertakes R&D on the subject of *Mobile Emergency Technique and Mobile Application System* of the project named *Technique Research and Application Demonstration of National Emergency Platform System*.

## SATCOM Application Case

### Site Command Comm. System of State Earthquake Bureau

CETC54 has developed and established four sets of earthquake emergency command systems in Sichuan, Gansu, Yunnan and Xinjiang for State Earthquake Bureau. The system is used for realizing information transmission between earthquake site and rear command center and plays very important role in earthquake relief work of *Wenchuan Earthquake*.

# SATCOM Application Case

## Function:

Emergency command vehicle, as the center of earthquake site command and comm. network, plays the role of data processing, comm. network, video conference and site office. It supports site command and decision-making, and site data also can be transmitted to the upper level so that leader/expert can conduct remote command. If necessary, video conference can be held for television consultation and ordering commander's decision or command.

# SATCOM Application Case

## Function:

The function of site image collection and transmission is mainly used after the earthquake. Camera and image transmission equipment of working team will be dispatched to the site. First-hand disaster material will be transmit to site command center in the shortest time and provides support for disaster rescue and relief and earthquake damage assessment.

## SATCOM Application Case

### Mobile Emergency Command Platform of Ministry of Communications

**Including:**

- second-class chassis and shelter (Benz 1829): 13

- large-size coach (Yutong coach): 6

- middle-size coach (Benz 816D): 12

- off-road vehicle (Toyota Prado): 14

## SATCOM Application Case

### SATCOM Teleport of Venezuela

SATCOM teleport of Venezuela, as the core of satellite ground application system and infrastructure of Venezuela, provides perfect integrated value-added service by SATCOM and seamless network connection, expands telecommunication services to the area without ground comm. network. The technical system of teleport SATCOM system includes FDMA, TDMA and TDM/TDMA. Station types include:

- 1 C-band 13m fixed station, used for digital television broadcasting and trunk service transmission;
- 3 Ku-band 13m fixed station, used for digital television broadcasting, DTH service, IP data and telephone service;
- 1 Ka-band 9m fixed station, used for comm. testing;
- 1 C-band 3m demonstration station, VSAT demonstration station is used for satellite information transmission demonstration;
- 1 Ku-band 1.8m demonstration station, VSAT demonstration station is used for satellite information transmission demonstration;
- Integrated service switch network is used for Tx and Rx information switch of satellite ground station and connecting with ground network.

## SATCOM Application Case

### Function

- **Satellite DVB-S/S2 broadcasting;**

- **High-speed Internet satellite access;**

- **Data, voice and fax transmission;**

- **Integrated service switch network;**

- **Ka-band testing capability.**

## SATCOM Application Case

### CDMA SATCOM System of X-Country

The system is employed with direct-sequence spread spectrum technique. With good concealment, anti-jamming and anti-interception performance, it is especially suitable for SATCOM private network and secure communication among important departments. The system is composed of 102 SATCOM stations, including 1 fixed center station, 25 fixed slave stations, 75 fixed terminal stations and 1 on-the-move vehicular station.
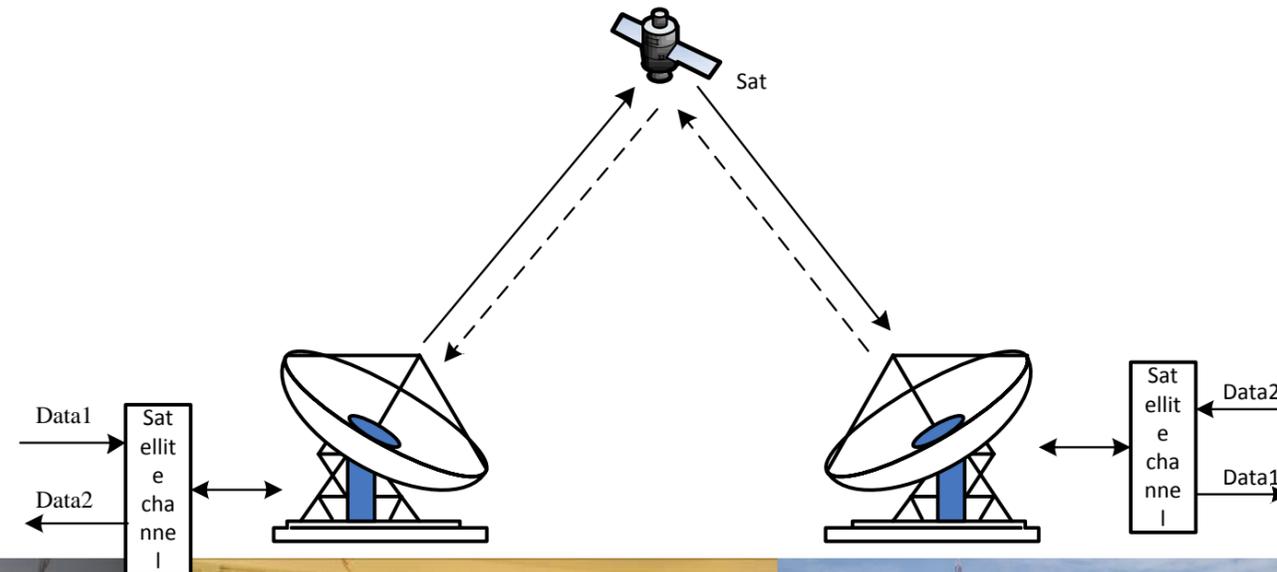
## SATCOM Application Case

## SATCOM System of Telemetry & Telecontrol Station in Nigeria

The system is used for telemetry & telecontrol information intercommunication between Nigeria telemetry & telecontrol station and Kashi telemetry & telecontrol station and guarantees normal operation of the telemetry & telecontrol station. The system includes two fixed stations and is adopted of FDMA technical system.
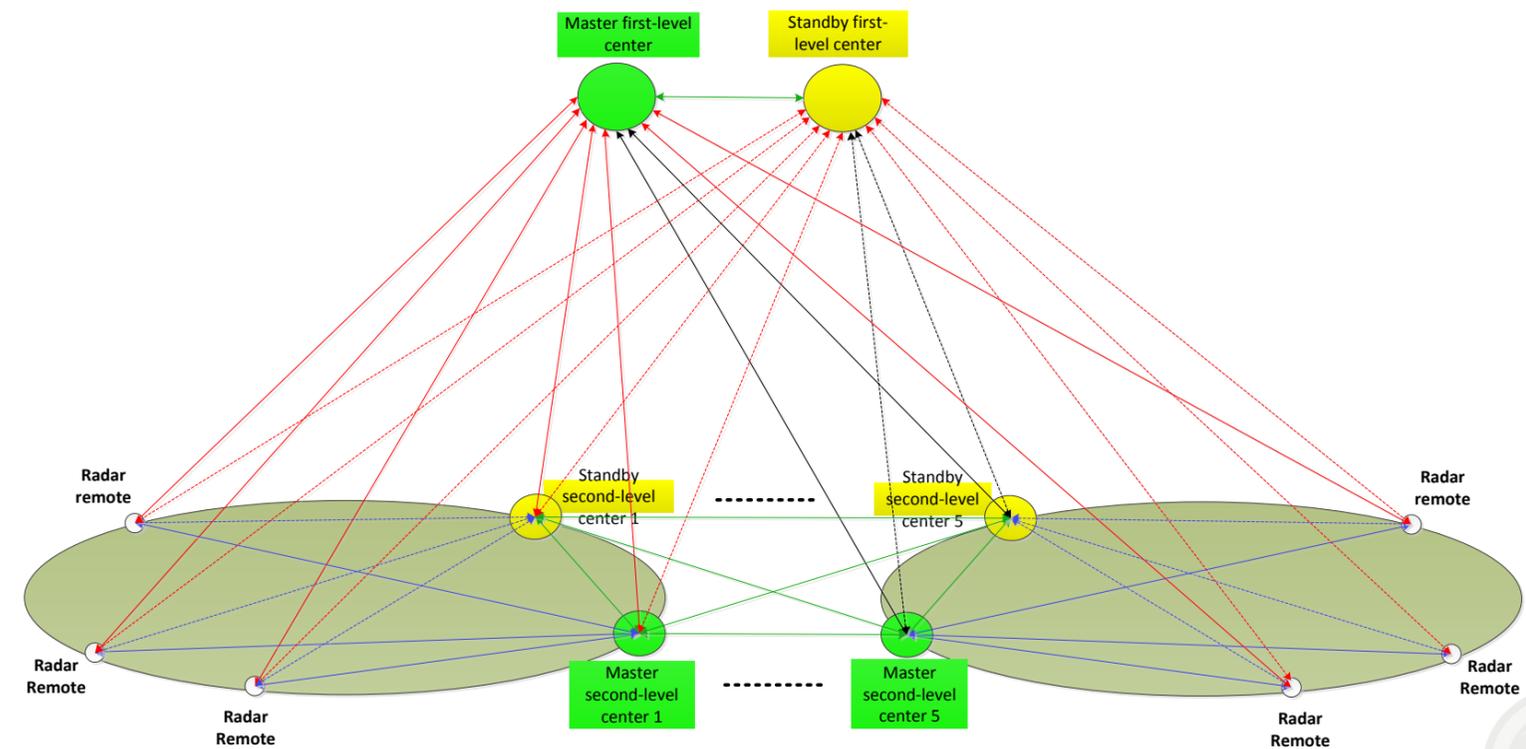
## SATCOM Application Case

### SATCOM System of XXXX 422 Project

The project is employed with MF-TDMA satellite communication system, featured by flexible networking and supporting multi-level, multi-center & multi-virtual-subnet complicated network structure and used for necessary service transmission within the stations of the network.

The system is adopted of redundancy design, and master SATCOM station can realize offsite standby. Master station and master standby station are configured with network management center. The whole SATCOM network can be normally operated with the network management system.

It includes 2 first-level centers (1 master and 1 standby), 11 second-level centers (6 master and 5 standby), 42 vehicular remote stations and 1 fixed remote station, totally 56 SATCOM stations.

T hanks