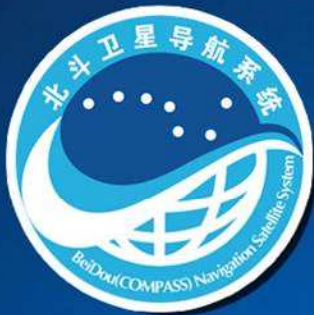
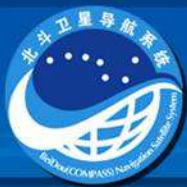


CHINA SATELLITE NAVIGATION OFFICE



# ***Update of BeiDou Navigation Satellite System***

*China Satellite Navigation Office  
9 Feb. 2015, Vienna, Austria*



01

**Development  
Plan**

02

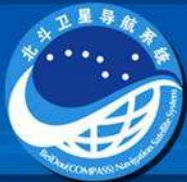
**Latest  
Progress**

03

**Recent  
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01

**Development  
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**Development Objectives**

**Basic Principles**

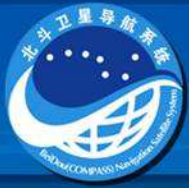
**Development Steps**

**System Components**

**Latest  
Progress**



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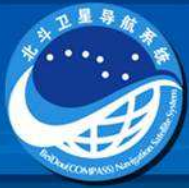
# Development Objectives

## **BDS is committed**

- To provide continuous, stable and reliable positioning, navigation and timing services;
- To meet the requirements of national security and the development of our society and economy, to accelerate the national informationization construction and the transformation of economic development mode, and to improve both economic and social benefits;
- To serve the world and benefit the mankind through joint efforts with other satellite navigation systems across the globe.



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# Basic Principles

## Openness

BDS will provide open services free of charge for direct users, and welcome worldwide applications.

## Independency

BDS will be developed and operated by China independently.

## Basic Principles

## Compatibility

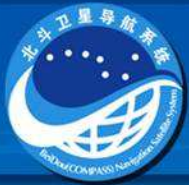
BDS is devoted to pursue compatibility and interoperability with other satellite navigation systems so as to provide better services for users.

## Gradualness

The deployment of BDS follows a step-by-step pattern in accordance with the actual national technical and economic development circumstances.

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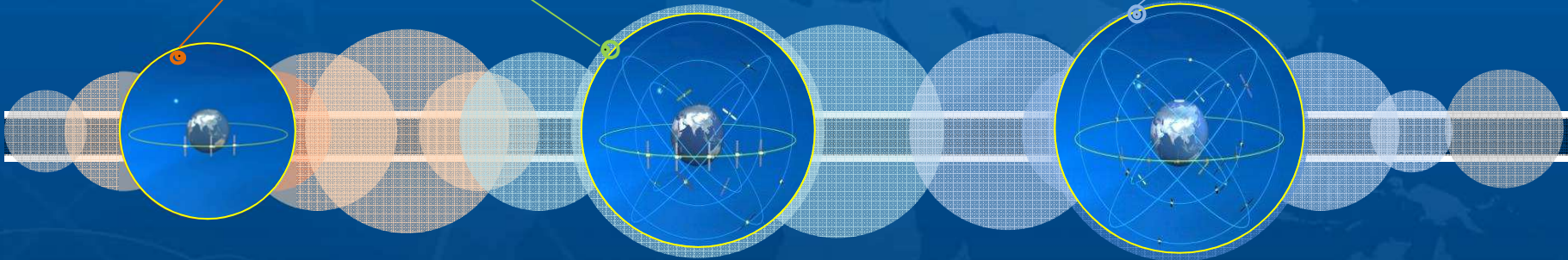
# Development Steps



BeiDou Demonstration System started to provide regional active services.

BDS with global passive service capabilities will be accomplished.

BDS started to provide regional passive services.

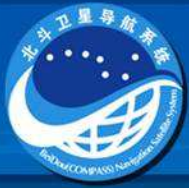


2000

2012

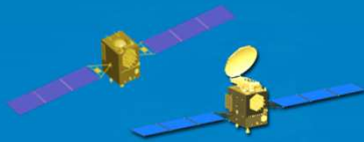
2020

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# System Components

Space  
Segment



Ground  
Segment



User  
Segment

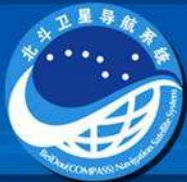


- 5 GEO satellites
- 3 IGSO satellites
- 27 MEO satellites
- Master Control Stations (MCS)
- Uplink Stations (US)
- Monitoring Stations (MS)
- BeiDou terminals
- Terminals compatible with other navigation satellite systems

**Four types of services:**  
open, authorized, differential augmentation, and short message services.

**The nominal positioning accuracy is better than 10 m, timing and velocity accuracy is better than 20 ns and 0.2 m/s respectively.**

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**System Construction**

**Application and Popularization**

**International Cooperation**

**Latest  
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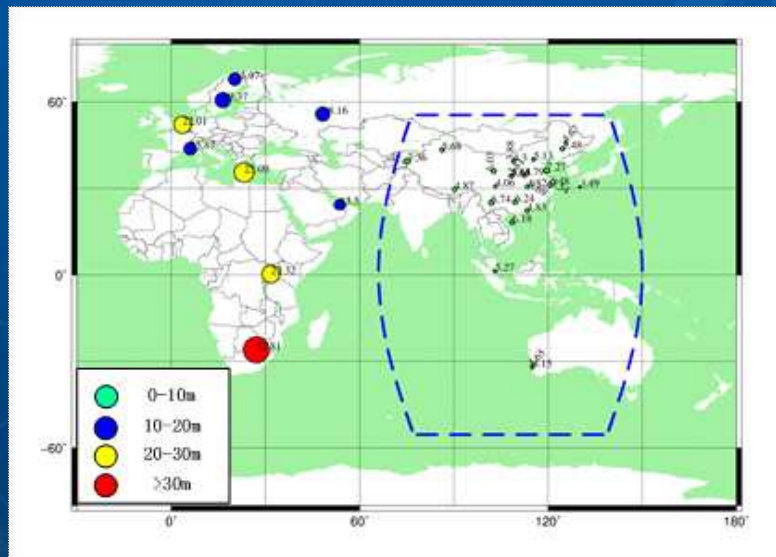




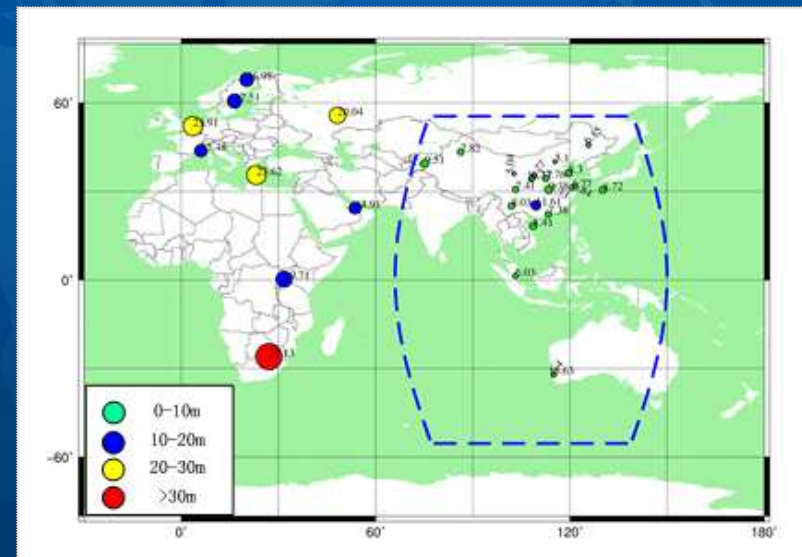
# System Construction

## 1. Maintain Stable Operation

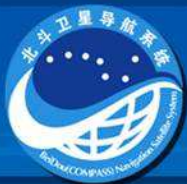
Since formal regional service provision on December 27 2012, BDS has maintained continuous and stable operation. The system service performance can satisfy the nominal requirements, and might be better than 10 m in some areas.



B1I Horizontal Positioning Accuracy

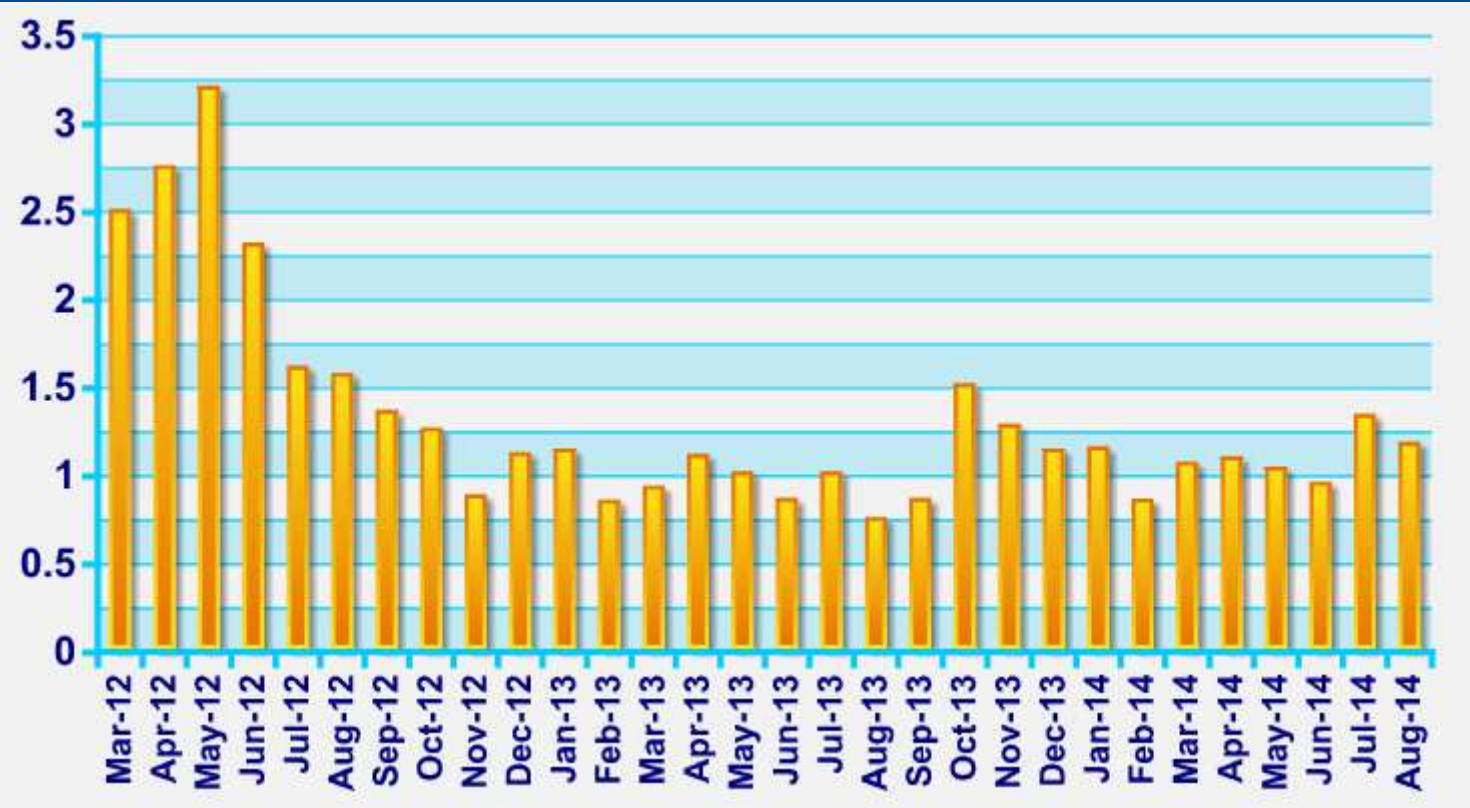


B1I Elevation Positioning Accuracy



# System Construction

## 1. Maintain Stable Operation



URE ( m )

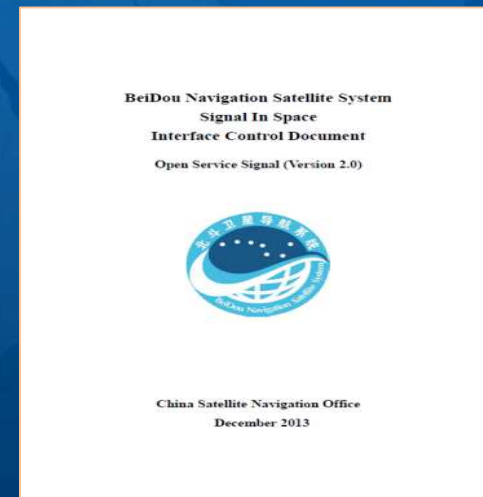
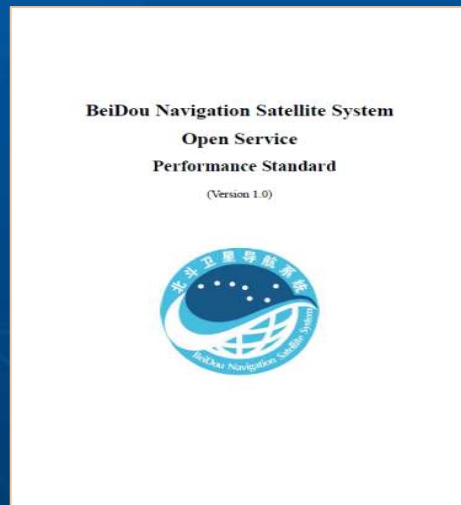




# System Construction

## 2. System Specification Documents Published

- “BDS Open Service Performance Standard (Version 1.0)” and “BDS Signal In Space Interface Control Document Open Service Signal (Version 2.0)” was released.
- The second open service signal B2I is available.



*Both Chinese and English versions of above documents are available at <http://en.beidou.gov.cn/>*



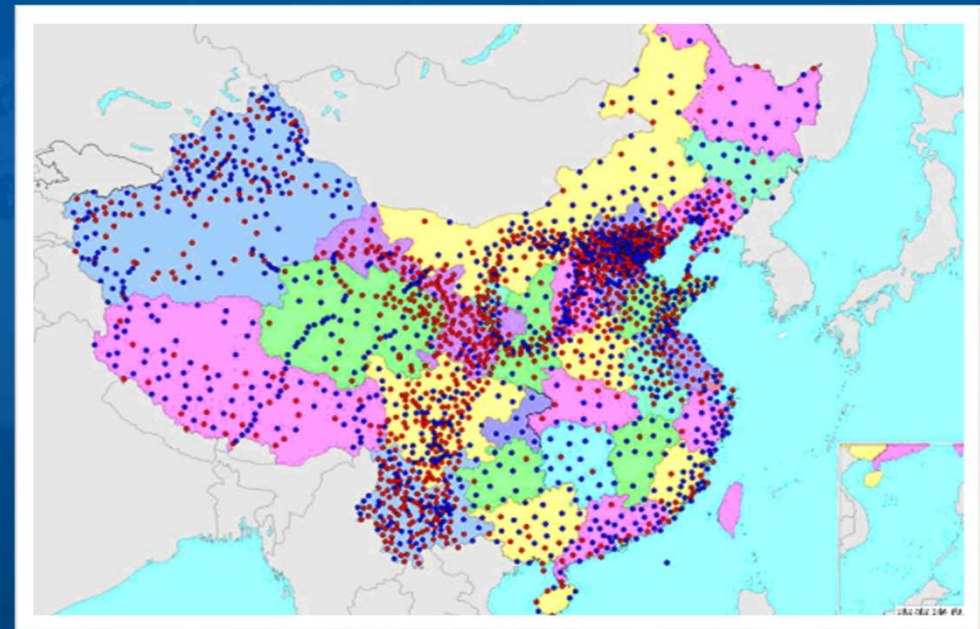


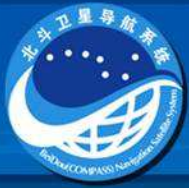
# System Construction

## 3 . Continue to Develop Augmentation System

### National Differential BDS

**NDBDS will provide not only meter/decimeter-level wide area navigation and positioning services but also centimeter-level real time regional positioning services for China and its neighboring areas.**

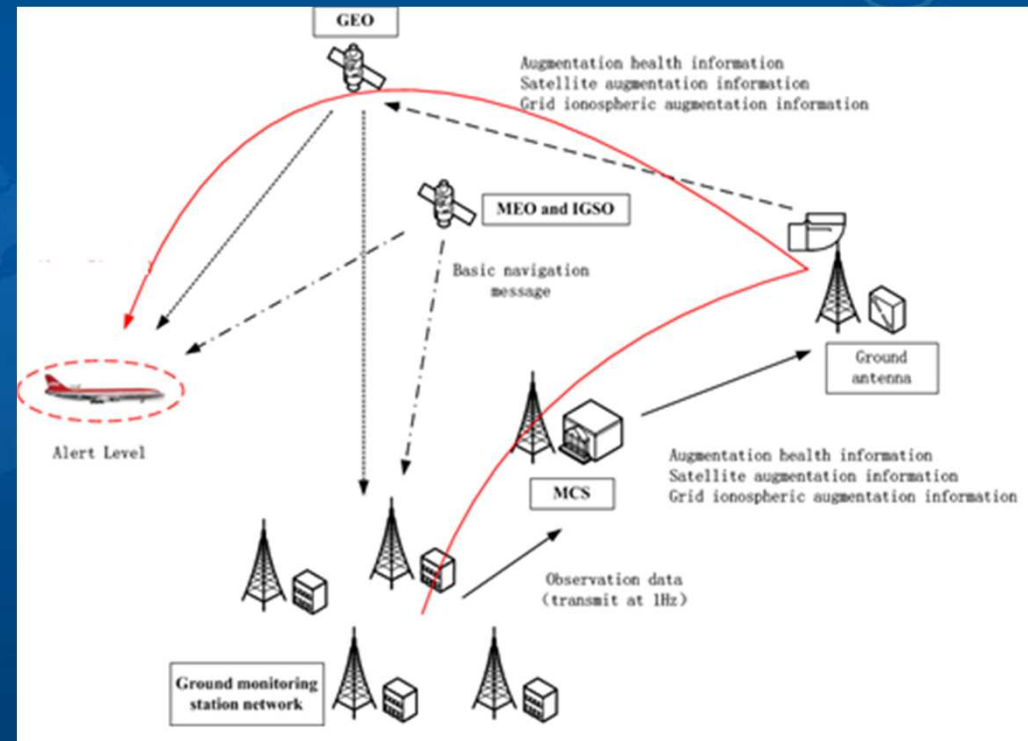




# System Construction

## 3. Continue to Develop Augmentation System

In order to meet the demands of civil aviation users for CAT-I services, design for a dual-frequency multi-system augmentation signal in line with international conventions is underway.



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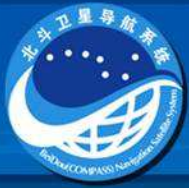
# System Construction

## 4 . Continue to Develop M&A System

### iGMAS & IGMA

- **March 2011, China first proposed the concept of international GNSS Monitoring and Assessment System (iGMAS).**
- **June 2011, China proposed international GNSS Monitoring and Assessment services at the ICG conference in Vienna.**
- **September 2011, ICG-6. 'International GNSS Monitoring and Assessment' (IGMA) sub-working group co-chaired by China, IGS and Japan was set up with its objective and tasks to promote international GNSS monitoring and assessment activities.**
- **We expect to cooperate with other countries/agencies in data sharing, signal monitoring and assessment .**



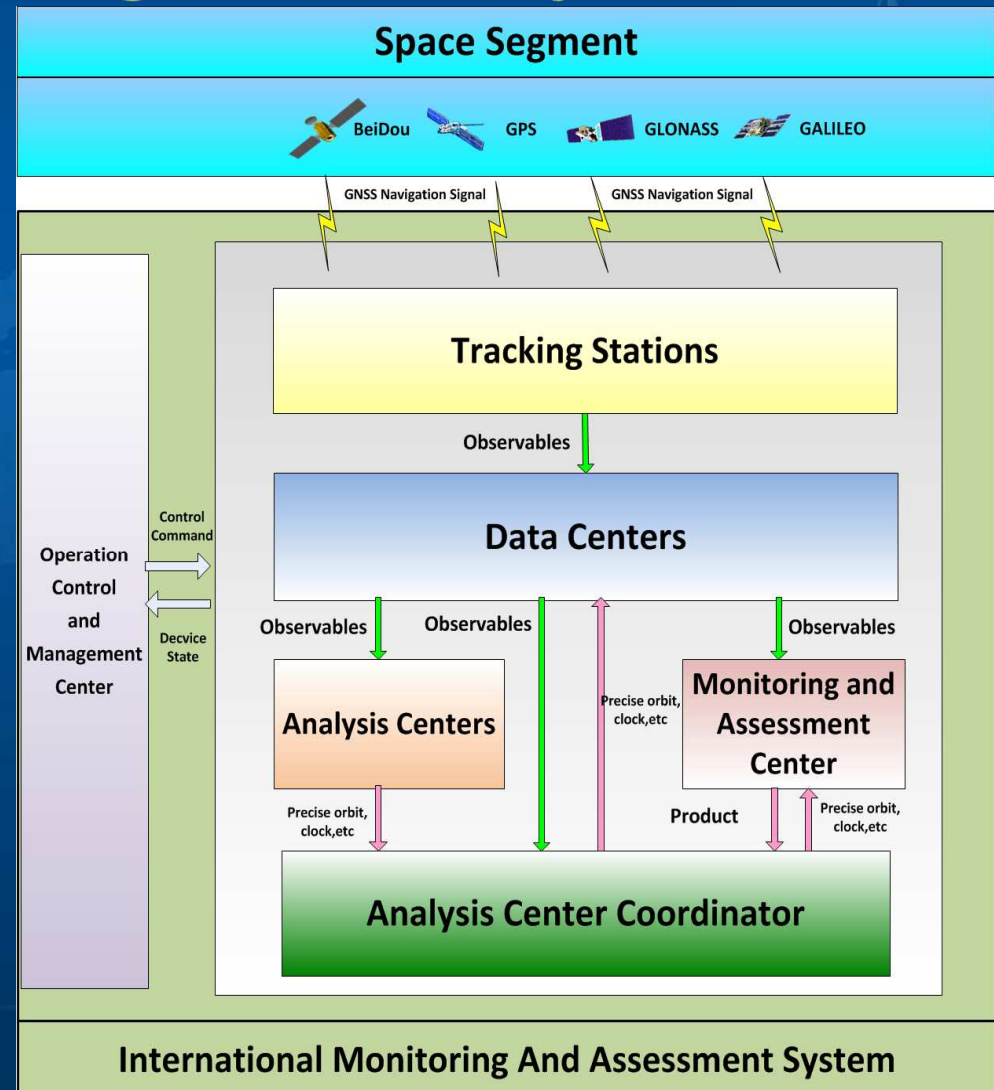


# System Construction

## 4 . Continue to Develop Augmentation System

### System Components

- 30 tracking stations;
- 4 signal monitoring stations;
- 3 data centers;
- 8 analysis centers;
- 1 monitoring and assessment centers;
- 1 product integration and service center;
- 1 operational control and management center.





## Tracking Stations

- Infrastructure construction of 8 domestic stations have been completed, receiver equipments have been installed.

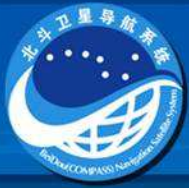




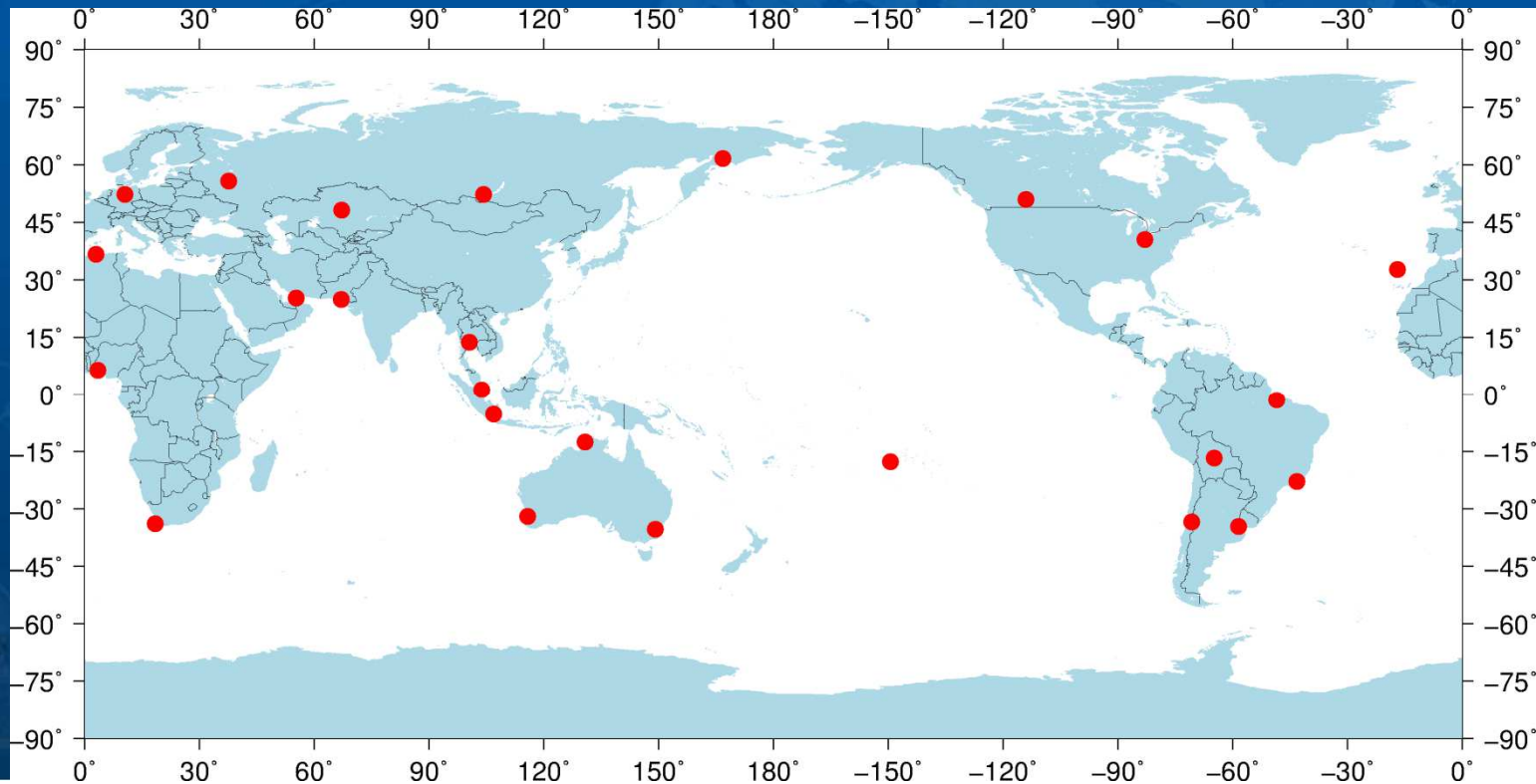


- Arctic and Antarctic stations infrastructure construction have been completed and equipped with receiver and network equipment.
- Stations in Pakistan and Brazil have been equipped with receiver and network equipment.





- Stations in Russia, Australia, Germany, England, Argentina, Canada, South Africa, etc. are progressing.
- Data from 40+ IGS stations are involved as well.

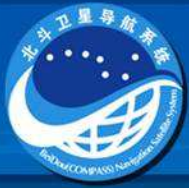






- **Signal monitoring station**
- **Apr. 2009, an 7.3m antenna started to work in Xi' an;**
- **Oct. 2014, an 40m antenna was put into service in Xi' an;**
- **International cooperation with Canada, Malaysia and Argentina for signal quality monitoring and assessment has been determined.**





# System Construction

## 5. Third-Step Construction Launched

Aiming at providing services with global coverage by around 2020



- Deepen the general design scheme
- Endeavor to make breakthroughs in key technologies, especially new systems and techniques
- Develop and manufacture the new-generation BDS satellites

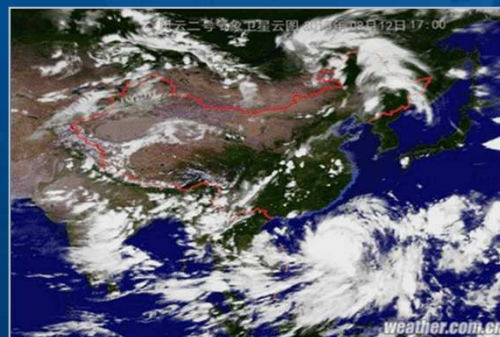
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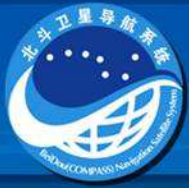
# Application and Popularization

**BDS's unique position reporting feature and short message service has been widely welcomed by different industries;**

**The combination of satellite navigation with mobile communications, internet, etc. make BDS has been applied widely in various fields, such as transportation, finance, meteorology, fishery, etc.**



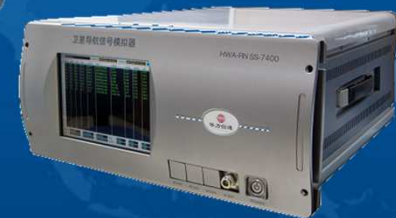
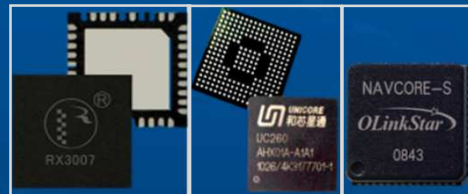
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# Application and Popularization

## 1. Basic Product Industrialization

Comprehensively advanced the R&D and industrialization of BDS/GNSS compatible basic products, like chip, module, antenna, simulator, navigation software, etc.



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# Application and Popularization

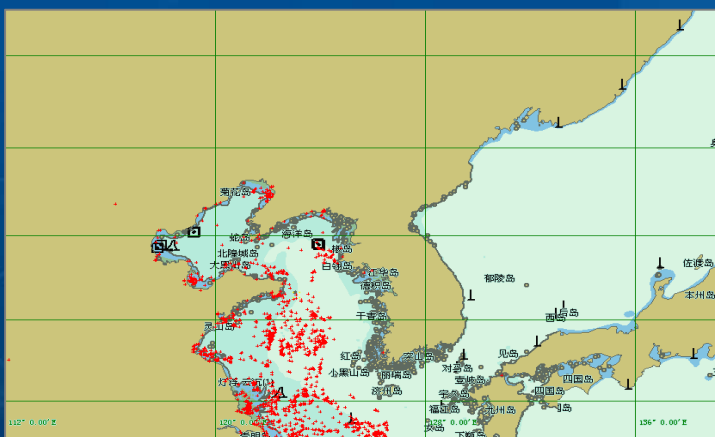
## 2. Industrial /Regional Application Demonstration

### ● Transportation



### National Monitoring Platform For Key Transportation

### ● Fishery





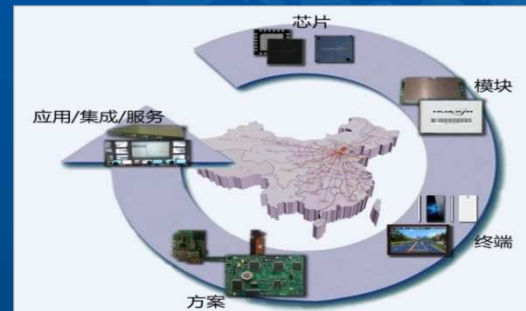


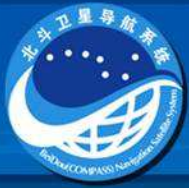
# Application and Popularization

## 2. Industrial /Regional Application Demonstration

public operation service platform

city emergency management, intelligent transportation, comprehensive law enforcement, people safety guarding service, business car supervision, etc





# Application and Popularization

## 3. Mass Market Application

### Smart phones



### Vehicle Navigation



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# International Cooperation

## 1. Bilateral Cooperation

Continue to carry out compatibility and interoperability coordination with the U.S. (GPS), Russia (GLONASS), EU(GALILEO), India and Japan, so as to jointly provide better services for users.



*Sino-U.S.*



*Sino-EU*



**The First Bilateral Meeting of China-U.S GNSS Cooperation**

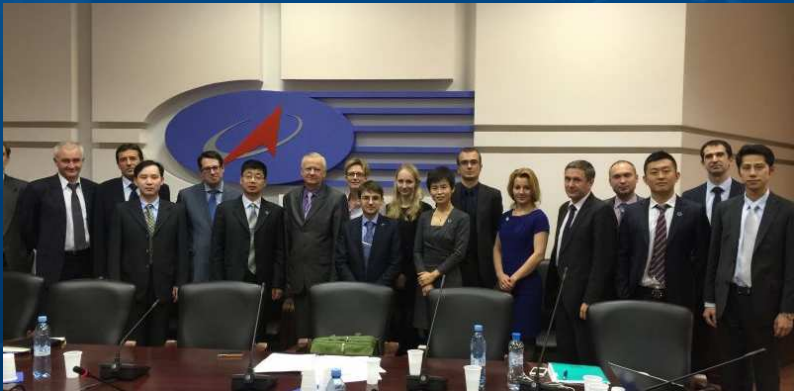


# International Cooperation

## 1. Bilateral Cooperation



*Sino-Russia*





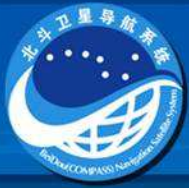


# International Cooperation

## 2. Multilateral Cooperation

- Persist in coordination on multilateral platforms like ICG, ITU, etc., to promote co-existence and integrated applications of satellite navigation systems.





# International Cooperation

## 2. Multilateral Cooperation

- Take part in ICAO related activities and promote BDS to enter into the ICAO standards as planned.
- The performance specifications of Ship-borne BeiDou receivers has been formally examined and approved by IMO MSC ; BDS has been recognized as one WRNSS.
- 3GPP technical standard supporting BDS positioning service has been approved.

Consistently promote the admission of BDS into the international general data standards for satellite navigation receivers.



RTCM

NMEA

IGS



# International Cooperation

## 2. Multilateral Cooperation

- Promote the cooperation with organizations such as APSCO, ESCAP, APEC, UNSPIDER, etc.
- Continue to promote both the International GNSS Monitoring and Assessment (IGMA) initiative and the BDS/GNSS Application Demonstration and Experience Campaign (BADEC) initiative.







# International Cooperation

## 3. International Applications

- Strive to set up cooperation mechanism in satellite navigation applications and other fields with the Asia-Pacific countries.
- Continue to sponsor BeiDou Tour







# International Cooperation

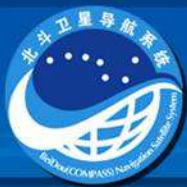
## 4. Technical Cooperation

- Encourage academic exchanges, hold China Satellite Navigation Conference in May

Support to set up a Regional Center for Space Science and Technology Education

- Affiliated to the United Nations. Master courses for space application and satellite navigation and the summer school for advanced technology in satellite navigation have been offered each year.





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System Construction

Application and Popularization  
International Cooperation  
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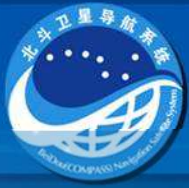


# System Construction



- 1. Continue to maintain stable and reliable operation of the system and consistently improve the system service performance**
- 2. Deploy the global constellation with 4-5 new generation BDS satellites to be launched in 2015**
- 3. Construct the National Differential BDS which is scheduled to begin to provide services around 2015**

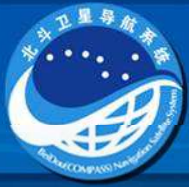
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# Application and Popularization

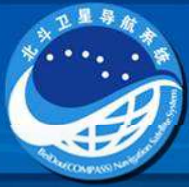
1. To encourage innovation of BDS/GNSS application and commercial modes, facilitate interaction, promote industrial and regional demonstration applications
2. To encourage the industrialization of BDS/GNSS products and to accelerate popularization in the mass market through taking advantages of policies and market, and integrating capital, technical and commercial resources
3. To standardize market order, improve the industrial development environment, and promote BDS/GNSS industrialization and internationalization process through product quality supervision, IPR protection and standardization work





# International Cooperation

1. Publish BDS white paper as a comprehensive description of the BDS development concepts and related opinions
2. To advance dialogues and communication with the US, Russia and EU and to deepen cooperation in compatibility and interoperability, monitoring and assessment, augmentation system, application and other fields



# International Cooperation

3. To create a favorable atmosphere for BDS/GNSS cooperation and development, like promoting improvement of the multilateral coordination mechanism with ICG, ITU and other international organizations, coordination on hot international issues, as well as specification formulation
4. To further explore international cooperation channels through establishing coordination mechanism of BDS/GNSS international application and to facilitate BDS/GNSS global applications, as support of BDS/GNSS service capabilities enhancement
5. 13<sup>th</sup> -15<sup>th</sup> May 2015, 6th China Satellite Navigation Conference in Xi' an.



# Conclusions

**BDS continues to provide stable and reliable services and started construction for the third step.**

**Preliminary success has been achieved in BDS application. Mass production has been realized for basic products which have gradually entered into various industries and the mass market.**

**Steady progresses are witnessed in the internationalization process of BDS, and China will further performed its duties and fulfilled its obligations as a core GNSS provider.**

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# Thank you!

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