



*The Tenth Meeting of International Committee
on Global Navigation Satellite Systems*

Update on BeiDou Navigation Satellite System

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China Satellite Navigation Office





Objectives and Policies

The BeiDou System is committed:

- To provide continuous, stable and reliable positioning, navigation and timing services to global users.
- To meet the requirements derived from national security, economic and social development sectors, to accelerate IT applications and the transformation of economic development methods, and to improve both economic and social benefits.
- To serve the world and benefit the mankind through joint efforts with other navigation satellite systems across the globe.

Openness

Independency

Compatibility

Gradualness



Objectives and Policies

- BDS will provide open service free of charge for direct users.
- The service performance will be continuously improved through sustainable maintenance and consistent updates.
- Open Service Performance Specifications will be released and updated on schedule.
To bring the function of government and market into full play, to promote innovation, popularization and internationalization of BDS/GNSS applications.
- To adhere to the concept of development and win-win cooperation, to realize compatibility and interoperability with other navigation satellite systems.
- To improve application efficiency, to expand application field, to promote international application, and to improve the users' benefits.

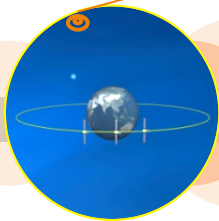


Development Steps

The BeiDou System has been developing in line with the “three-step” and the thinking of “from regional to global, and from active to passive”, and forms a development path as region-highlighted, world-oriented, with its own features.

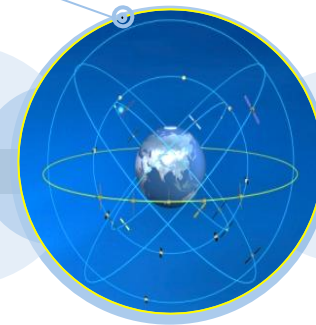
The 1st Step:

1994~2000 , provide regional active services



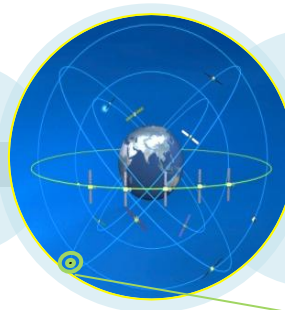
The 3rd Step:

2013~2020, provide global passive services

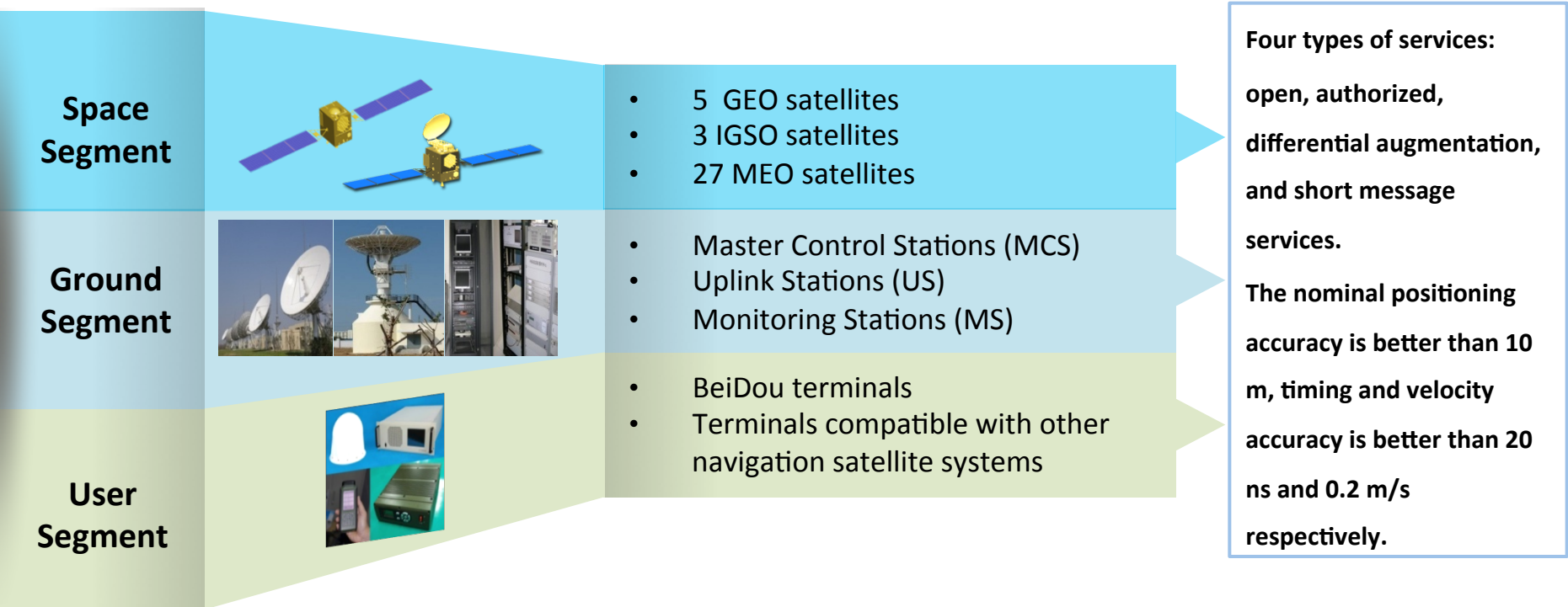


The 2nd Step:

2004~2012, provide regional passive services



System Components

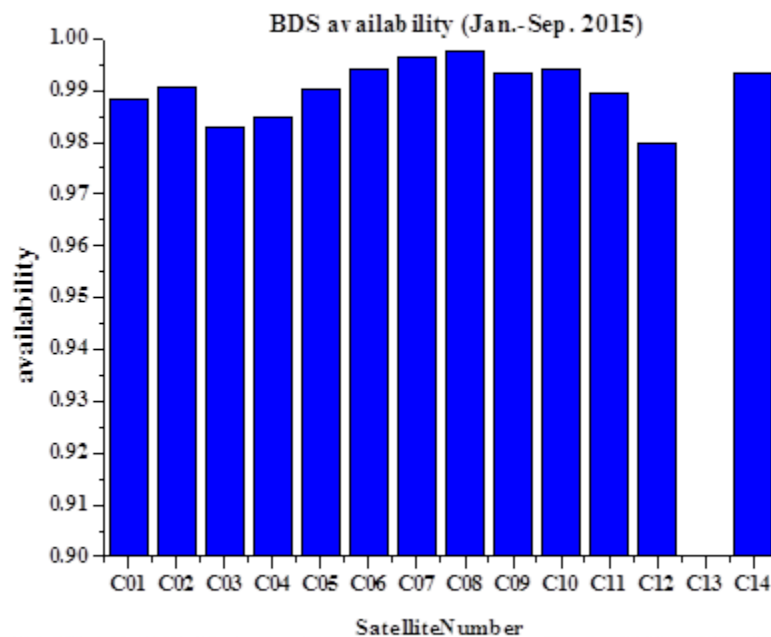
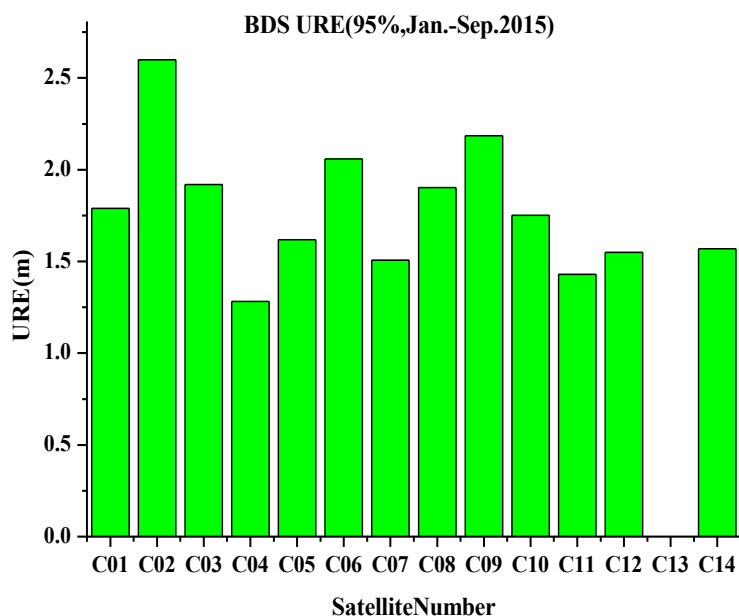




System Construction

1. Maintain Stable Operation

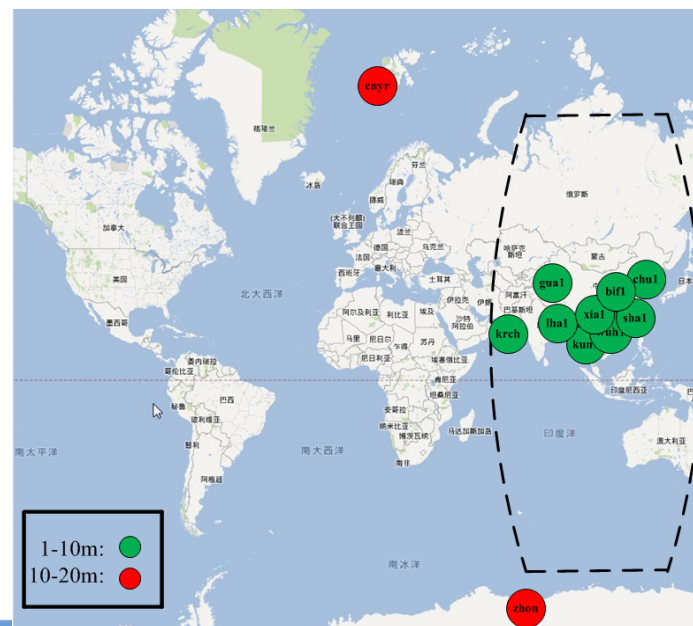
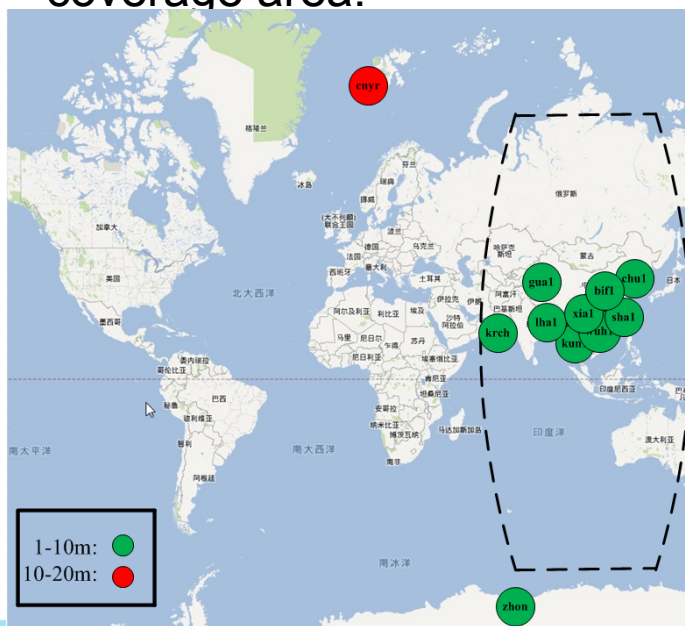
Since its formal regional service provision on December 27 2012, BDS has maintained continuous and stable operation. The system service performance can satisfy the nominal requirements.



System Construction

1. Maintain Stable Operation

- Monitoring and assessment results of signals covering the Asian-Pacific region indicate that the BDS performance meets the specification.
- The accuracy of positioning is better than 10m in some of the coverage area.

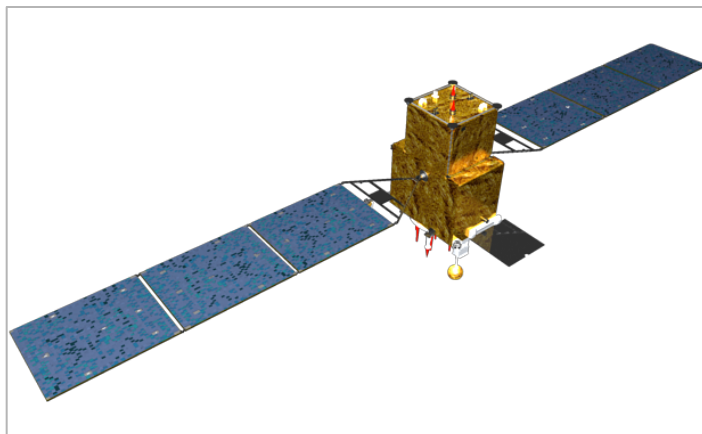


System Construction

2. Deployment of Global Constellation

- 1st new generation BeiDou navigation satellite was launched on 30th March 2015;
- Two additional MEO satellites were launched on 25th July 2015;
- One IGSO satellite was launched on 30th September. 2015

*At present, all newly launched satellites work well, and the in-orbit test is ongoing.
Preliminary test results indicate satellites performance meets the specification.*



System Construction

2. Deployment of Global Constellation

- The new satellites have adopted advanced signal structure, crosslink and other new technologies, and equipped with on-board clocks with higher accuracy, to improve service capability comprehensively:
 - New navigation signal validation is ongoing, the performance improves gradually, and signals has better compatibility and interoperability performance with other GNSS. *(For continuous services, the navigation signals include the regional open signals.) After the new signal system assessment is accomplished, the ICD of the global open signal will be published as soon as possible.*
 - Crosslink test is ongoing smoothly.
 - Rubidium clocks and hydrogen clocks with enhanced performance have been installed on the new satellites. The accuracy, stability and drift rate are improved.
- The new technology system and performance have been preliminarily verified, which meets the design requirements.

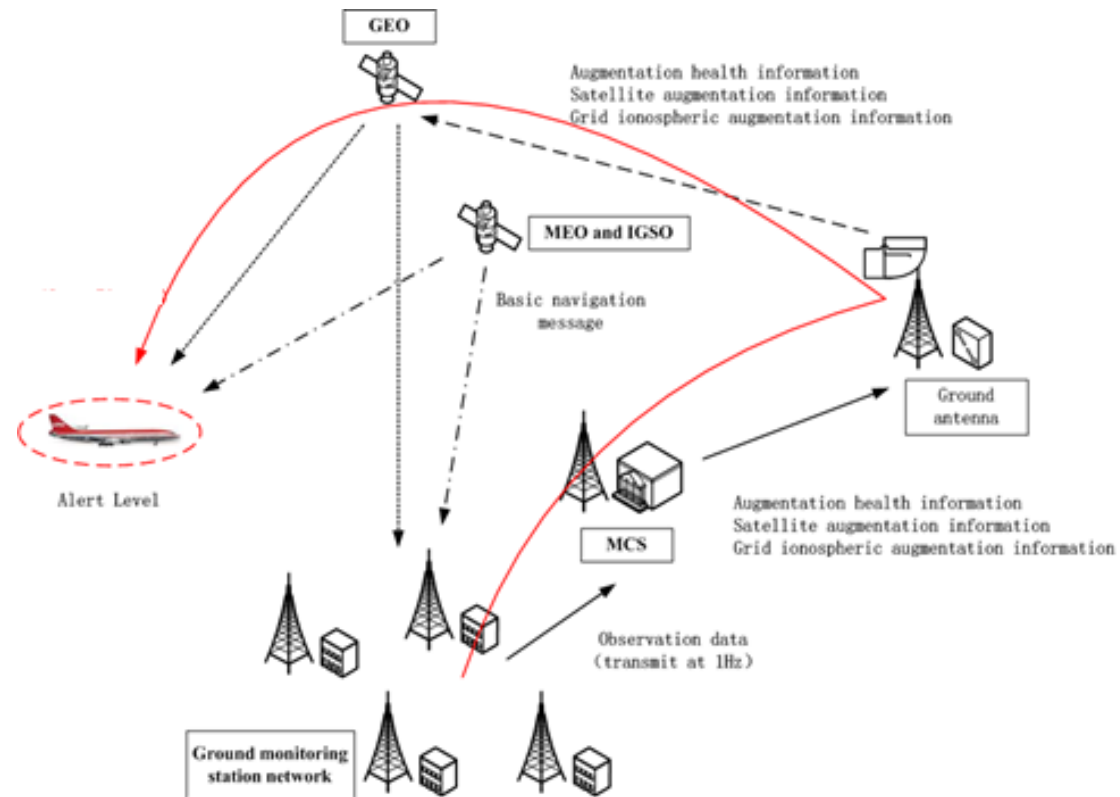


System Construction

3. BeiDou Augmentation System Construction

Satellite-based Augmentation System

- BDS will comply with the international civil aviation standards, carry out the design, validation and construction of BeiDou Satellite-Based Augmentation System (BDSBAS), which will provide CAT-I services to civil aviation users in China and surrounding areas.
- At present, SBAS IWG has adopted BDS as one of the augmented objects of future satellite-based augmentation systems.

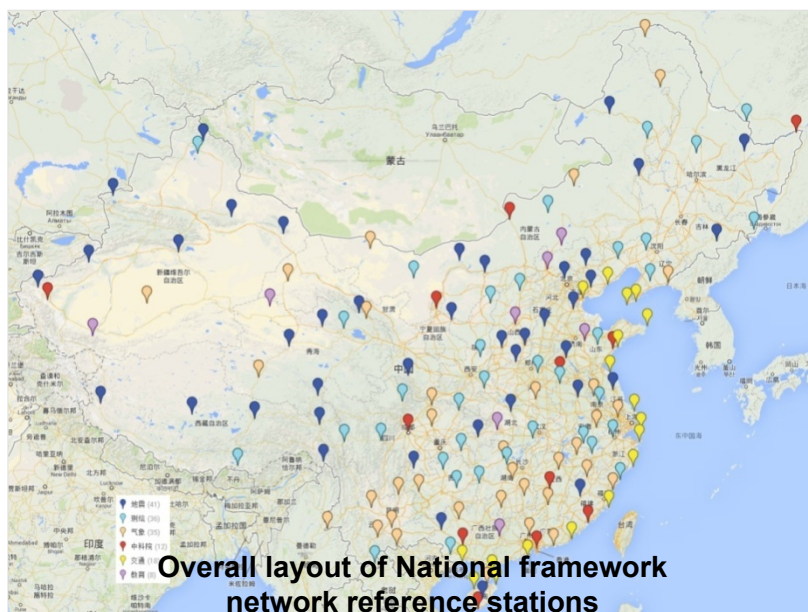


System Construction

3. BeiDou Augmentation System Construction

Ground-Based Augmentation System

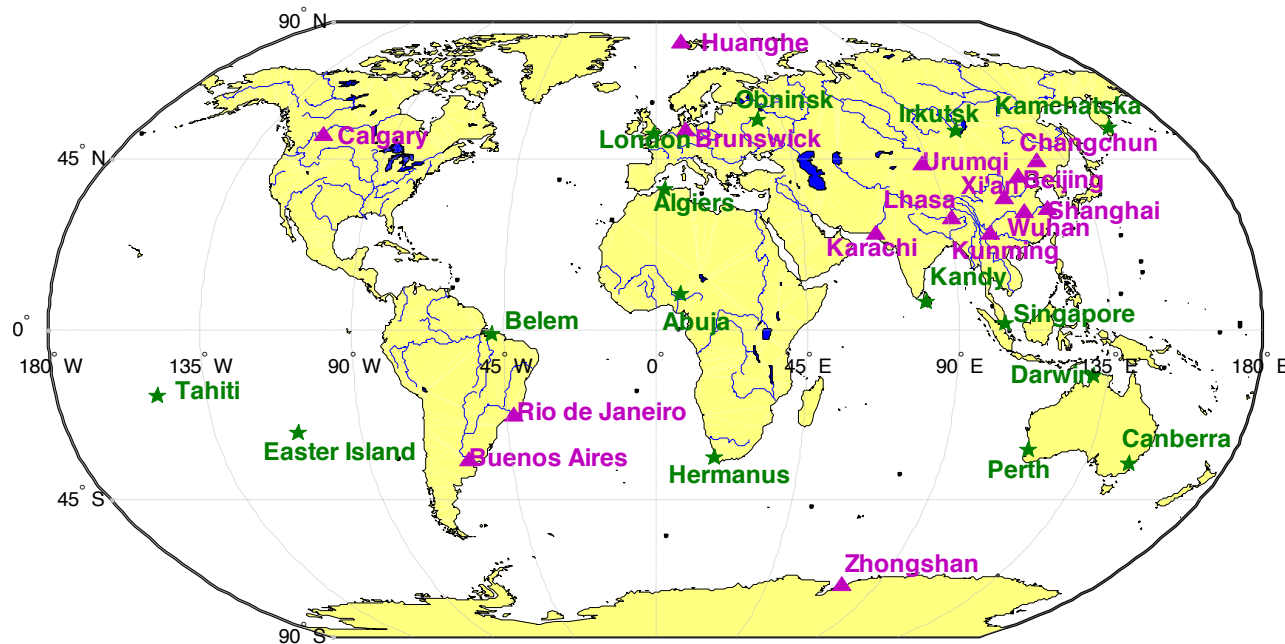
The basic system construction has been completed, while the positioning accuracy is under test, including meter and decimeter level for wide-area real-time services, centimeter level for the Beijing region, millimeter level for post-processing services.



System Construction

4. International Monitoring And Assessment System

15 iGMAS stations have been completed, and the system possesses BDS/GPS/ GLONASS/Galileo monitoring capability. The 40m observation antenna has been completed, with the capability of space signal quality assessment. The system started to provide services in July, 2014.



Application Promotion

1. Industrial Applications

- Being widely used in transportation, meteorology, fishery, disaster prevention, emergency rescue, public security ,agriculture, mapping and deformation monitoring.



Application Promotion

2. Mass Market Applications

- The BeiDou products have been used in smart phones, PADs, intelligent equipment, vehicle navigation, etc.



Application Promotion

3. Industrialization of fundamental Products

- Promote the R&D and industrialization of fundamental navigation products with independent IPR in an all-round way, with BDS/GNSS compatible chips as the cores.



- the sales volume of BDS/GNSS navigation chip/module has surpassed 9 million pieces
- the sales volume of high-precision surveying boards has surpassed 100, 000 sets,
- the sales volume of high-precision antenna is approximately 300, 000 pieces,



International Cooperation

1. Bilateral Cooperation

Keep coordinating with other navigation satellite systems in the sector of compatibility and interoperability, to jointly provide high quality services for users.

China -Russia

The Project Committee on China-Russia GNSS cooperation has been founded, the first bilateral meeting on GNSS cooperation has been held, the MOU on China-Russia cooperation in the field of satellite navigation was signed and the joint statement on compatibility and interoperability has also been released.

China -U.S.

The bilateral meetings of China-U.S. civil GNSS cooperation have been held two times, the cooperation mechanism between BeiDou and GPS has been set up, and a Joint Statement between these two systems was signed.

China -EU

Actively push forward the frequency coordination process between BeiDou and Galileo , and the cooperation mechanism between these two systems are under discussion.



International Cooperation

2. Multilateral Cooperation

Actively undertake international responsibility, promote the compatibility, interoperability, and co-existence among navigation satellite systems.

- Encourage academic exchanges, host the China Satellite Navigation Conference, and attend other international academic conferences in the field of satellite navigation.
- Actively participate in the meetings of the ICG, SBAS IWG, ITU and other GNSS activities organized by the United Nations.



International Cooperation

China in ICG

- Pay close attention to the work of ICG. Chinese representatives and experts have been participated in the activities of ICG since its foundation in 2005.
- Actively promoting the reforming mechanism of ICG, discussing the future development of ICG with respective parties; participating in the ICG topic coordination, such as compatibility and interoperability, IDM, IGMA, applications, time, and coordinate, and proposing the initiative of international monitoring and assessment, international application demonstration and experience; devoting to provide better service to users.
- Hosted the 2012 ICG-7 meeting. Pushed forward for the joint statement of the GNSS Providers.



International Cooperation

China in ICG

- Established ICG Information Center in Beihang University, launched international education training to popularize the application of satellite navigation.
- Willing to propose to host the 2018 ICG-13 meeting and make greater contributions to the common development of ICG and international GNSS community, and take them as important activities to celebrate the 50th anniversary of United Nations Conference on the Exploration and Peaceful Uses of Outer Space.



International Cooperation

3. International Standardization

Actively propel the recognition of BDS in international organizations, such as IMO, ICAO and 3GPP.

- BDS has been recognized as the third worldwide navigation satellite system by IMO.
- Promote the establishment of BeiDou Working Group affiliated to the 104th professional committee of RTCM.
- The BeiDou System has been adopted to ICAO standard framework gradually.
- 16 technical standards which support the BDS positioning functions have been approved by the 3rd and 4th Generation Partnership Projects.



**National Marine
Electronics Association**



China Satellite Navigation Office



System Construction

- Keep enhancement of the continuous stability and service accuracy of the BeiDou System, ensure its regional service performance to maintain stable and to grow better.
- Launch 3 next-generation BeiDou satellites in 2016, and steadily accelerate the deployment of next-generation global constellation, to lay foundations for serving the areas along the Silk Road Economic Belt and 21st-Century Maritime Silk Road by 2018.
- Launch GEO satellites of BeiDou Satellite-based Augmentation system in 2018, Construct BDSBAS service covering China and surrounding regions in 2020.
- Complete the construction of 150 reference stations for the frame network of BeiDou ground based augmentation system, and 300 reference stations for regional density network before the end of 2015, with meter/decimeter-level positioning accuracy available to major regions nationwide, centimeter level to density regions, and millimeter level correction data for post-processing services.
- Establish more iGMAS stations at the end of 2016, strengthen international cooperation, promote the system application. At the end of 2020, upgrade system further , with the capability of monitoring and assessment the new generation signal.

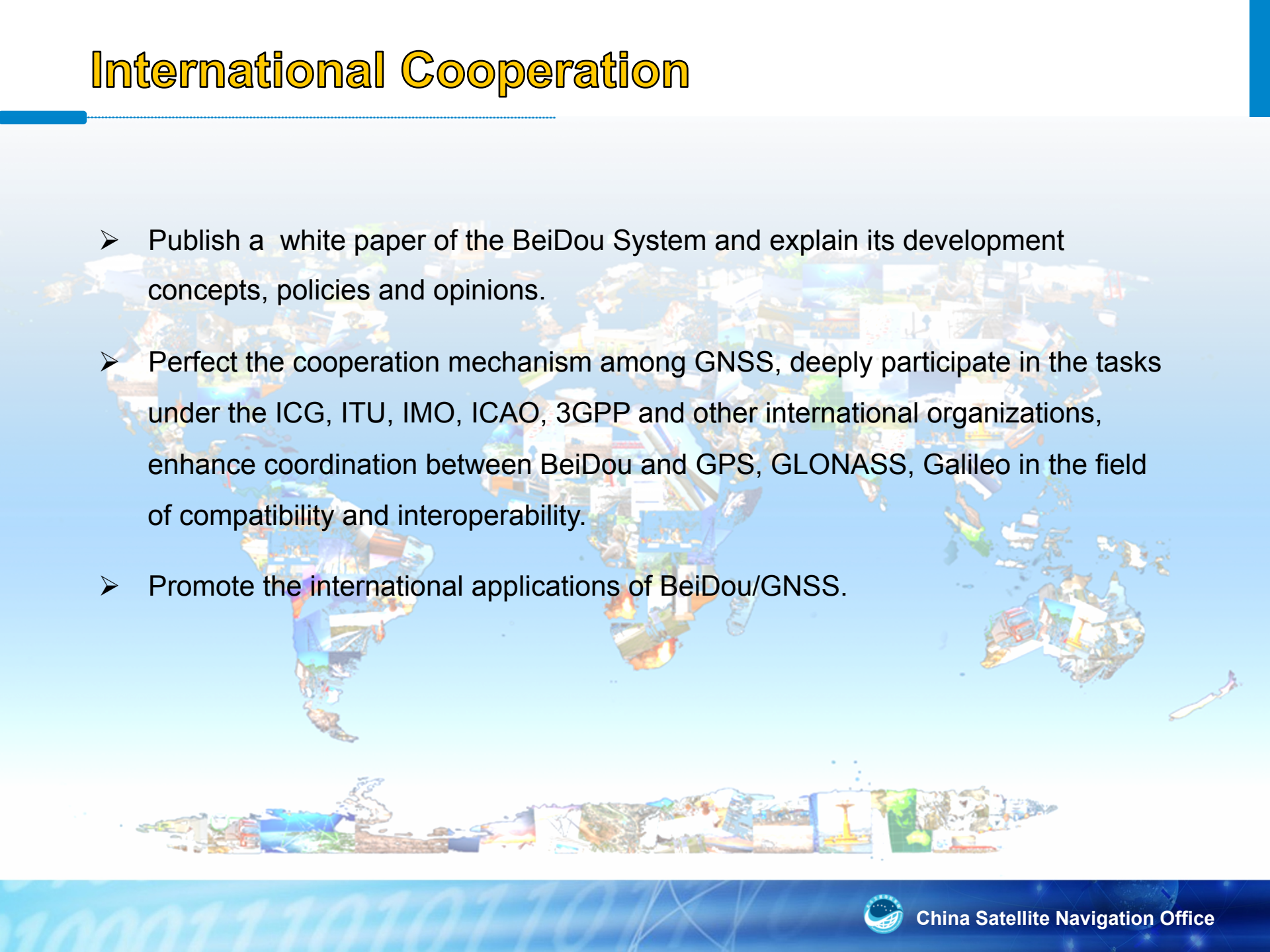


Application Promotion

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- Carry out all-round R&D and industrialization of new generation BDS/GNSS fundamental products, to promote mass market applications amount to ten-million units.
 - Bring GNSS to full play in the integration procedure between industrialization and IT applications, push forward applications.
 - Comprehensively implement industrial policies and action plans on standardization and IPR protection. Improve the industry chain of satellite navigation.



International Cooperation

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- Publish a white paper of the BeiDou System and explain its development concepts, policies and opinions.
 - Perfect the cooperation mechanism among GNSS, deeply participate in the tasks under the ICG, ITU, IMO, ICAO, 3GPP and other international organizations, enhance coordination between BeiDou and GPS, GLONASS, Galileo in the field of compatibility and interoperability.
 - Promote the international applications of BeiDou/GNSS.



SUMMARY

- The BeiDou System has been providing stable services to the Asia-Pacific region, successfully launched the first next-generation BeiDou satellite to verify new technologies, deploy the BeiDou augmentation system from all-round scale, and steadily push forward the BDS construction.
- The BDS applications market has been preliminarily fostered, expanding from the typical industries to mass market, and the application industry is under fast development.
- The BeiDou system deeply promotes cooperation among GNSS, and keeps strengthening international exchanges. "BeiDou" becomes one of the Chinese brands.



A satellite with large solar panels and a gold-colored body is shown in orbit above the Earth. The Earth's surface, with blue oceans and white clouds, is visible in the background. The text "THANKS FOR YOUR ATTENTION!" is written in large, bold, yellow capital letters across the center of the image.

THANKS FOR YOUR ATTENTION !

China Satellite Navigation Office

<http://en.beidou.gov.cn>