



International Committee on
Global Navigation Satellite Systems

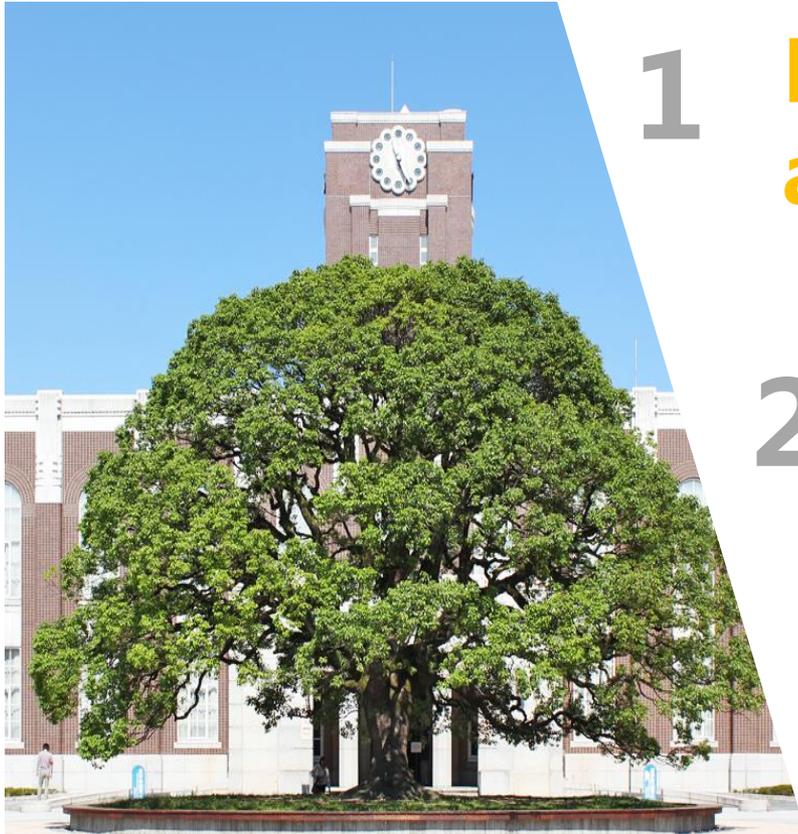
BDS/GNSS Applications Activities along the Belt and Road



Dr. Jun Shen (shenjun@beidou.gov.cn)

**Deputy Director, International Cooperation Center
China Satellite Navigation Office**





1

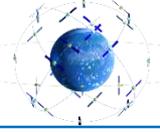
**Development of BDS
and the Belt & Road**

2

**GNSS Applications
along the Belt &
Road**

3

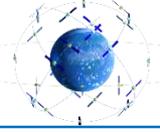
Prospects



Background of the Belt & Road

- More than two thousands years ago the diligent and courageous Chinese people, together with people in Eurasia, explored and opened up several routes of trade and cultural exchanges which linked the major civilizations of Asia, Europe and Africa, collectively called the Silk Road by later generations.
- For thousands of years, the Silk Road Spirit - "peace and cooperation, openness and inclusiveness, mutual learning and mutual benefit" - has been passed from generation to generation, promoted the progress of human civilization, and contributed greatly to the prosperity and development of the countries along the Silk Road.
 - Symbolizing communication and cooperation between the East and the West, the Silk Road Spirit is a historic and cultural heritage shared by all countries around the world.

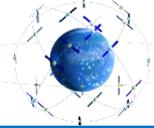




Background of the Belt & Road

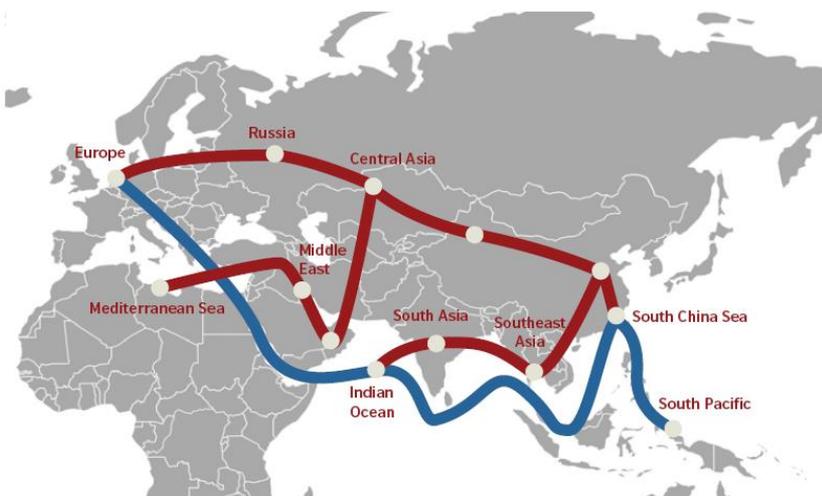
- When Chinese President Xi Jinping visited Central Asia and Southeast Asia in September and October of 2013, he raised the initiative of jointly building *the Silk Road Economic Belt and the 21st-Century Maritime Silk Road* (together they are referred to as the Belt and Road), which have attracted close attention from all over the world.
- The Chinese government has drafted and published “the Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road” to promote the implementation of the Initiative, instill vigor and vitality into the ancient Silk Road, connect Asian, European and African countries more closely and promote mutually beneficial cooperation to a new high and in new forms.





The Concept of the Belt and Road

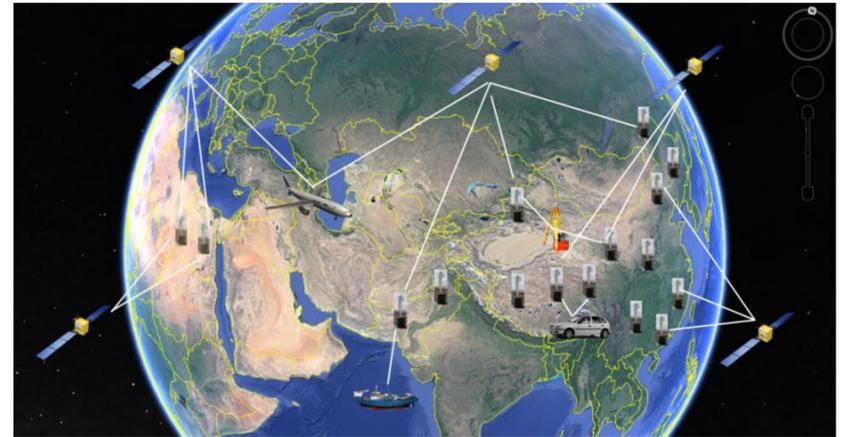
- The Belt and Road should be jointly built through consultation to meet the interests of all. It can help promote the economic prosperity of the countries along the Belt and Road and regional economic cooperation, strengthen exchanges and mutual learning between different civilizations, and promote world peace and development. It is a great undertaking that will benefit people around the world.
- The Belt and Road area spreads over 60 countries, which accounts for 60% of the world's population and a collective GDP equivalent to 33% of the world's wealth.

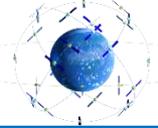


The **blue route** is the “21st Century Maritime Silk Road”, and the **red routes** are the “Silk Road Economic Belt”

Benefits of GNSS for the Belt and Road Region

- Satellite navigation is an important area for the countries along the Belt and Road to carry out scientific cooperation.
 - BDS/GNSS are helpful for safeguarding regional security, resource development, economic, scientific and technical advancement.
 - Through collaboration in the field of satellite navigation, the countries can
 - enhance technical capabilities
 - improve applications level
 - enrich talents pool
 - promote economic and social development
 - benefit people' s livelihoods
- Especially,
- Cooperation on GNSS applications
 - Jointly study application solutions of BDS/GNSS, and local applications in combination with the state demands, especially in the key areas of oil and gas development, transportation, precision agriculture, smart tourism, etc.
 - Upgrade industrial capacity
 - Carry out joint R&D of fundamental and terminal products, standards, etc. Set up industrial park and alliance, to facilitate technical advancement and industrial development.





BDS Development Roadmap

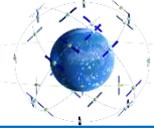
- As one of the four major GNSS providers, the establishment of BeiDou Navigation Satellite System (BDS) has been steadily pushed forward, in line with a “three-step” roadmap, and has paved a development path, as world-oriented, region-highlighted, with its own features.
- BDS currently provides PNT + SMS services for the Asia-Pacific region.

The 1st step: 1994~2000, provide regional active services

The 2nd step: 2004~2012, provide regional passive services

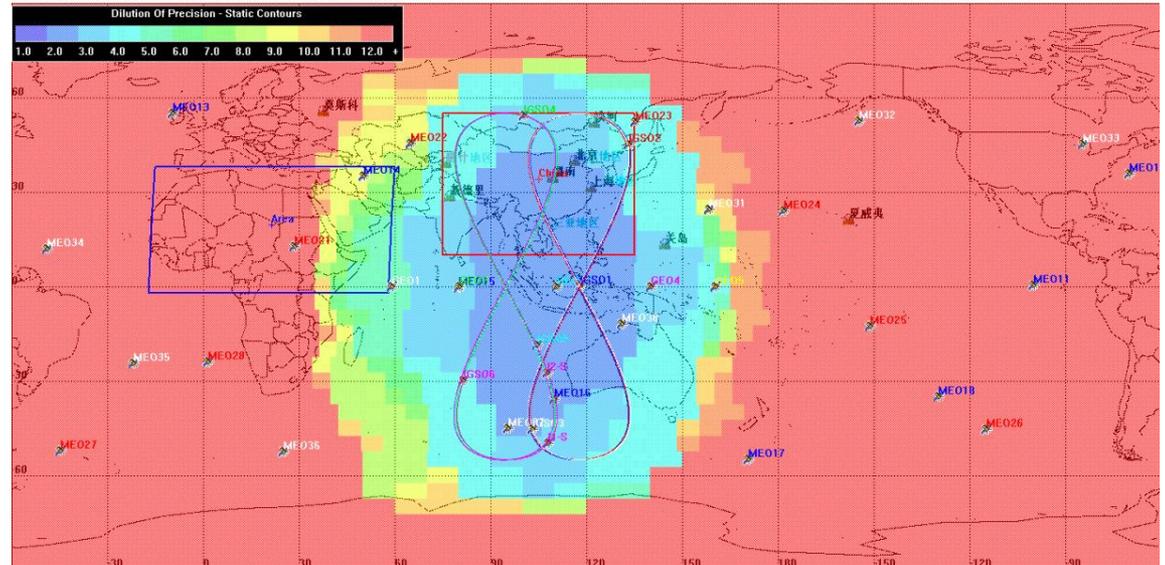
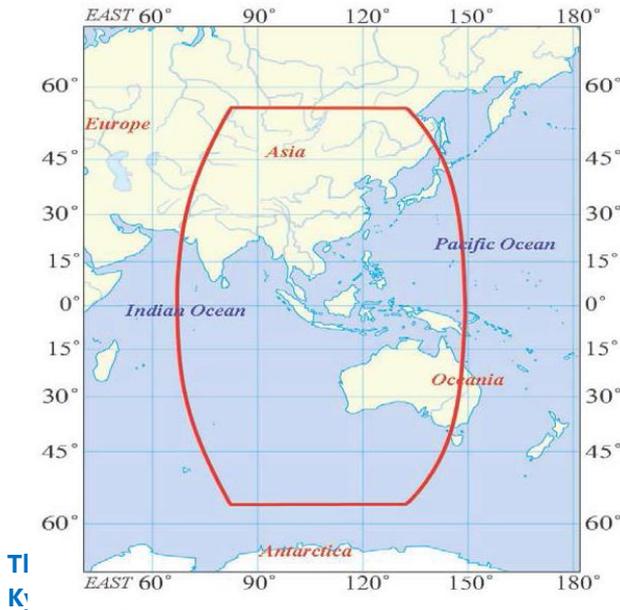
The 3rd step: provide global passive services by 2020

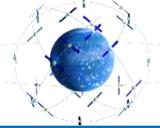




BDS Regional Services

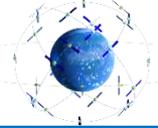
- Since provision of regional services by the end of 2012, BDS maintains continuous and stable operation, with the performance being improved
- With the current space constellation of 13 operational satellites, BD-2 positioning accuracy in the service area ($55^{\circ}\text{S}\sim 55^{\circ}\text{N}$, $70^{\circ}\text{E}\sim 150^{\circ}\text{E}$) meets the specification as better than 10m, and current measurement of nominal positioning accuracy is superior to 8 meters.
- It currently covers almost 30 countries or nearly 2.7 billion people in the countries along the Land and Maritime Silk Roads.





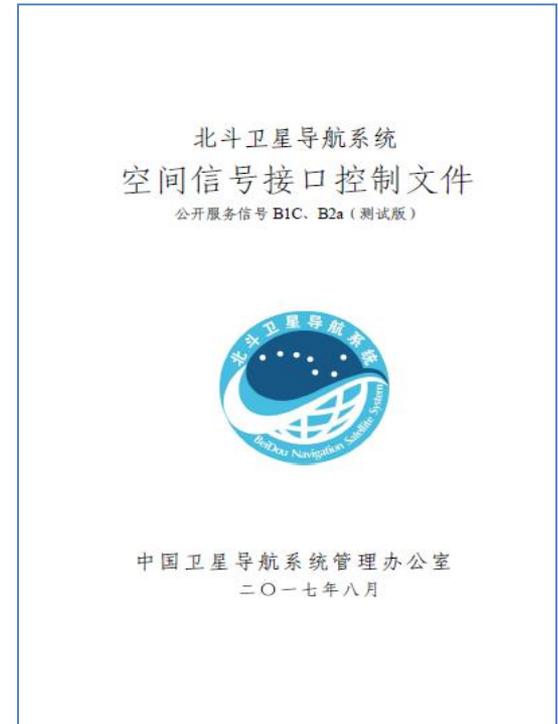
- Between 2015-2106, five new-generation BDS satellites have been successfully launched, which have adopted advanced signal structure, crosslink and other new technologies.
- The tests and verifications of the BD-3 system have been completed. The status of the BD-3 satellites has been solidified, and achieved breakthroughs on the core system technologies in a comprehensive approach.

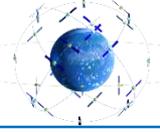




Development of BDS

- On November 5th, 2017, the first 2 BD-3 MEO satellites were successfully launched.
- The BD-3 satellites are equipped with two new civil signals, B1C and B2a, with optimized performance.
- The Interface Control Document for B1C and B2a (Beta version) has been released, and the official version will be released in 2018.

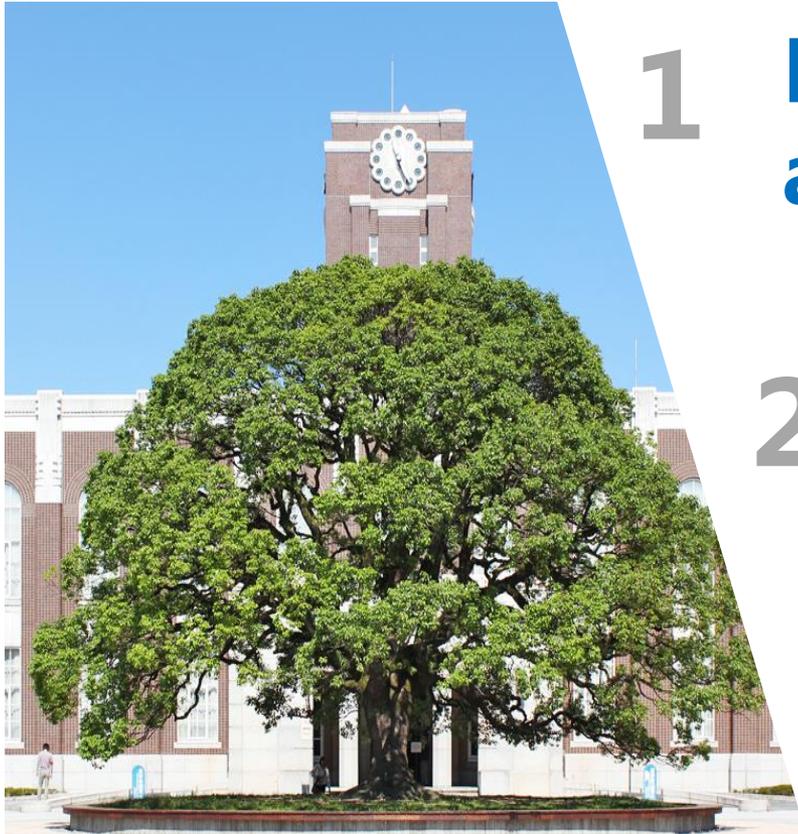




Development of BDS

- The BD-3 system will include a nominal 30-satellite space constellation.
- The BD-3 satellites have also adopted the higher-performance rubidium atomic clock with stability of E^{-14} and hydrogen atomic clock with stability of E^{-15} .
- By utilizing new technologies, the signal-in-space (SIS) accuracy will be superior to 0.5m, the position accuracy will reach 2.5m to 5m.
- Further enhancement of the basic services, such as Satellite-Based Augmentation System (SBAS) and Search and Rescue(SAR) services will be developed according to international standards.





1

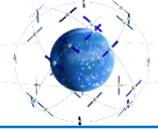
**Development of BDS
and the Belt & Road**

2

**GNSS Applications
along the Belt &
Road**

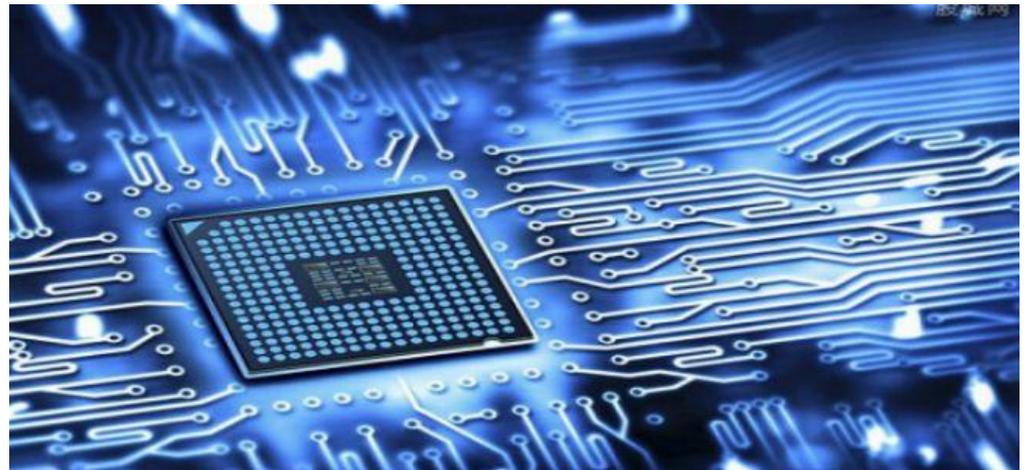
3

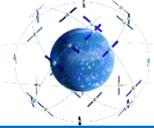
Prospects



Fundamental Products Provide Tailored Services

- Independent, self-controlled intellectual property rights on the fundamental BDS products have been achieved.
- By the joint ecological cooperation of industrial giants and searching for the industrial and user needs, BDS has presented the advantages on products and services. With the release of the first Chinese in-house developed “meter-level fast positioning BeiDou chip”, BDS applications start to embrace the era of meter-level positioning.





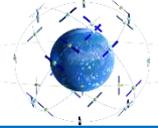
Fundamental Products Provide Tailored Services

- ❑ The domestic sales volume of BDS navigation chips and modules has exceeded 50 million pieces, and that of high-precision surveying boards and navigation antenna take 30% and 90% of market shares respectively.
- ❑ The products have also accessed to the markets of over 70 countries and regions, over 30 of which are along the B&R.



- ❑ BDS can offer positioning, navigation and timing services to those nations in terms of cross-border transportation, construction of infrastructure, fishing management, customs clearance, and modern agriculture, etc.

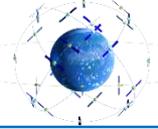




BDS/GNSS applications

- So far, GNSS applications have made achievements and progressively enhanced in a spectrum of industries and fields, such as agriculture, forestry, fishery, police equipment and disaster prevention and relief.
- By 2020, the sales volume of satellite navigation industry in China will surpass RMB 400 billion, in which BDS will take RMB 240 billion to RMB 320 billion of market shares.



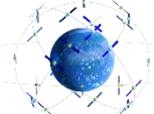


China-Russia GNSS Cooperation



- Under the framework of the Chinese-Russian Committee on Important Projects of Strategic Cooperation in the field of Satellite Navigation, 7 cooperation projects, including the Service Platform of Chinese-Russian Satellite Navigation Monitoring and Assessment, Joint Demonstrations on BeiDou and GLONASS-based Cross-border Transporters and Joint Design Center of Chinese-Russian Navigation Chips, were launched.
- The countries are pushing forward new cooperation on satellite-based augmentation system and education and training in the field of satellite navigation.



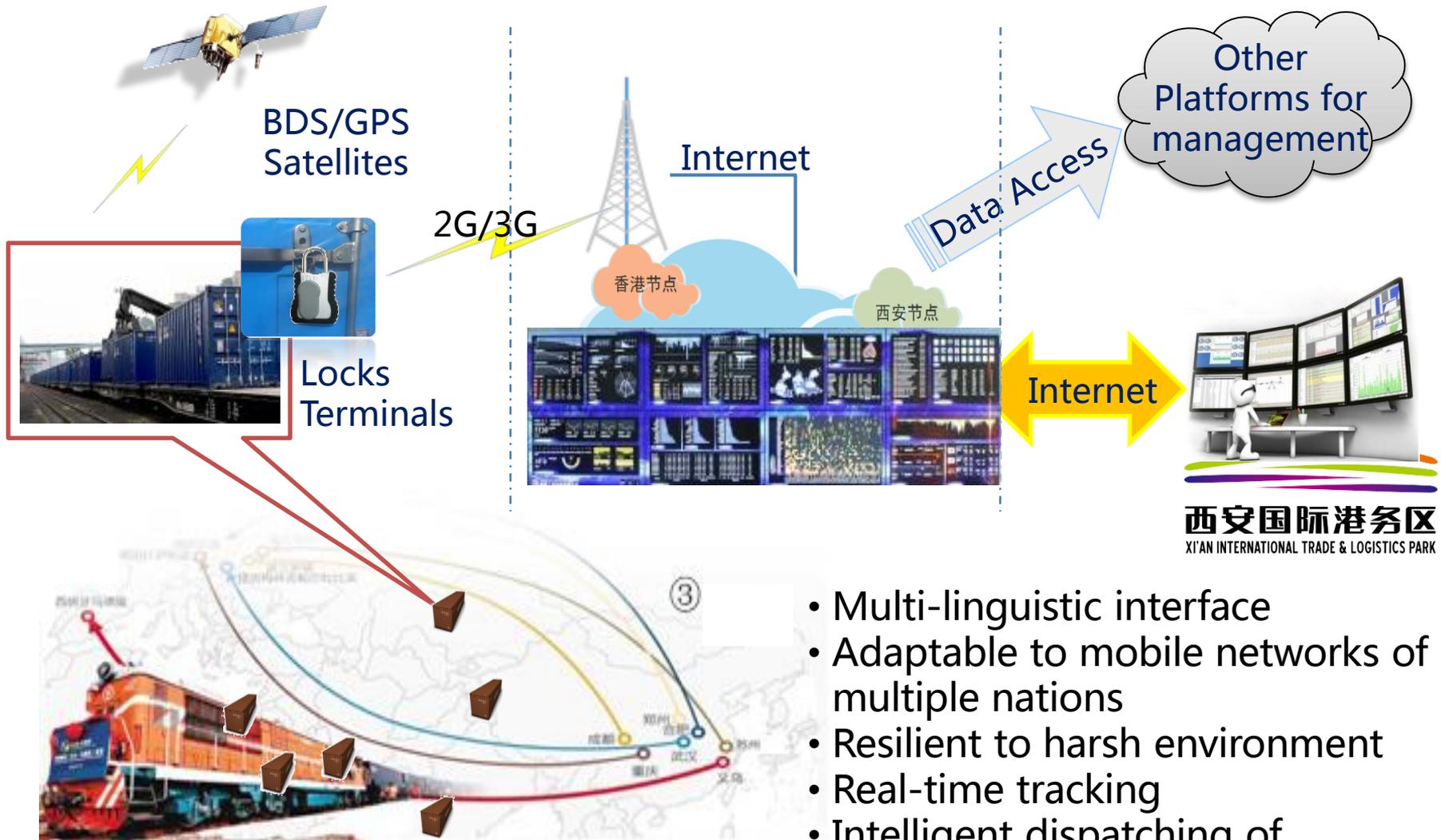


China-Europe Railway Express (CR Express)

- CR Express has effectively enhanced the transport links between China and countries in Asia and Europe, and gradually become a viable alternative to sea and air transport.
- The first China-Europe freight train route was launched in July 2013, and about 5000 trains have been dispatched so far. 3/4 of mainland areas can enjoy rail freight services to 108 cities in 20 foreign countries.
- Demands for location based services
 - Tracking logistics that cross the borders, and upgrade transparency
 - Improve the efficiency and security of transportation
 - Provide technical tools for better dispatching containers
 - Offer the third-party monitoring data, to solve dispute
 - Strengthen the capabilities and competitiveness of related logistics providers of cargo transportation and distribution
 - Provide data to support door-to-door delivery
 - Analyze the data and provide improvement proposals for enterprises



China-Europe Railway Express (CR Express)



- Multi-linguistic interface
- Adaptable to mobile networks of multiple nations
- Resilient to harsh environment
- Real-time tracking
- Intelligent dispatching of containers

Main Specifications:

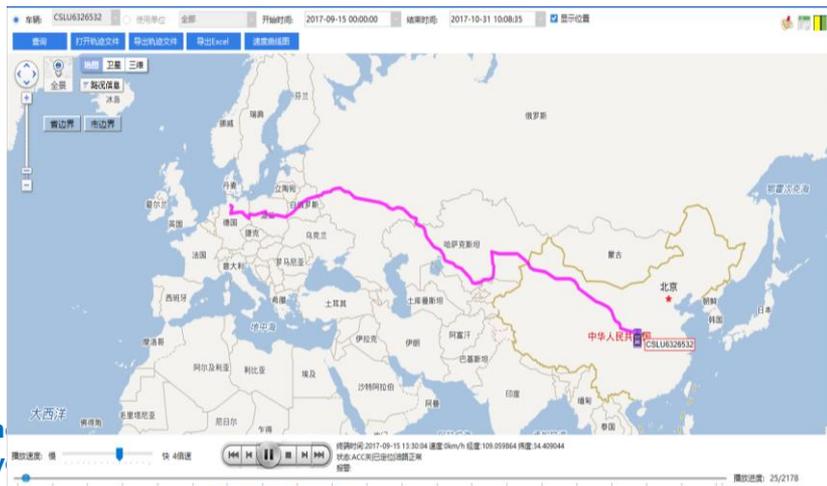
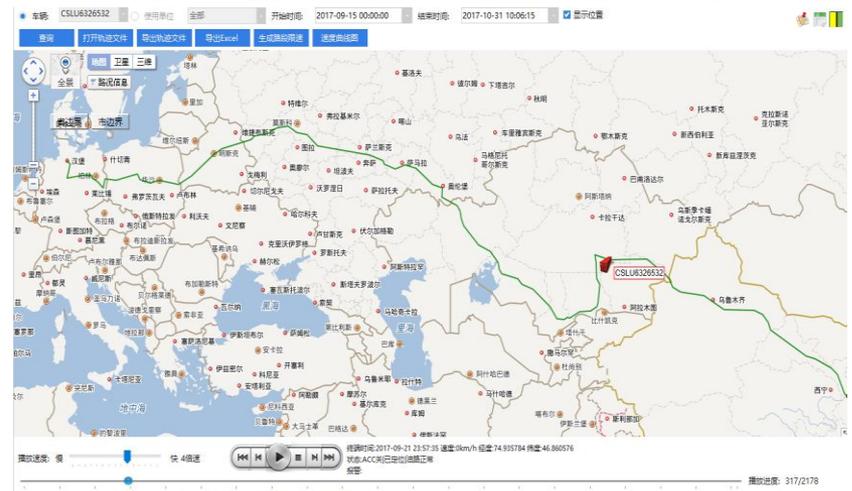
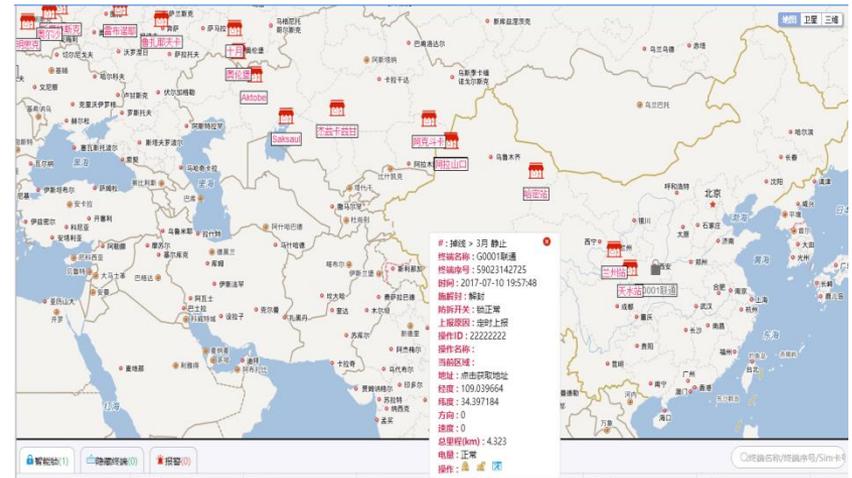
- Automatically switching between multiple communication systems
- Adaptable to mobile networks in more than 200 countries
- Customized receiving antenna
- Controllable remote unlocking method
- Long-term power supply (up to 50 days)

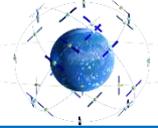




Applications of Aerospace BDCloud Platform

- It is expected that there will be over 100,000 installations of BDS/GNSS terminals for the CR Express project, and to generate revenue of over 10 billion RMB.
- All stations' info and real-time status can be viewed from users' terminals.
- Current routes:
Xi'an, China – Kazakhstan – Russia – Belarus – Poland – Germany

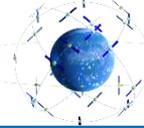




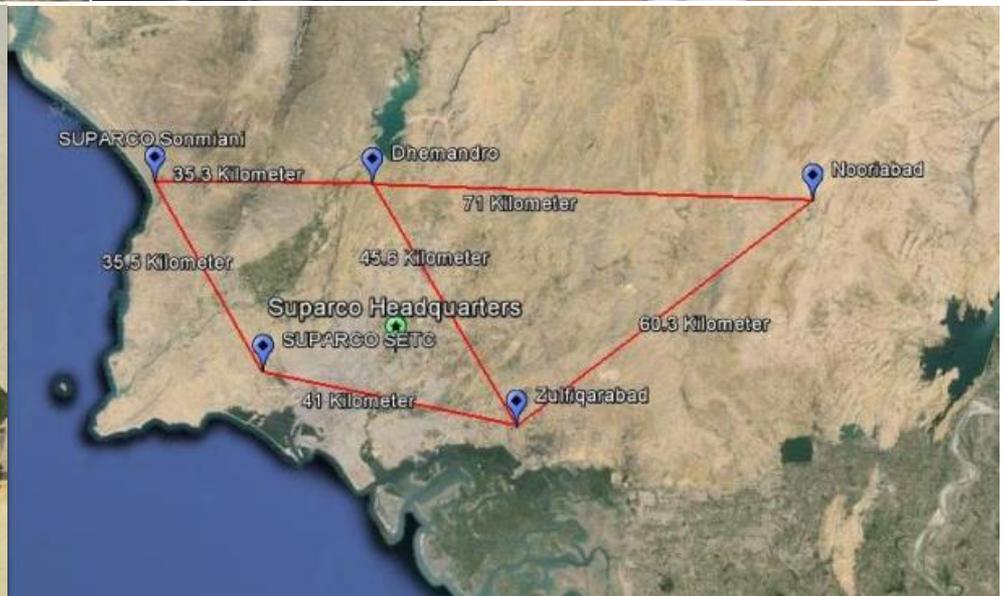
BDS services along the Belt & Road

- The applications of BDS/GNSS have been welcomed in overseas countries. Comprehensive cooperation with Russia, Pakistan, Thailand, ASEAN, Arab League and other countries has been carried out.



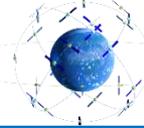


Pakistan National Positioning Service Network Project (Phase I)



The 19th Meeting of the ICG Providers' Forum
Kyoto, Japan, 03/12/2017





Pakistan National Positioning Service Network Project (Phase I)



BDS/GNSS Application Promotion Activities

- The applications of BDS have been welcomed in overseas countries.
- Comprehensive cooperation with Pakistan, Thailand, United Arab Emirates, ASEAN, Arab League and other countries has been carried out.

第一届中阿北斗合作论坛·中国上海
الدورة الأولى لممنتدى التعاون الصيني لبيدو
The First China-Arab States BDS Cooperation Forum, Shanghai, China

24.05.2017



19th Meeting of the Providers' Forum
Kyoto, Japan, 03/12/2017



China Satellite Navigation Office



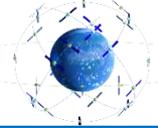
BDS/GNSS Symposium in Saudi Arabia (2017/4)



19th Meeting of the Providers' Forum
Kyoto, Japan, 03/12/2017



China Satellite Navigation Office



BDS/GNSS Applications in Kuwait

- The Kuwait National Bank, with the height of 300 meters, used the BeiDou high-precision measurement devices, during the construction process.

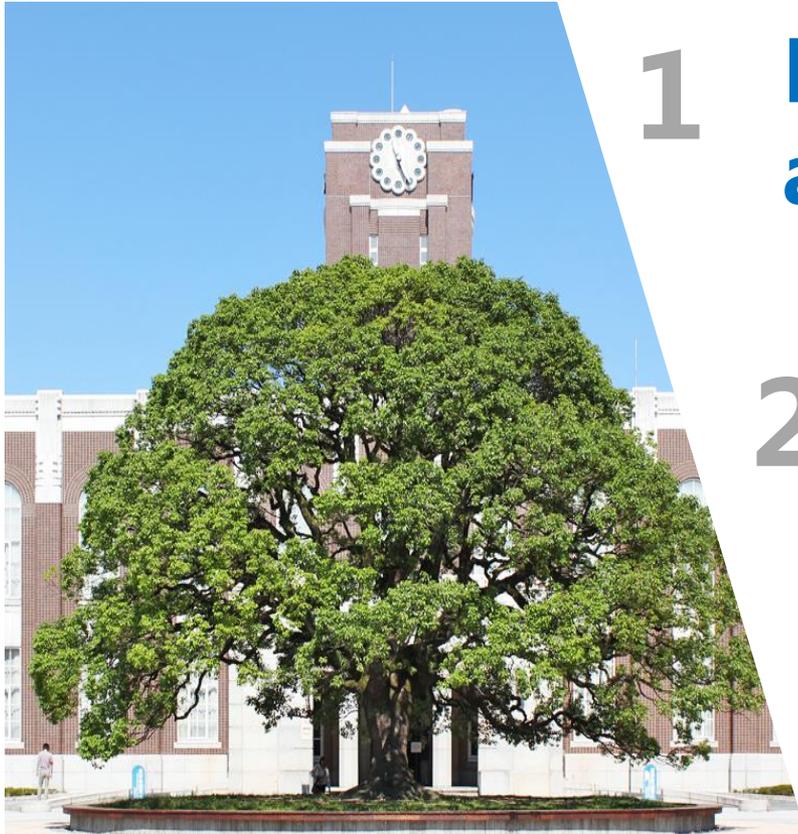




BDS Applications on Precision Agriculture

(Courtesy of BDNST)





1

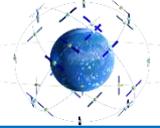
**Development of BDS
and the Belt & Road**

2

**GNSS Applications
along the Belt &
Road**

3

Prospects



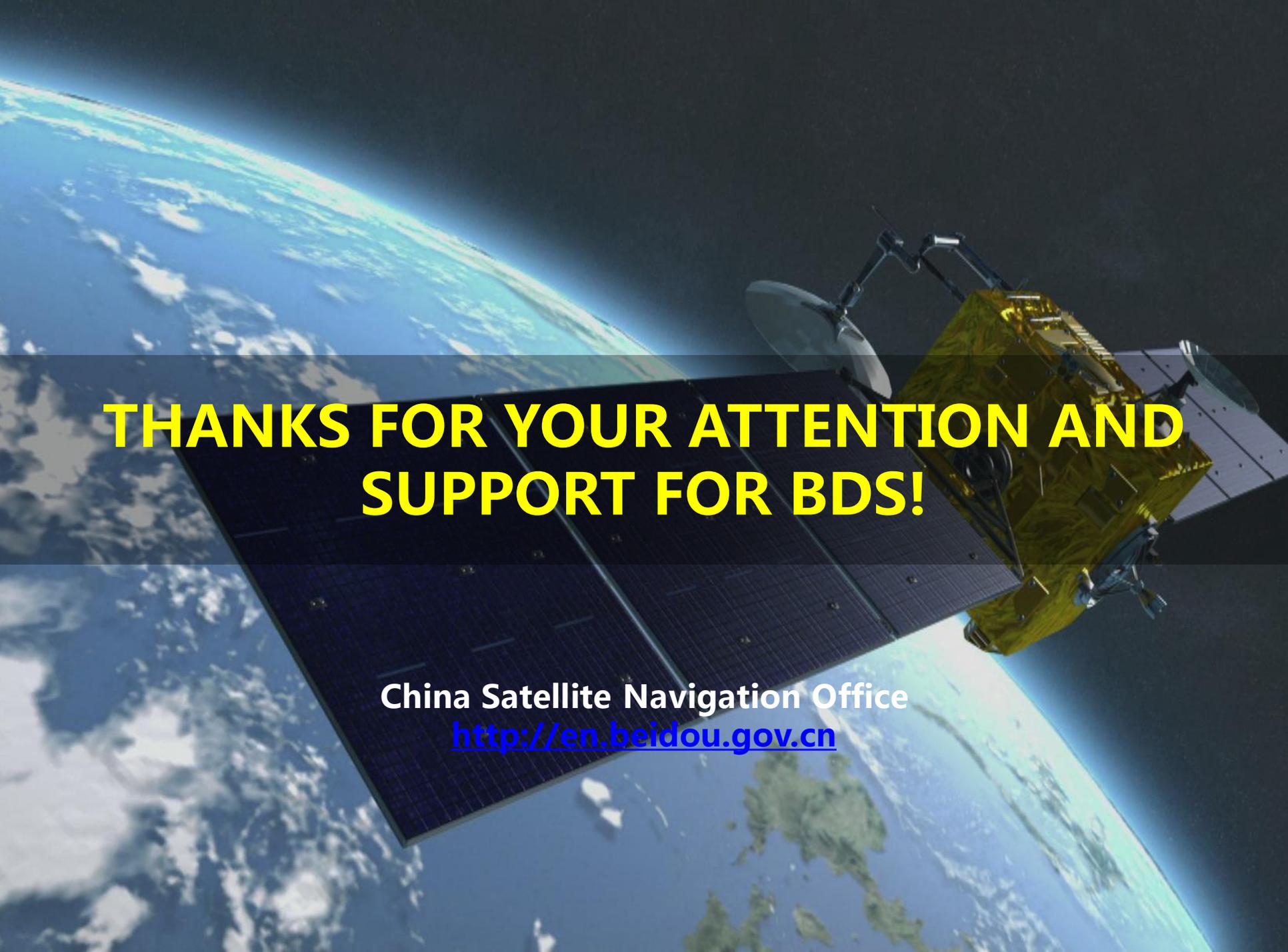
Prospects

- BDS will guarantee continuous and stable operation, steady improvement on the service performance with meeting promised standards as a prerequisite, and gradually obtain the worldwide service capability.
- With the construction and development of the global system, relentless possibilities will appear in the period of connecting everything.
- In the foreseeable future, BDS will provide services for the Belt and Road area, and will eventually be anywhere, positioning everything and connecting all!





- Before the end of 2018, 18 BD-3 satellites will be launched, to serve the countries along the “Belt and Road” .
- Promoted by the initiative of mass creative business and innovation and “the Belt and Road ” initiative, BDS-related industries will embrace the period of golden opportunities.
- *We call for all the GNSS provider’ s participation to work together to provide high-quality PNT services for the people in the Belt and Road region as well as the whole world.*

A satellite with a gold-colored body and a large black solar panel is shown in orbit above the Earth. The satellite has several antennas and instruments. The Earth's surface is visible below, showing blue oceans, white clouds, and green landmasses. A semi-transparent dark grey horizontal band is overlaid across the middle of the image, containing the main text.

**THANKS FOR YOUR ATTENTION AND
SUPPORT FOR BDS!**

China Satellite Navigation Office
<http://en.beidou.gov.cn>