

Update on the BeiDou Navigation Satellite System (BDS)

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System Construction



System Construction BDS enters into global era

- A total of 19 BDS-3 satellites have been successfully launched between 2017/11-2018/11 (with 2 IGSO satellites were launched in 2019), and
- The BDS preliminary system was declared operational on December 27, 2018.



2017.11.5



2018.1.12



2018.2.12



2018.3.30



2018.7.29



2018.8.25



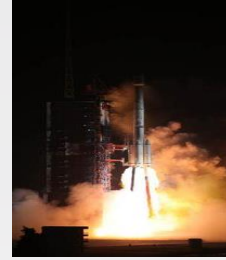
2018.9.19



2018.10.15



2018.11.1



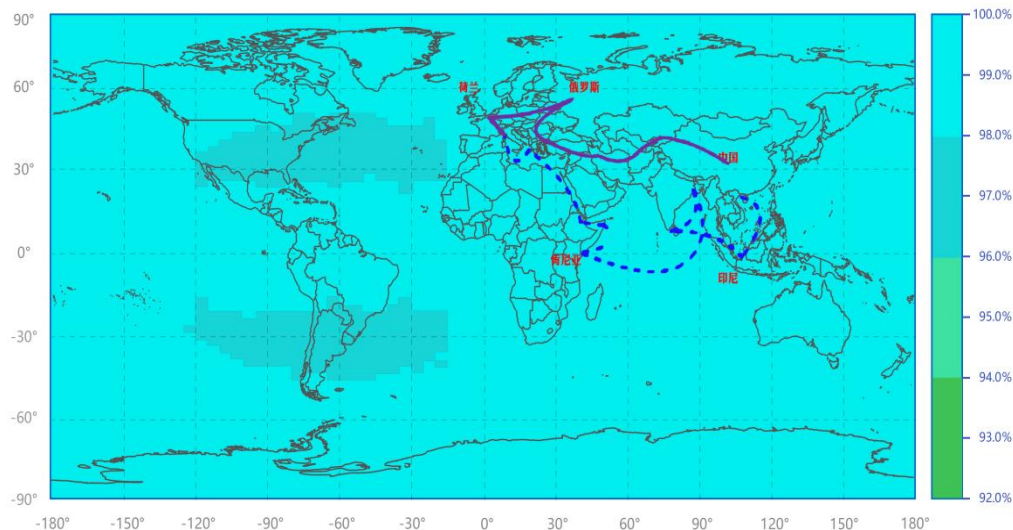
2018.11.19



System Construction

The overall BDS performance (B1I and B3I signals)

北斗系统服务可用性 (PDOP \leq 6、高度角5度)

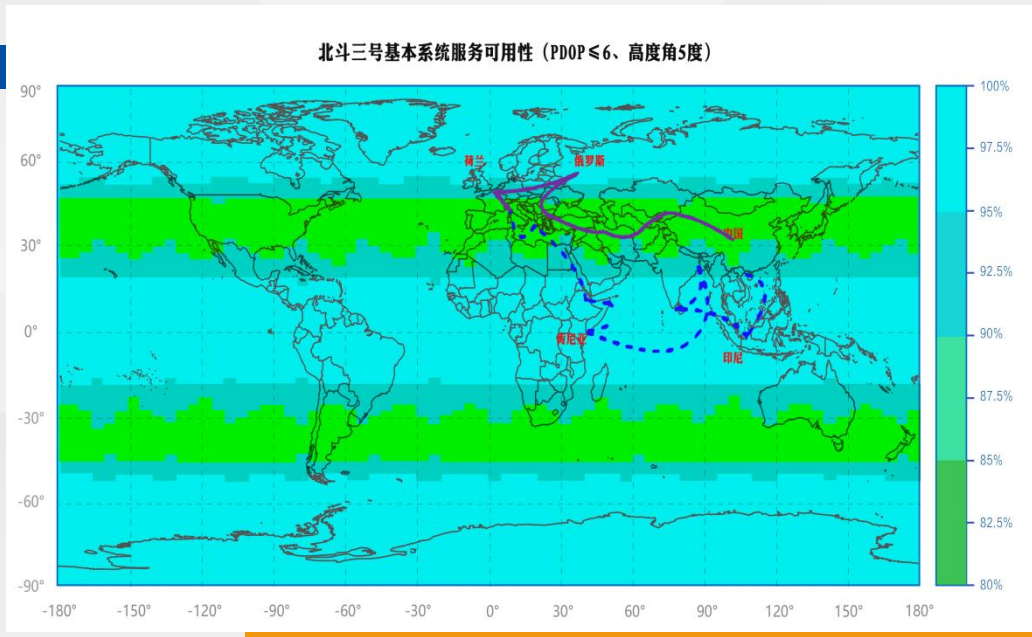


- System service availability can reach over **99%** in most regions worldwide
- Horizontally positioning accuracy is about 3.6m, vertical positioning accuracy is about 6.6m, velocity accuracy is about 0.05m/s and timing accuracy is 9.8ns (95%)
- The service accuracy in Asia-Pacific region has increased by about **30%** and the service availability has increased by about **5%**.



System Construction

The Overall BDS Performance (B1C and B2a Signals)

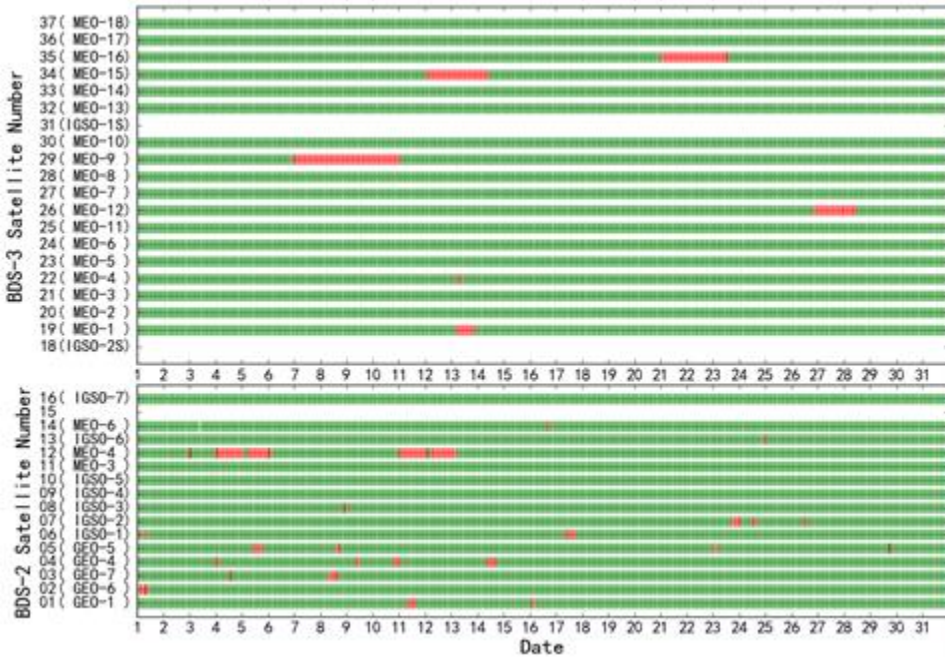


📶 The global service availability is **over 87%**

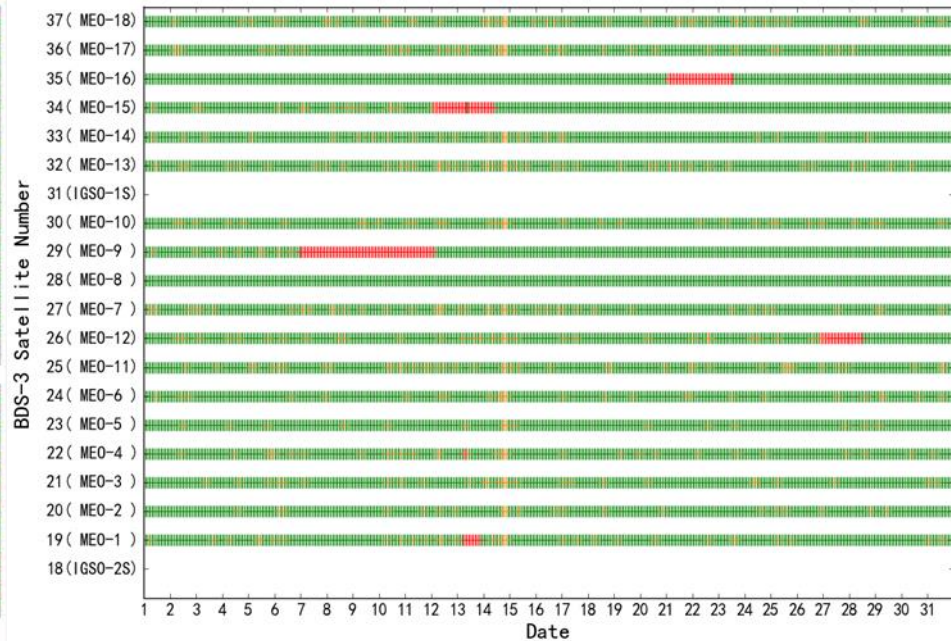
📶 Horizontal positioning accuracy is about 2.4m, vertical positioning accuracy is about 4.3m, velocity accuracy is about 0.06m/s and timing accuracy is 19.9ns (95%)



System Construction – The BDS Signal Availability in August 2019



B1I/B3I

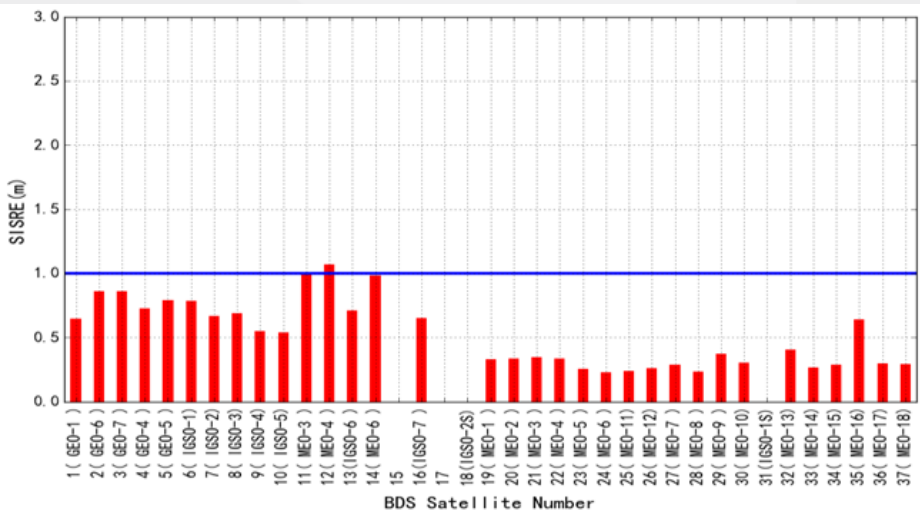


B1C/B2a

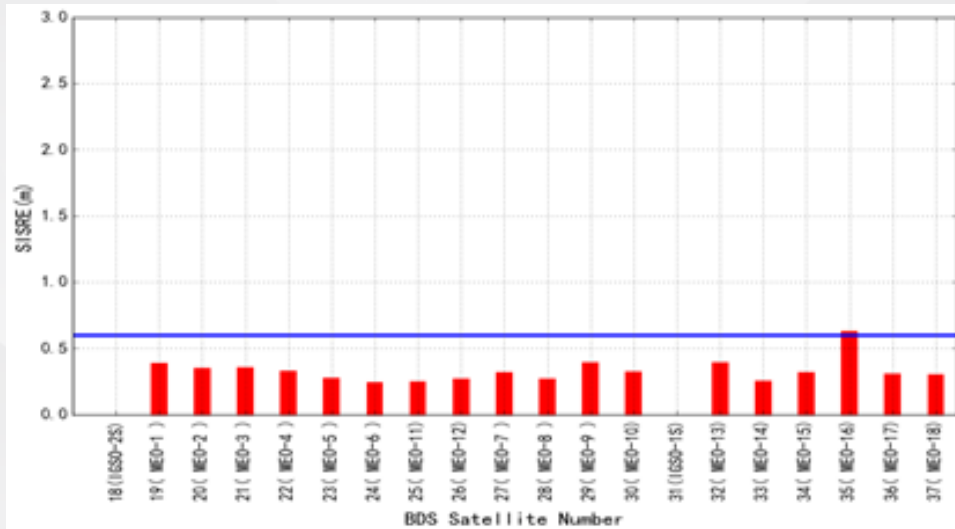




System Construction – The BDS SISRE in August 2019



B1I/B3I



B1C/B2a





System Construction

Upcoming Launch Plan



6-8 BDS-3 satellites



2-4 BDS-3 satellites



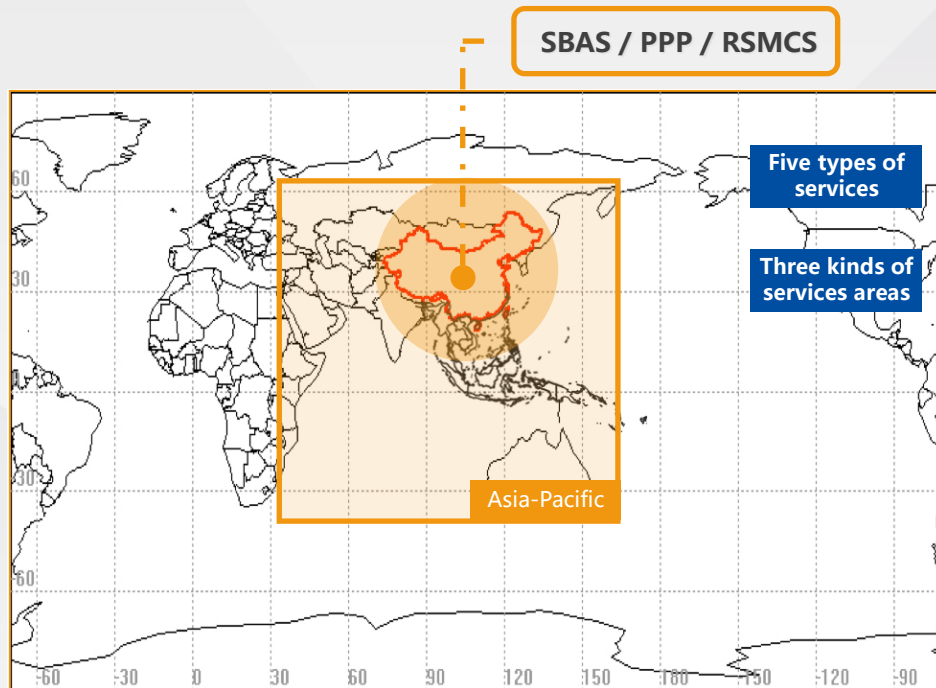
Full Operational Capability



System Construction

Five Types of the BDS-3 Services

Type of service		Signal frequency	Satellite
Basic navigation services		B1I, B3I, B1C, B2a	3IGSO+24MEO
		B1I, B3I	3GEO
SBAS		BDSBAS-B1C, BDSBAS-B2a	3GEO
Short-message communication services	Regional	L (uplink) S (downlink)	3GEO
	Global	L (uplink)	14MEO
B2b (downlink)		3IGSO+24MEO	
International search and rescue services		UHF (uplink)	6MEO
		B2b (downlink)	3IGSO+24MEO
Precise Point Positioning service		B2b	3GEO



Navigation, Positioning and Timing / GSMCS / SAR



System Construction

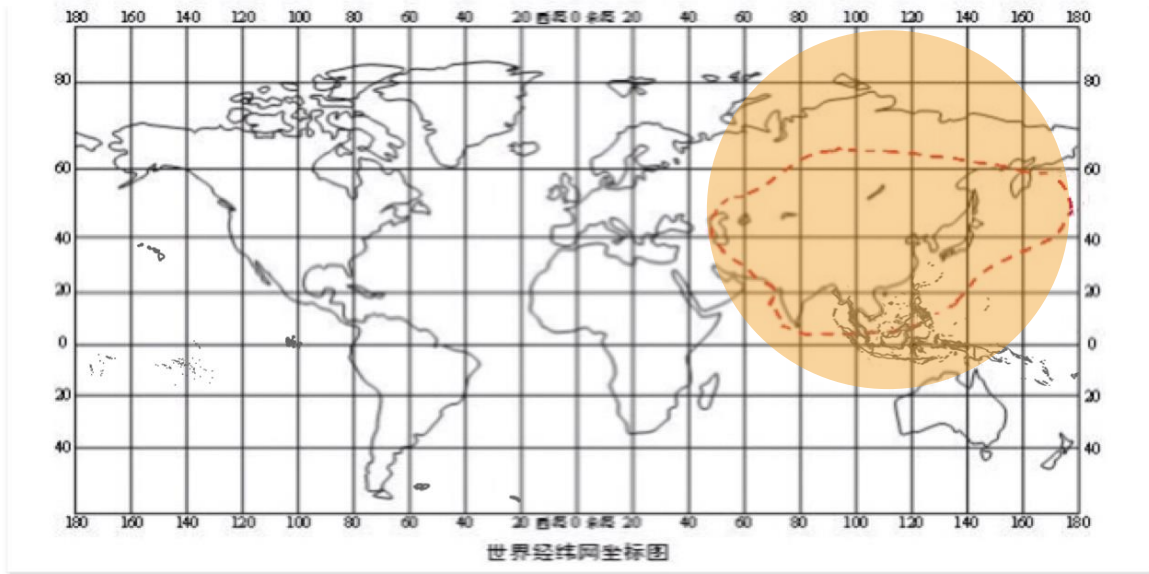
Short-message Communication Services (Regional)

Service Planning:

- 3 GEO satellites
- Serve China and the surrounding regions
- System capacity increased by 10 times

Development Progress:

1 GEO satellite has been launched and the in-orbit tests are currently being conducted





System Construction

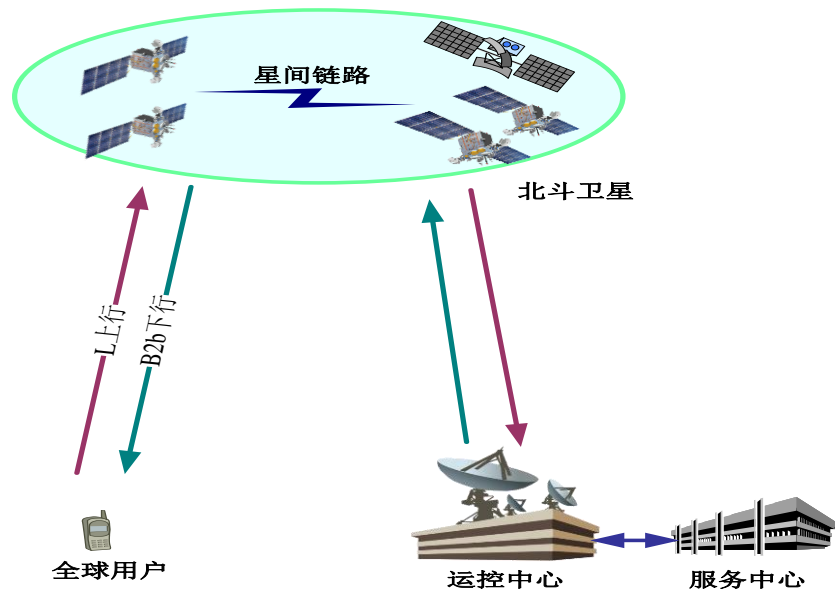
Short-message Communication Services (Global)

Service Planning:

- 14 MEO satellites
- Global coverage
- 40 Chinese characters per message

Development Progress:

8 MEO satellites with the short-message communication payload have been launched and the in-orbit technology experiments are currently being conducted





System Construction

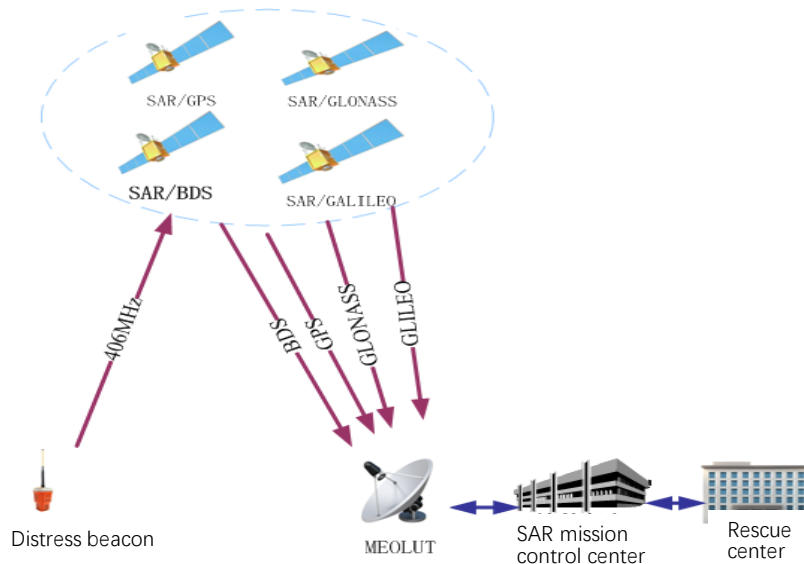
International Search and Rescue Services

Service Planning:

- Follow international standards
- 6 MEO satellites with the SAR payload
- Return-links

Development Progress:

4 MEO satellites with the SAR payload have been launched and the in-orbit tests are currently being conducted





System Construction

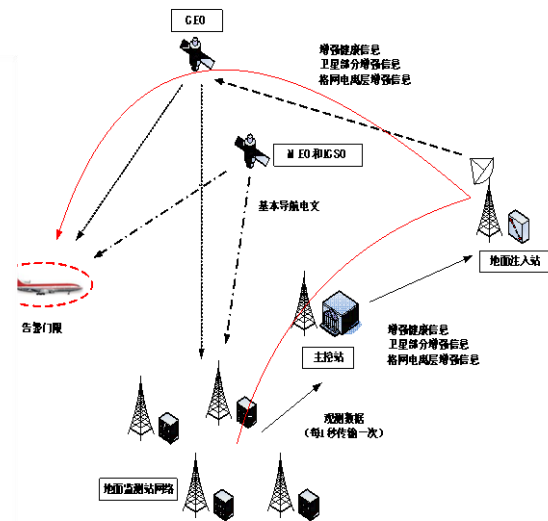
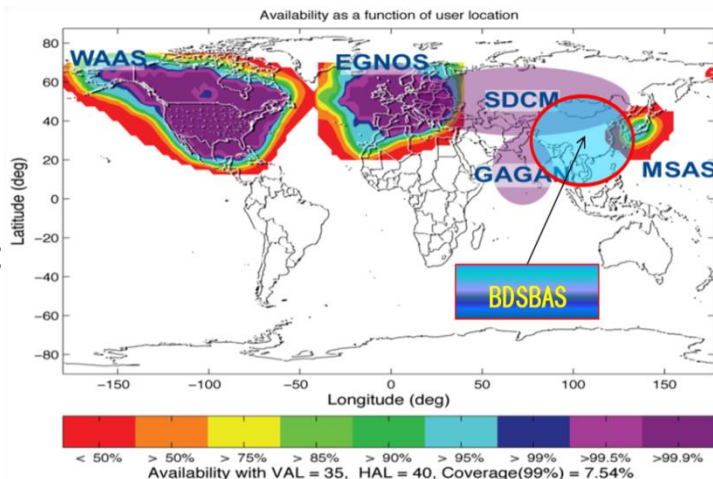
Satellite-based Augmentation Services

Service Planning:

- 3 GEO satellites
- Follow ICAO standards
- Serve China and the surrounding regions

Development Progress:

1 GEO satellite has been launched and the broadcast tests are being conducted.








System Construction

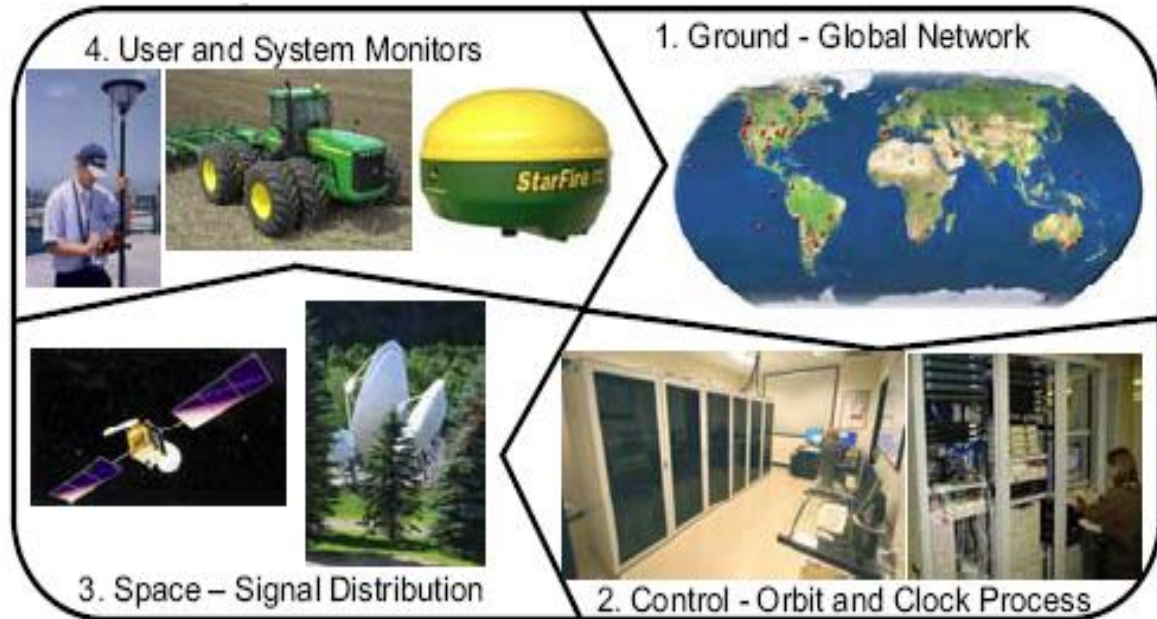
Precise Point Positioning Services

Service Planning:

-  3 GEO satellites
-  Serve China and the surrounding regions
-  Positioning precision: dynamic decimeter-level, static centimeter-level

Development Progress:

1 GEO satellite has been launched and the in-orbit experiments are currently being conducted

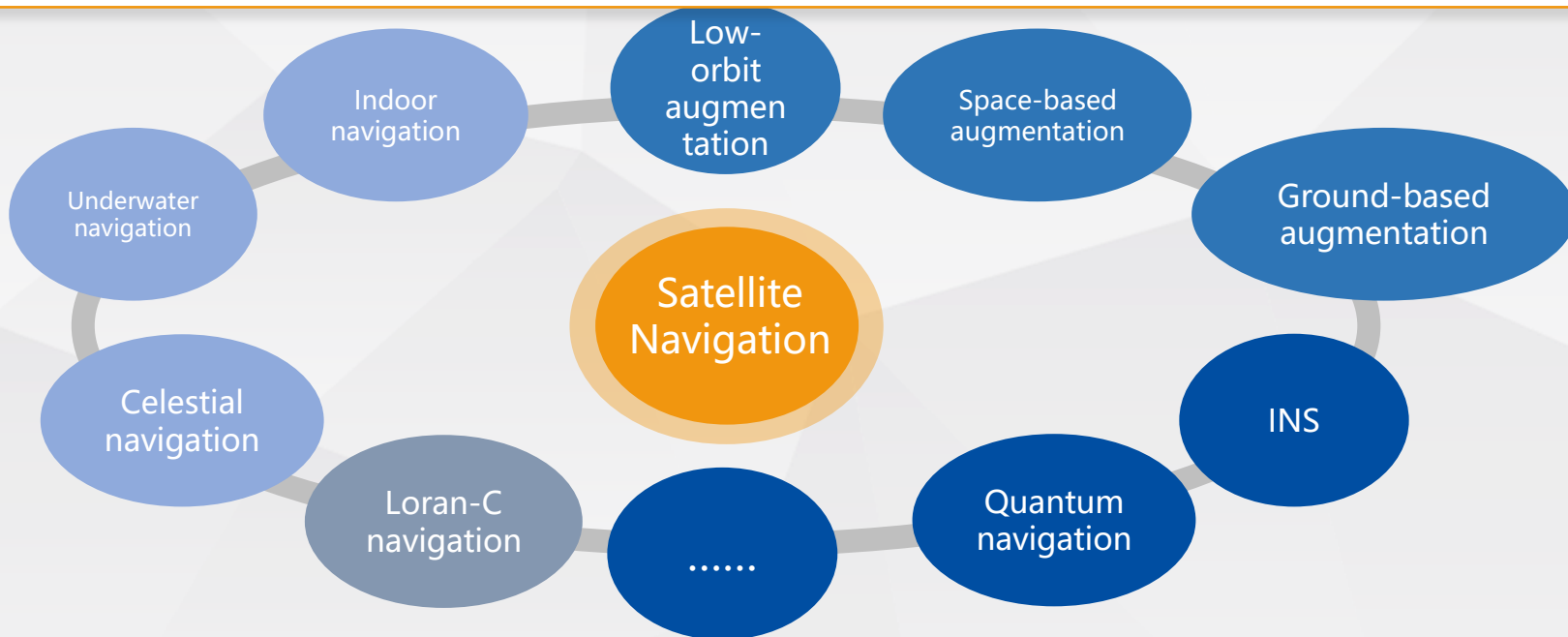




System Construction

Future Development

A comprehensive national PNT system will be completed by 2035



A large, stylized blue logo consisting of the numbers '0' and '2' in a bold, rounded font. The '0' is a simple circle, and the '2' has a curved top and a horizontal base.

Application Promotion



Application Promotion

The BDS Industry



The BDS
contribution to
core industrial
output value

2018
RMB

300+ billion

80%

2020
RMB

400+ billion



Applications Promotion

Fundamental products

The sales of domestically made BDS-enabled chips reached over 80 million, with the domestic high-precision board chips and antennas being sold to over 100 countries and regions, and accounting for 30% and 90% of the domestic market respectively.





Applications Promotion

Industrial and Regional Applications

- The BDS-enabled products have been widely used in traffic & transportation, public security, agriculture, forestry and fishing, hydrologic monitoring, weather forecast, communications system, generation dispatch and disaster response & relief, as well as national core infrastructure, which has greatly increased economic and social benefits.





Applications Promotion

Applications in traffic and transportation

- The world's largest dynamic monitoring system for operational vehicles has been built
- **6.2 million** operational vehicles
- **30,000** postal and delivery vehicles
- **80,000** buses
- **Over 3,200** inland waterway navigation facilities
- **Over 2,900** marine navigation facilities





Applications Promotion

Applications in agriculture, forestry and fishing



Serve over 50,000 agricultural equipment



Precision farming output has increased by 5%



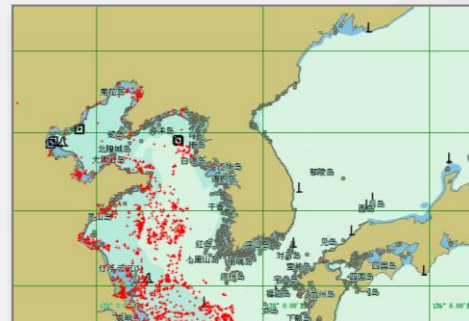
Income growth of RMB 60-90 per Mu per peasant household



Positioning & short-message communication function help prevent forest fires



Over 70,000 networked boats has rescued over 10,000 people

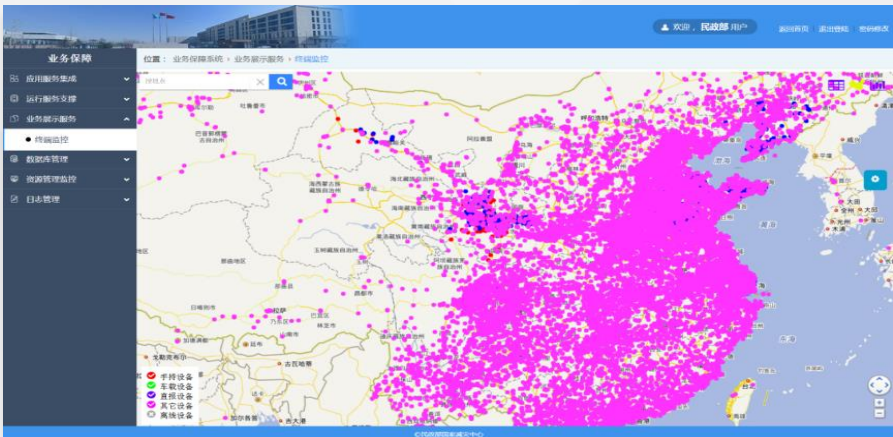




Applications Promotion

Applications in Disaster Response and Relief

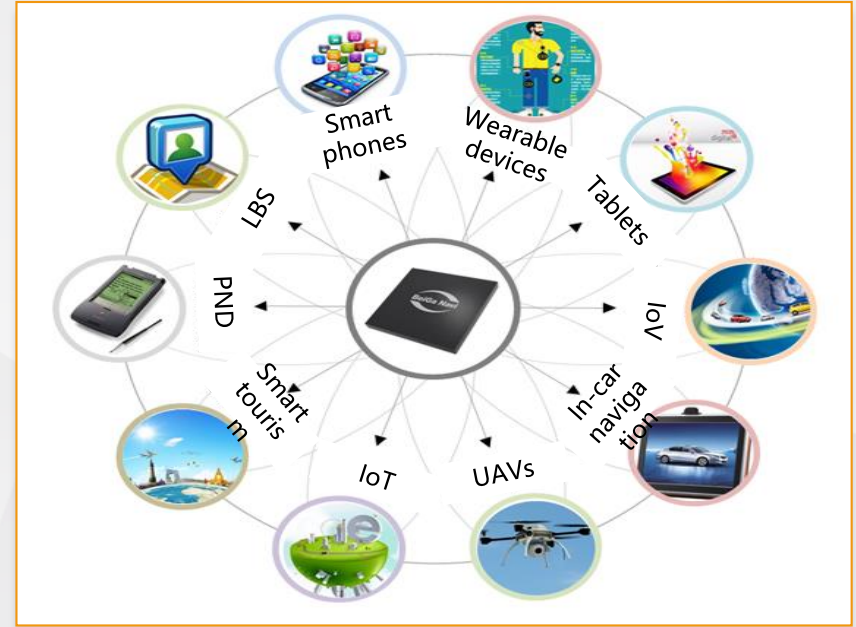
- 6 levels of business applications
- Over 45,000 BDS terminals have been promoted
- Relevant disaster response information has been reported
- Disaster relief materials management has been improved





Applications Promotion

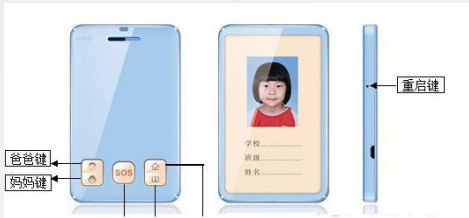
Mass Market Applications





Applications Promotion




Mass Market Applications







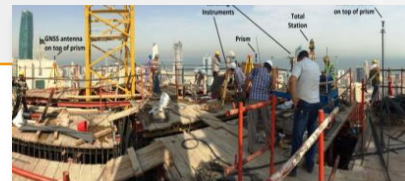


Application and Promotion

The International BDS Applications

-  Land rights confirmation in Indonesia
-  Building construction deformation monitoring in Kuwait
-  Homeland surveying and mapping in Uganda
-  Agriculture in Myanmar
-  Marine piling in Maldives
-  Construction of piling in Singapore

-  Land rights confirmation in Laos
-  UAVs in Cambodia
-  Postal services and ecommerce in Uganda
-  Timing service in Pakistan airports
-  Electricity patrolling and checking in Russia





03

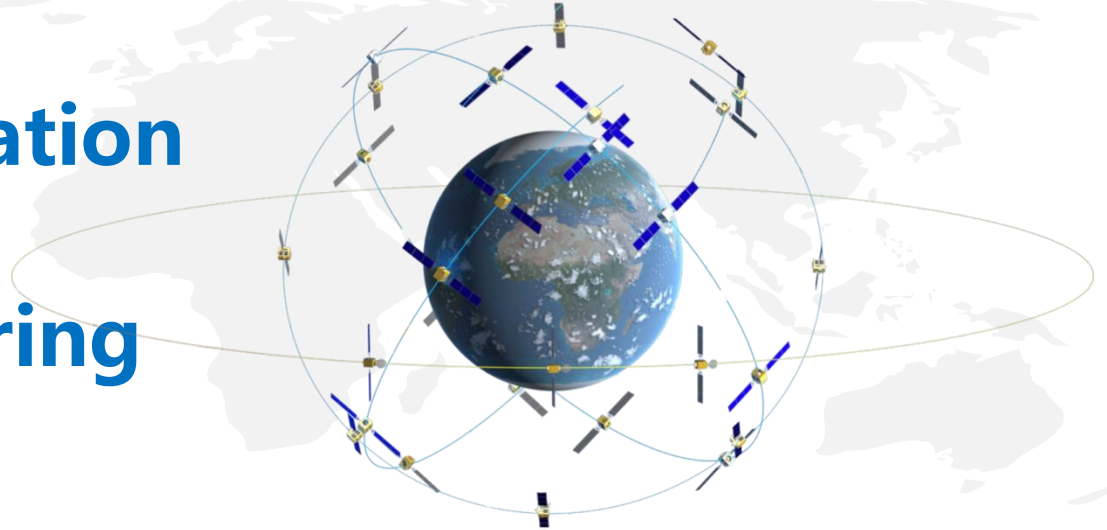
International Cooperation



International Cooperation

Open Cooperation

Resource Sharing





International Cooperation

The UN International Committee on Global Navigation Satellite Systems (ICG)

13th Meeting of the International Committee on Global Navigation Satellite Systems





China Satellite Navigation Office

International Cooperation

The China-US Cooperation

- Three plenary meetings of the China-US Cooperation have been held. Working groups have been set up to discuss related topics.
- “The Joint Statement on Civil Signal Compatibility and Interoperability between GPS and BDS” was signed in November 2017





International Cooperation

The China-Russia Cooperation





International Cooperation

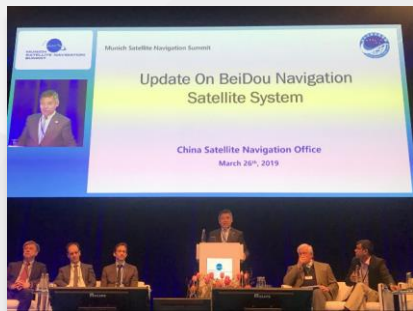
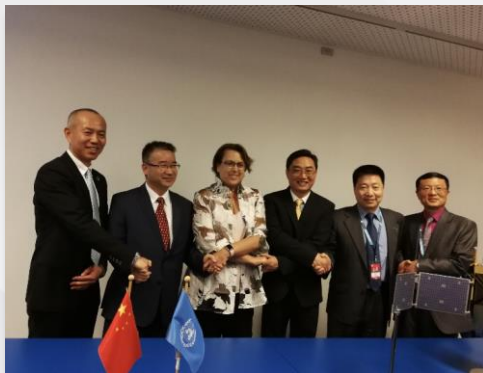
The China-Arab States BDS Cooperation





International Cooperation

International conferences





International Cooperation

International standards



A GLOBAL INITIATIVE



国际民航组织

COSPAS-SARSAT.INT
INTERNATIONAL SATELLITE SYSTEM FOR SEARCH AND RESCUE
406TM DISTRESS ALERTING SERVICE



International
Electrotechnical
Commission



International Cooperation

The China Satellite Navigation Conference (CSNC)



共享北斗
交流合作
第一届中国卫星导航学术年会·北京

设计北斗的未来

第二届中国卫星导航学术年会·上海

走向应用的北斗

第三届中国卫星导航学术年会·广州

北斗应用——

机遇与挑战

第四届中国卫星导航学术年会·武汉

北斗应用——

科技融合共享

第五届中国卫星导航学术年会·南京

开放融通共赢

第六届中国卫星导航学术年会·西安

感知·走向智能

第七届中国卫星导航学术年会·长沙

定位·万物互联

第八届中国卫星导航学术年会·上海

位置·增强时代

第九届中国卫星导航学术年会·哈尔滨

导航·遇见十年

第十届中国卫星导航学术年会·北京



Conclusion

Looking back on the past decade and looking into the new journey,

- During the past decade, BDS has gone global successfully, developed from struggling to keep up with its peers to matching its peers.
- In the next decade, BDS will play a more active role in serving mankind and the world and keep contributing wisdom and strength to the world with its stronger abilities and better-quality services.



Thank you.

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