

GLOBAL PPP (Precise Point Positioning) Technology

(Stefan Wei)

Abstract: The ability to determine precise positions has become a very basic and important function in the world today. GNSS satellites provide positioning services globally, allowing one to know where they are anywhere in the world. Positioning correction services improve the accuracy from meters to centimeters, and based on CORS, a single receiver is able to perform centimeter positioning accuracy within the network area. Based on Global PPP (Precise Point Positioning) Technology, we are able to achieve centimeter accuracy all everywhere in the world without any regional communication limitations.

Host: Good evening. Welcome to attend English GeoScience Café session 15. The topic of today is GLOBAL PPP (Precise Point Positioning) Technology Hi-RTP. The speaker is Mr. Stefan Wei, the marketing director for Hi-Target's international department

He graduated from China University of Geosciences and studied Land Resource Management. Hi-Target is a professional surveying equipment manufacturer and industry solution provider headquartered in Guangzhou, China. Since joining Hi-Target, Mr. Wei, worked as a technical engineer, product manager, before moving to the marketing side. He has attended many international exhibitions and conferences of the surveying and mapping industry. He is also in charge of the communication between Hi-Target and scientific organizations, such as ISPRS, FIG, AFLAG, etc. Mr. Wei has a strong belief that "Made in China" will lead the world.

Stefan Wei:

My presentation was comprised of two parts:

1. Global Precise Point Positioning Technology
2. A brief description of my work and my trips around the world.

Before introducing the new technology and the term Precise Point Positioning, I would like to mention that the first time I encountered this technology was in 2011. The importance of accuracy in GNSS positioning should be emphasized. PPP is a positioning technique that removes or models GNSS system errors to provide a high level of position accuracy from a single receiver. A PPP solution uses a network of global reference stations to do the job. Once the corrections are calculated, they are delivered to the end user via satellite or over the Internet. These corrections are used by the receiver, resulting in centimeter-level accuracy. Furthermore, let me tell you how Continuously Operating Reference Station (CORS) and Real Time Kinematics (RTK) work in place of the conventional base station used in differential GNSS positioning. RTK can provide swift positioning to cm level accuracy, significant in many industrial uses.



Fig. 1 Mr. Stefan Wei is giving talk (photo by Xu Lei)

Traditional Single station RTK & CORS 传统单基站和CORS系统

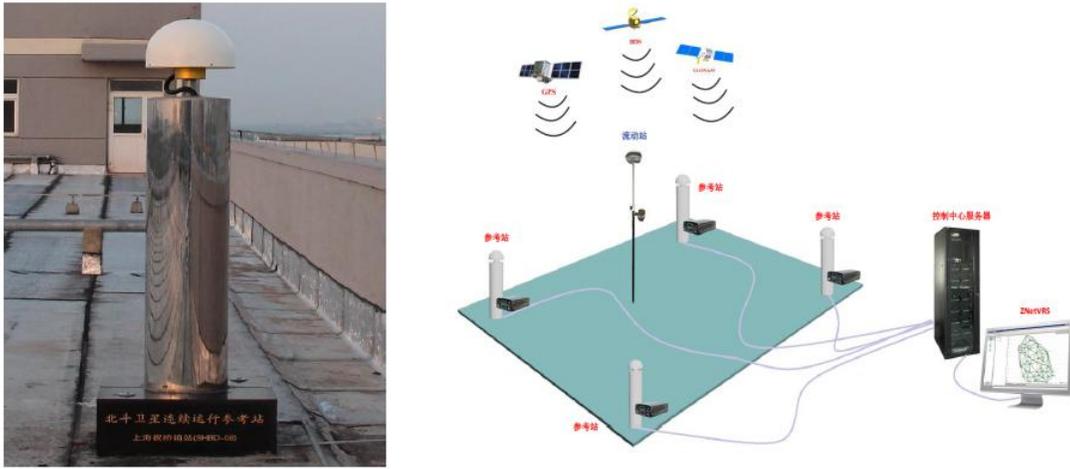


Fig. 2 Traditional Single station RTK & CORS

Now let us move on to the regional Satellite Based Augmentation System (SBAS) and learn how they work. SBAS comprises of geosynchronous satellites, which complement global navigation satellite systems (GNSS) to optimize the accuracy and availability of GNSS signals. Accuracy is enhanced through the transmission of wide-area corrections for GNSS range errors. Addition to this, there are existing SBAS systems in the world being operated by several countries. Europe has EGNOS covering Europe and possibly beyond. The USA has WAAS. Japan is covered by its MSAS. India has launched its own SBAS program, GAGAN to cover the Indian subcontinent and along with this, is the basic error sources in GNSS systems. Now categorize them into Ionospheric and Tropospheric Delays.

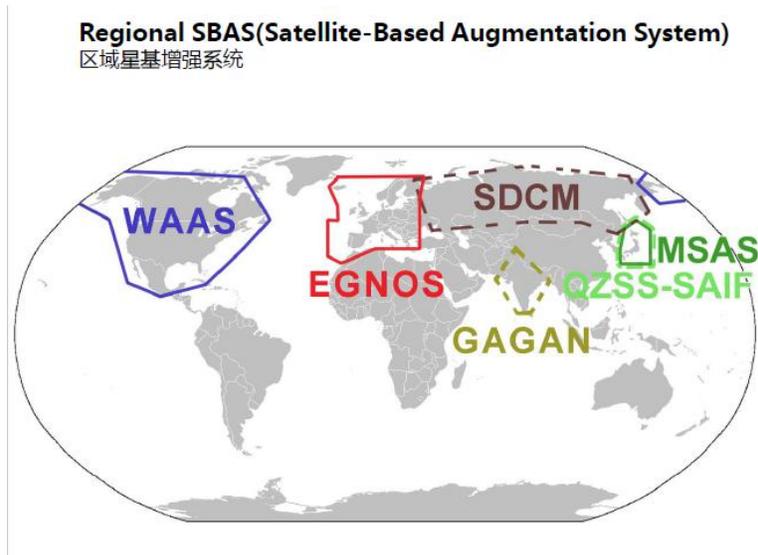


Fig. 3 Regional SBAS (Satellite-Based Augmentation System)

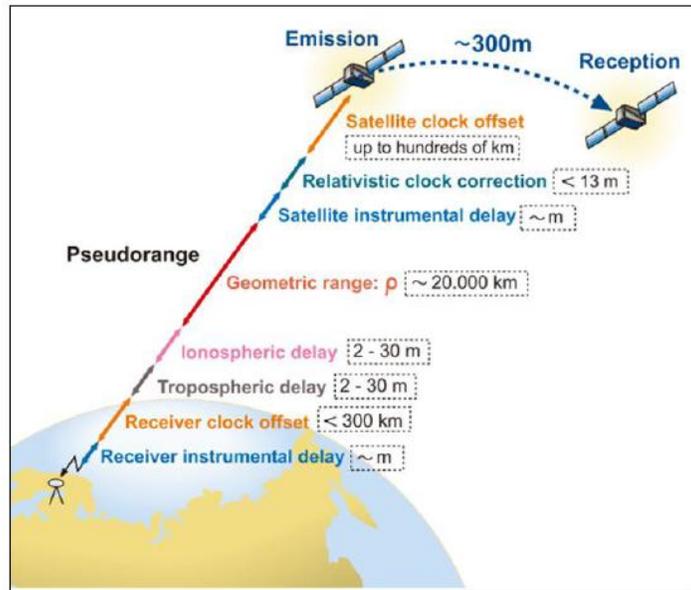


Fig.4 Pseudorange generation

I want to give you a flavor for Hi-RTP, a product of Hi-Target (Hi-Target Real Time Precise Positioning Service System) and briefly mention its capabilities and specifications. Followed by the map of 100 plus Global Reference Systems that Hi-Target has all developed around the world and share plans for increasing the number.

Hi-Target Real-Time Precise Positioning Service System (Hi-RTP)

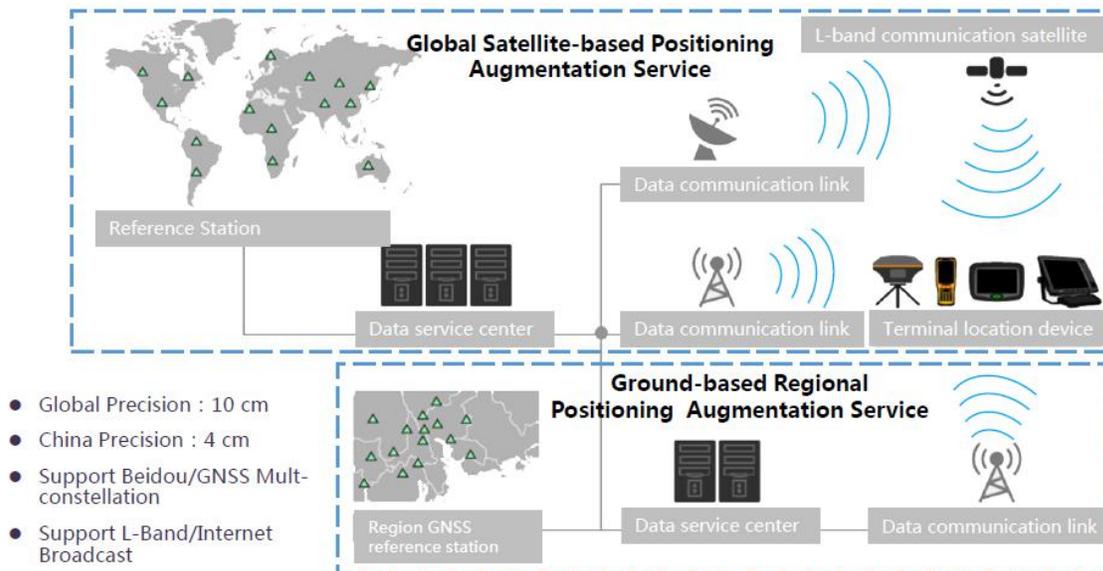


Fig. 5 Hi-Target Real-Time Precise Positioning Service System (Hi-RTP)

Global Reference Stations



Fig. 6 Global Reference Stations

And then, I'll make an introduction about the salient features of PPP technology such as Hi-RTP and other services provided by Hi-Target in general. From quality monitoring and service center of Hi-Target to Hi-RTP's 5-8 cm real time orbital accuracy, each service provided by the company and their applications is fruitful. This is a glimpse of the iRTK5 receiver and Fieldwork Software integrated Hi-RTP as well as the performance and test results of Hi-RTP globally. Incidentally, the improvements in the services and products are worth looking forward to in the future.

Different applications with different service subscription

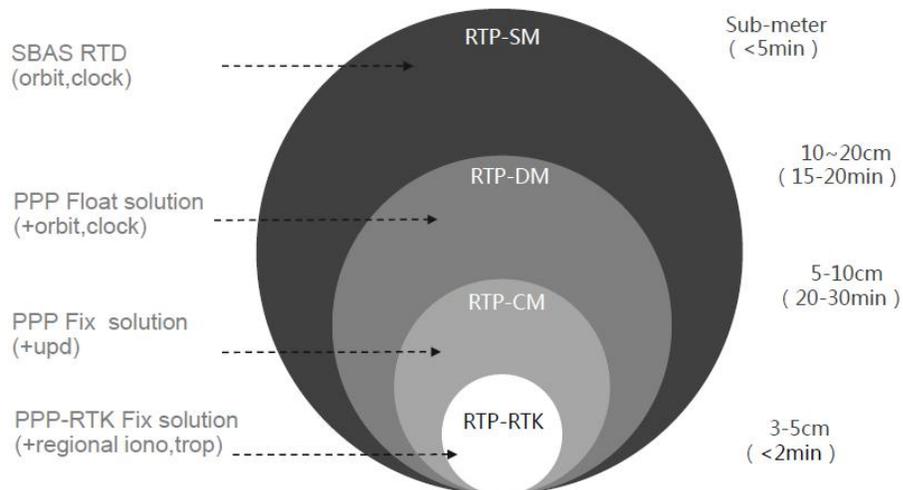


Fig. 7 Different applications with different service subscription

Hi-RTP Positioning Services Performance (Global)



Fig. 8 Hi-RTP Positioning Service Performance (Global)

Now I begin to share my personal experiences of travelling around the world since I started working for Hi-Target. I have travelled to 47 countries. However, it is sometimes stressful to travel quite often but meeting different people from all over the world gave me the knowledge and experience I could never achieve by being in one place. In addition, my travels helped me change my views and perceptions of certain places. In my point of view, knowing about different cultures and ethnicities enables one to see this world with a different perspective and teaches humility.



Fig. 9 Mr. Stefan Wei is sharing his personal experiences (photo by Xu Lei)

Let us turn to my most interesting trips and stories. When I first travelled to ASEAN FLAG in 2011, I was proud to have represented China and Hi-Target in the international association. From this, my travels began. What impressed was the discipline in the Japanese nation. Travel broke the stereotype that it is dangerous to roam in Africa. Contrary to the common belief, I found African people loving, caring and the place is not as dangerous as many people believe it to be. By the way, I also experienced both extremes on the temperature scale, from -20°C in Canada to $+40^{\circ}\text{C}$ in Pakistan.

ASIA: ASEAN FLAG



ASIA: JAPAN



NORTH AMERICA: CANADANORTH



Q&A

Q: Are Chinese products competitive to the European counterparts?

A: In 2017, 90% of the GPS receivers used by the surveying industry in China were made in China only the remaining 10% were European or made elsewhere. It reminds me of when Hi-Target merged the brand with a Finnish group in Germany and the team of Hi-Target worked together with European team in the same alacrity and professional manner. My goal is to break the stereotype and help others see Chinese products and technology as most innovative and creative in the eyes of the world.

The session concluded with a group photo along with presenting the honorable speaker a token of gratitude. This edition of English GeoScience Café was one of the most informative and interactive sessions LIESMARS has rendered, in which the speaker took the audience on a roller coaster ride from technical knowledge sharing to professional development, with real life experiences.



Fig. 10 to 12 Q&A part and Group Photos (photo by Xu Lei)

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