International GNSS Service

Why Is IGS Involved in Real-Time GNSS?

Since its inception in 1994, the IGS has produced high-quality GNSS data products from a cooperative global infrastructure. The IGS products enable access to the definitive global reference frame for scientific, educational, and commercial applications that greatly benefit the public, and they are freely available to users.

To date, access to this highly accurate reference frame has been *ex post facto* or predicted, limiting the utility of the IGS products. For years, IGS users have expressed a desire for real-time products to enhance existing applications, or to enable new applications that require low or no latency. This desire is now being satisfied by the IGS.

Real-time GNSS has been an element of IGS strategy for more than 10 years in the context of providing innovative support for scientific applications and performance monitoring of GNSS. In 2002, the IGS conducted a cutting-edge workshop titled "Towards Real-Time," which laid out a framework for developing a real-time service, from network configuration and management to algorithm development and product generation to definition of real-time protocols and standards.

During this time, the IGS has faced many challenges. As technology has progressed to enable real-time GNSS applications, so has the perception that the IGS could become competitive with commercial entities, or even with IGS participants themselves. However, commercial services are generally not practical for users within sponsored research organizations, universities, national geodetic and mapping agencies, or non-governmental organizations because of costs imposed by for-profit business models, or a lack of technical transparency due to the proprietary nature of the services.

The IGS response to these challenges is driven by a strong rationale to support public-benefit applications. Principal beneficiaries include conventional weather and space weather forecasting, geophysical hazard detection and warning systems, and GNSS performance monitoring. Of key importance are real-time geophysical applications where openly available, global, real-time GNSS information is complementary to other information, such as seismic data, for rapidly detecting, locating, and characterizing hazardous events such as earthquakes and tsunamis.

Quoting an article entitled "Scientific value of real-time Global Positioning System data", which was published in the American Geophysical Union's publication Eos in 2011, "…. Global Navigation Satellite System (GNSS) … provides an essential complement to other geophysical networks because of its high precision, sensitivity to the longest-period bands, ease of deployment, and ability to measure displacement and atmospheric properties over local to global scales. Recent and ongoing technical advances, combined with decreasing equipment and data acquisition costs, portend rapid increases in accessibility of data from expanding global geodetic networks. Scientists and the public are beginning to have access to these high-rate, continuous data streams and event-specific information within seconds to minutes rather than days to months. These data provide the opportunity to observe Earth system processes with greater accuracy and detail, as they occur."

The IGS real-time products include data streams from a global network of high-quality GNSS receivers, real-time combined orbits, accurate satellite clock solutions, and real-time ionosphere information. These products enable real-time precise point positioning (PPP) at global scales for scientific and hazard detection applications. They also have potential application for quality assessment of multi-constellation satellite performance and monitoring inter-system biases between the different GNSS.