

# ConferenceReview



L-R: Dr. Georg Weber of the German Federal Agency for Cartography and Geodesy, Dr. Richard Snay of NGS, and Mark Caissy of Canada Natural Resources

The National Geodetic Survey is seeking to better define their role in the renewed real-time boom, and are seeking direct input from the public on this matter. Of late, CORS and CORS related matters have achieved dominance within NGS, and several CORS forums are hosted yearly by at different venues around the country. The September 13th, 2005 CORS forum generated quite a bit of excitement and anticipation for many as the heretofore little discussed matter of real-time was to be the main theme of the gathering.

Hosted and moderated by Dr. Richard Snay of NGS, invited speakers included Dr. Georg Weber of the German Federal Agency for Cartography and Geodesy (BKG—the German peer to NGS), Mark Caissy of Canada Natural Resources, and Dr. Gregg Anderson of Earthscope's PBO. Following the speakers there was an open forum and breakout groups on key subjects. Preceding the forum, in the morning meeting of the States and Local Sub-committee of the CGSIC, the subject of real-time, and in particular other federal real-time initiatives provided additional fodder for discussion in the afternoon CORS forum.

NGS is our national maven for all matters geodetic; as the purveyors and guardians of the National Spatial Reference System (NSRS), real-time was not particularly on their radar. Recent developments have pushed the worlds of real-time and reference frameworks closer together.

CORS is fast becoming the default reference frame, not only here in the U.S. but in other countries as well. From NGS CORS, to its Cooperative CORS program, to the related products

## NGS Talks Real-Time

>> By Gavin Schrock, LS

and initiatives like OPUS, NGS is fast becoming a sort of "Ministry of CORS." The agency is particularly well suited and qualified for this role and has acted in a fair and benevolent manner considering the rapid evolution.

Real-time has really hit its stride; the latest wave of innovation has been the advent and wider acceptance of network RTK solutions. The wave hit Europe and Asia several years ago, and in the past two years there have been dozens of real-time networks developed or under way in the U.S. The vendors have heeded the call and are aggressively marketing infrastructure and field solutions to suit.

What these two developments have in common is quite obvious; good stability and consistency in continuously operating reference stations with readily accessible data products. Individual stations can, and in many instances already do serve multiple purposes; providing multiple flavors of data products. Even older receivers are designed to 'multitask. Snay reported that there are over a thousand continuously operating reference stations across the U.S. and the numbers are rapidly rising. This includes NGS stations, those registered as part of NGS Cooperative CORS, and others that have been established autonomously or as part of other initiatives nationally, regionally, or locally.

An example of the rapid densification of CORS is the Earthscope PBO (Plate Boundary Observatory) as reported by Dr. Gregg Anderson, data products manager of said project. As Dr. Anderson reported, the project has established more than 200 of a proposed array of nearly 800 reference stations across the western U.S. and Alaska. Funded from a National Science Foundation grant for the purposes of plate tectonic studies, the original guidelines did not include the provision of or need for real-time data. But PBO is now quite willing to provide an auxiliary stream to permitting parties. PBO will not deliver or handle the real-time data for any other parties, the arrangement is as simple as access to a receiver port and a real-time stream, all other arrangements for communication and further processing of the real-time data is the responsibility of the recipient. The PBO mission has strictly defined requirements and timelines, but as long as the lateral provision of real-time does not interfere with their primary operations, Dr. Anderson and PBO are willing to collaborate.

### Other Federal Initiatives

Examples of other national initiatives employing reference stations or reference station data include the WAAS and LAAS from the FAA, NDGPS and the proposed HA-NDGPS programs; these were presented in-depth in the morning session. While representing wide-area real-time solutions, they are services primarily suitable for transportation, recreation, and resource-grade mapping. Proof-of-concept trials for HA-NDGPS have shown that survey-grade accuracies can be achieved. But where will the infrastructure come from to deliver the corrections? How many years will we have to wait? Maybe if the dream of data stream sharing can come to fruition, the combined infrastructure of regional and local networks may provide the density of spacing required to implement a HA-NDGPS suitable for surveyors. Another thing that most of the national and international initiatives unfortunately have in common is the perpetual funding shortfalls. These initiatives are noble causes and essential in their own right, but for the surveying community, localized initiatives may be the only realistic option for high accuracy real-time services. Folks must come to grips with the reality that the federal government is not going to come riding

into their local area on a white horse and put up a survey-grade real-time network; local cooperation in the public and private sectors will be needed. That is not to say that these types of initiatives, and particularly the data from their reference stations, will not ultimately prove mutually beneficial.

A strong advocate for such cooperation is Dr. Georg Weber of the German Federal Agency for Cartography and Geodesy (BKG). Weber oversees elements of an existing initiative in Europe that may serve as a model for the role NGS may soon play in the U.S. real-time community; provision of standards, guidelines, geodetic certification of CORS, monitoring, and brokering of real-time data streams between parties. A number of real-time broadcasters in the U.S. are already taking advantage of the automated monitoring and reporting services provided by BKG. Weber's take on the varied initiatives in the U.S. was summed up in the most memorable quote of the forum: "Why have a weekly newspaper only to deliver it monthly?"

The good doctor was referring to the common practice of formatting data products at epoch rates of 5, 10, 15, or 30 seconds and only delivering in hourly or daily chunks. That may suit the purposes of post-processing for a wide variety of uses, but precludes use for real-time. But, a live stream at a 1 second rate enables real-time and can always be decimated (or reduced) to other rates and repackaged in convenient chunks. Most dual frequency receivers are capable of outputting multiple deliverables simultaneously. Why not serve as many purposes as possible, *especially* if a reference station was established with public funds. Other recommendations included upgrading all single frequency reference stations to dual frequency (a dual frequency receiver can continue to serve the single-frequency needs), and setting all output rates to 1 Hz.

Mark Caissy of Canada Natural Resources spoke on behalf of the International GNSS Service (IGS, formerly the International GPS Service), an international cooperative effort to pool resources, expertise, and services of over 200 worldwide agencies. The IGS and their initiative for Precise Point Positioning (PPP) as a worldwide amenity (that may eventually have a viable real-time service component) is a model for data-stream sharing, a role that NGS could play in the U.S. as a broker and quality monitoring body.



### Please take the time to consider the following questions and email your responses to [cors@noaa.gov](mailto:cors@noaa.gov).

- What format would be most useful? RTK? Raw? Rinex? Other (specify)?
- What software do you expect to be used to import and process CORS data broadcast in near real-time? Who do you expect to provide this software?
- Are there particular stations in the CORS network for which you would like to be able to receive data broadcast in near real time via NTRIP?
- Are there limitations on how close a CORS station must be to your project area for you to use broadcast data? Specify.
- What sample rate do you require?
- What latency can your processing tolerate?
- Describe a typical session during which you might ingest CORS data broadcast in near real-time. How long might a typical session last? How many CORS stations might you use?
- What value might the availability of broadcast CORS data add to your operations? Would it add confidence to your result? Would it allow you to avoid some costs? Specify.
- Would you be satisfied with a broadcast of whatever data is produced by the GPS receiver, or would you expect NGS to perform some further quality control?
- NGS considers streaming data via NTRIP to be just another means of delivering CORS data. However, there is some concern that such a broadcast could be seen as an infringement on the activities of state, local, or private organizations. Is this a concern to you? What activities and/or areas should NGS specifically avoid?
- How many people and/or organizations do you think might answer these questions the same as you have?

Should NGS become merely a broker of real-time observables from CORS? Or, should NGS go one step further and actually deliver real-time corrections? This is one of many angles being examined by NGS. Concerns were voiced by representatives of commercial real-time networks, and from public network providers. The objection of private providers is fairly obvious; NGS would

in some cases be directly competing with private enterprise. In the case of public networks, and regional cooperatives, NGS would be a direct recipient of data streamed from networks developed and paid for with local funds and sweat; in other words, getting all the glory without having to do the work. It is more than local pride at stake; it could spell the loss of local incentive for local initiatives, or

the loss of possible revenue sources to offset development costs. NGS was not directly proposing such a scenario, in actuality there was more talk of flexibility and range in possible services.

Proposals discussed that would most definitely directly benefit local initiatives could include data streams from existing NGS and other stations to add to their networks, saving substantial infrastructure costs. In addition, monitoring and geodetic certification services by NGS could make up for shortfalls in local expertise in such projects.

It was made clear that NGS is currently only evaluating the options, and indeed there has been a questionnaire circulating for some time seeking specifics on types of services, formats, and other needs.

Lively discussion continued through the open forum, where there were many references to the plethora of federal initiatives (that give the appearance of duplicity of effort), and the narrow focus of some projects (particularly with respects to the data rates, formats and delayed delivery methods. There was a suggestion that NGS should serve as the spatial reference coordinator for the various initiatives (which NGS is actually chartered to do and already does in many ways).

Subsequent breakout sessions focused on matters related to real-time formats, industry standards (and the growing interoperability of the various vendor solutions), standards for reference station construction, and matters related to existing and proposed CORS related programs. The obvious enthusiasm of the forum participants, the diverse groups represented, and the fine service models to emulate bore a glimpse of the need for, and role NGS will ultimately play in this real-time revolution. Snay and other innovators at NGS have always been dynamic advocates for valuable programs. Let's provide some thoughtful feedback to help them cook up the next great initiative! *AS*

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