The Information and Communication Layer for a Network of Permanent Reference Stations

A. MULS[1], J.-M. SLEEWAEGEN

Abstract

Since 1992, the geophysical community has set up international and regional networks of permanent GPS reference stations collecting high quality GPS observations. Within the IGS and EUREF, these data are stored in regional and local data centers and are processed by several processing centers. The precisions obtained have fully satisfied the initial objectives of the campaigns and are currently done on a routine basis throughout the world. Until today, the data collection scheme consisted of collecting the GPS data at a 30s data interval and transfering them on a daily basis to the local data center.

In 1997, the Royal Observatory of Belgium and the Royal Military Academy decided to revise the ROB network of permanent GPS reference stations. A new data collection scheme, both at the level of each reference station and at the level of the local processing center, was put forward. This article details both the philosophy and the details of implementation of the present ROB GPS network. The flow of the data in a production environment will be detailed and future improvements pointed out.

More information in following part:

The design specifications were divided into 2 layers:

1. The Reference Station level

The old design of the network would only work with a Turbo-Rogue receiver, since the data download depended on the scripts obtained from Allen, Osborne & Associates. This was considered as a serious drawback because it does not allow a future upgrade or replacement of the GPS receiver.

A major change to the reference station design was that a permanent data download had to be set up, so that the data storage capacity would no longer be constrained by the internal memory of the receiver. This processing scheme implied that GPS time would be available at all times at the reference station. It was therefore decided that all operations at the reference station level had to be initiated by GPS time.

It was also agreed to develop a proper binary data format for storing the observables made by the reference station.This binary data format had to give a user quick access to whatever data epoch and should contain all relevant information with regard to the observables. The format had to allow a correct data decimation before transfer to the control center.

The download interval would be selectable between 1 and 60s.

2. The Control Center level

The sequential transfer approach adopted in the old network does not provide any support for near real time applications, nor does it allow an (considerable) extension of the number of reference stations in the network.

Since the driving factor for all operations at the reference station level is the GPS time, a passive consumer program at the control center has to handle all concurrent communications initiated by the reference stations.

Since the transfer and data interval would increase, the cost of the communication line became to play an important role. An efficient dedicated compression algorithm could alleviate these costs.

At the control center, the transferred data are to be made available to the international and national users. An efficient forwarding of the data were to be developed.

In case of failure at a reference station an user friendly intervention procedure should assist the network supervisor in his task of restablishing normal operations and of recovering of possible non transferred data.

The redesign of the ROBNet network was successfully completed by the collaboration between the Royal Military Academy and the Royal Observatory of Belgium and satisfies completely the current needs of the prime users of the network, namely the GPS section of the ROB. The use of the software has demonstrated its robustness and has alleviated the personnel from the tedious and difficult procedures used beforehand. The current scheme offers an easy upgrade path towards more reference stations and is not tied to a specific reference receiver. The current operational parameters of the network as defined by the ROB fully complies with the demands of the Euref of IGS community. Next to the fully automated functioning of the network, the administrator has the possibility to supervise the operations and to intervene at all levels if necessary.

From the navigational viewpoint the current implementation still offers some drawbacks. The data are transmitted at hourly intervals as opposed to a real time transfer needed for the navigational community. Only minor changes are needed in order to adapt the software for this usage.

The full text of this paper is published in the internet, cf. *http://homepage.oma.be/eurefnew/EurefHome.html*

[1] Alain Muls, Royale Military Academy, Avenue de la Renaissance, 30, B - 1000 Bruxelles, Belgium, Fax +32 - 2 - 737 61 20, Tel. +32- 2 - 737 61 20, E-mail: amuls@elec.rma.ac.be