An innovative software development within the framework of “SIRGAS in real time”
Federico A. Bareilles\textsuperscript{1,3} Mauricio Gende\textsuperscript{1,2} Claudio Brunini\textsuperscript{1,2}
\textsuperscript{1}Facultad de Ciencias Astronómicas y Geofísicas - UNLP
\textsuperscript{2}CONICET
\textsuperscript{3}Instituto Argentino de Radioastronomía (IAR)

Abstract
“SIRGAS in real time” is a pilot project which was originated at the last SIRGAS Conference (Montevideo, 2008). This project is meant to study the possible ways in which GNSS observations can be distributed in real time. Within this framework, we have developed an original program to capture, store and distribute raw observations coming from an Original Equipment Manufacturer (OEM) GPS device.

The main advantages of the product presented here are: the possibility of working with high performance OEM equipment, dual frequency code and P, with relatively low cost and without using a GPS receiver, offering real-time data, having the possibility of transmitting these data over the Internet, the flexibility of having a self-made development. This last point draws the independence of the manufacturer in terms of support, the ability to adapt the software to different operating systems and platforms. This flexibility translates in independence in the part of the manufacturer in terms of support, the ability to adapt the software to different operating systems and platforms.

We believe there are two added values to this work: 1. the fact that the development has a General Public License (GNU GPL) and 2. the fact that the equipment used is a 15-year-old receiver which has not been used for nearly 10 years.

1 Introduction

The NovAtel ProPak, (see Figure 1), has been designed for the GPS navigation or positioning systems built around the NovAtel GPS Card. The ProPak is a rugged, reliable GPS receiver for adverse environments.

It is about a very high value-added equipment, that has neither technical support from NovAtel nor software for its use. It was doomed to live in a shelf.

![Figure 1: OEM Series GPSCard](image1)

To recover these equipments it was only needed to build suitable software to transform them in permanent GPS stations; given the existence of a quite non homogenous variety of these equipments, the software for them should be completely modular, so that it could be adapted to different GPS devices from similar characteristics.

1.1 Situation

Nowadays, there is a growing request of GPS stations in our territory. Sadly, Argentina does not usually count with financial resources, needed to acquire new equipments specially designed for this purpose.

1.2 Motivation

The Facultad de Ciencias Astronómicas y Geofísicas at Universidad Nacional de La Plata used to have a former equipment forgotten on a shelf available, which possessed all the characteristics needed to be used as a GPS station:

- Dual frequency.
- Code P

1.3 Proposal

We would like to transform this instrument with high-power value for geodesics in a permanent station, performing a 100% original development.

This development would allow:
- Non-dependence on the manufacturer and on the life-cycle that it suggests for the product, as much in support or software supply.
- Porting it to different platforms (operating systems) that were needed according to the location of each particular station.
- To provide it with a license such as GPL (GNU General Public License) so that the code could be used in other stations, or as a ground for any development that includes GPS manipulation data or GPS devices.

2 Development

The development was written in C language, and so far it has only been used in GNU/Linux platforms.

Because of the absence of the internal memory in the equipment, the data should flow in real time through a serial port; therefore, we require a capture program and a stable operating system, even though the service exit from the capture equipment implies data loss.

We have called our program GPS DUMP; it can be configured through command line and configuration files; the header information for the output files RINEX are performed with configuration files.

![Figure 2: GPS DUMP life cycle](image2)

2.1 GPS DUMP

Figure 2 shows the life cycle of the GPS DUMP program. In GNU/Linux platform, GPS DUMP runs as common normal daemon.

![Figure 3: General view of modularization](image3)

2.2 Modular designed

Figure 3 shows the modules that conform the program. The module "gps-data" implements the format RINEX while "gpscivilis" handles the output archives. To adapt the program into another GPS device, only the "gps-reas232" module needs to be rewritten.

![Figure 4: Call graph of entire program](image4)

The next options are defined in gpdump program daemon:

```
# gpdump <daemon> -h help
GPDUMP - Dump GPS data; gpdump version 0.0.2
     -h - help
     -v - Dump user defined and system defined header informations
     -f - Dump data frame informations
     -s - Dump RINEX data frame informations
     -n - Dump GPS device's currents informations
     -t - Dump RINEX data frame informations
     -o - Dump RINEX data frame informations
     -r - Dump RINEX data frame informations
     -i - Dump RINEX data frame informations
```

The next essential parameters (Figure 5) are defined in gpdump.conf's file:

```
# GPSP - Dump GPS data daemon
# Configuration file
# Federico A. Bareilles fede@iar.unlp.edu.ar
# 3/11/2007
#
station = SRLP
device = /dev/ttyS0 # Serial port from computers side.
data_dir = /home/gpsuser/data # Serial port from devices side.
log_port = com1 # Serial port from devices side.
log_period = 2 # Trigger time for GPS devices.
log_format = 0 # Name of header file.
log_new = 10 # Name of header file.
log_old = 0 # Name for data storage.
```

![Figure 5: GPSP daemon configuration file](image5)

3 Permanent Station installation

During the first week of May 2008 the NovAtel ProPak receiver was placed in a concrete shelter allocated in the roof of the chief administrative building of La Pampa province located in Santa Rosa. The installation is composed by a PC A UPS and the GPS receiver with its choke ring antenna mounted on a pole. Since the equipment is located in a difficult access area the whole system can be remotely controlled from the cadastral office via Internet.

![Figure 6: RINEX header (parameters)](image6)

3.1 GPS card dedicated

The NovAtel ProPak (OM-20000008 Rev 3) has been designed for the GPS navigation or positioning systems built around the NovAtel GPS Card. The ProPak is a rugged, reliable GPS receiver for adverse environments.

1. Dual frequency.
2. Code P.

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![Figure 7: Location of antennas at the CENIT Center](image7)

![Figure 8: Coverage area of SRLP](image8)

4 Data access

The information is presented with a correct header, which has a dome number assigned by IGS. Information is presented, not raw data.

Previously to the publication of the first RINEX data, we were at the development stage, one week of our RINEX files were tested with. Ashtech Solution, GPPS and Bernese, and online processing services: AUSPOS, GPPS and CANSPACE.

The data from SRLP Permanent Station are published in: http://www.catastro.lapampa.gov.ar/GPS/ASP/Archivos.asp, since July 2008. Figure 9 shows an example of the web page written above.

![Figure 9: Example of data publication at “Catastro Provincial de La Pampa”](image9)

5 Future improvements

The next step in this development is for us to create the support for NTRIP standard; we are also going to adapt the program to other old GPS devices.

6 Acknowledgements

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References