

# GPS/GNSS Data Logger and Parser

Progetto di Ingegneria Informatica

Architetture e Sistemi di Elaborazione Dati

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# Introduzione

*GPS DataLogger and Parser* è un tool in grado di registrare uno stream di byte proveniente da uno (o più ricevitori) u-blox connessi al PC mediante porta COM, per poi analizzarlo e convertirlo nei formati standard RINEX (.obs e .nav) e NMEA.

In alternativa alla registrazione *realtime*, è possibile utilizzare files .ubx precedentemente acquisiti (con il tool u-center, ad esempio).

Scheda Progetto: [GPS data logger and parser | Progetto di Ingegneria Informatica \(polimi.it\)](#)

Link Repository GitHub: <https://github.com/lucapada/GPSDataLoggerParser>

# Implementazione

Il tool è stato sviluppato in Python 3.8. La scelta del linguaggio scaturisce dalla volontà di realizzare un applicativo cross-platform, espandibile, semplice e veloce.

Per rendere l'esperienza utente più semplice e intuitiva possibile è stata realizzata una GUI con il framework *PyQt5*.

# GUI

The screenshot shows the 'GPSDataLoggerParser' application window. It has a title bar with standard Windows window controls. The main interface is divided into several sections:

- NMEA and RINEX output path:** A text field containing 'ap/Desktop/prova' and a 'Choose' button.
- Sources:** A sub-section with two tabs: 'Serial Port' (active) and 'UBX Files'. Under 'Serial Port', there are three checked checkboxes for 'COM8', 'COM9', and 'COM10'. To the right are buttons for 'Discover Devices', 'Record', and 'Stop'. A 'Baud Rate' dropdown menu is set to '9600'.
- Messages and Logs:** A scrollable text area displaying a log of messages, including multiple entries for '[LOGGER "COM8"/"COM9"/"COM10"]: disabling ZDA', 'DTM', 'GBQ', and 'GLQ'.
- Constellations:** A list of satellite constellations with checkboxes: 'GPS' (checked), 'SBAS' (unchecked), 'Galileo' (checked), 'BeiDou' (unchecked), 'IMES' (unchecked), 'QZSS' (checked), and 'GLONASS' (checked).
- RINEX Conversion:** A section with a 'RINEX Version' selector (radio buttons for '3.01' and '3.05', with '3.01' selected), a 'Run Conversion' button, and an unchecked checkbox for 'Split .nav in different files per constellation'.

The window has a light gray theme and standard Windows window controls.

# Ambiente di Sviluppo

The screenshot displays the PyCharm IDE interface for the `GPSDataLoggerParser` project. The main code editor shows the `main.py` file with the following code snippet:

```
new_connection = self.model.item(d).text()
```

The Project view on the left shows the project structure, including the `bin` directory and various files like `COM6_rover.ubx`, `convbin.exe`, `cnx2mx.exe`, `gzip.exe`, `libguide40.dll`, and `libiconv-2.dll`. The bottom toolbar includes icons for actions like `discoverDevices(self)`, `recordUBXs(self)`, `stopUBXs(self)`, `loadFiles(self)`, `removeFiles(self)`, `startRinex(self)`, `openFile(self, path)`, `getPorts(self)`, `toggleUBXControl(self)`, `printLog(self, msg)`, and `CONNECTED_PORTS`.

The Threading graph at the bottom shows the execution timeline of the application. It includes a table with the following data:

Name	Waiting time (s)
MainThread	0,00 (0%)
Thread-12	0,00 (0%)
Thread-16	0,00 (0%)
Thread-20	0,00 (0%)



# Funzionamento

Il software consente di registrare stream di byte provenienti da uno o più ricevitori, contemporaneamente e in tempo reale, oppure il caricamento di files .ubx.

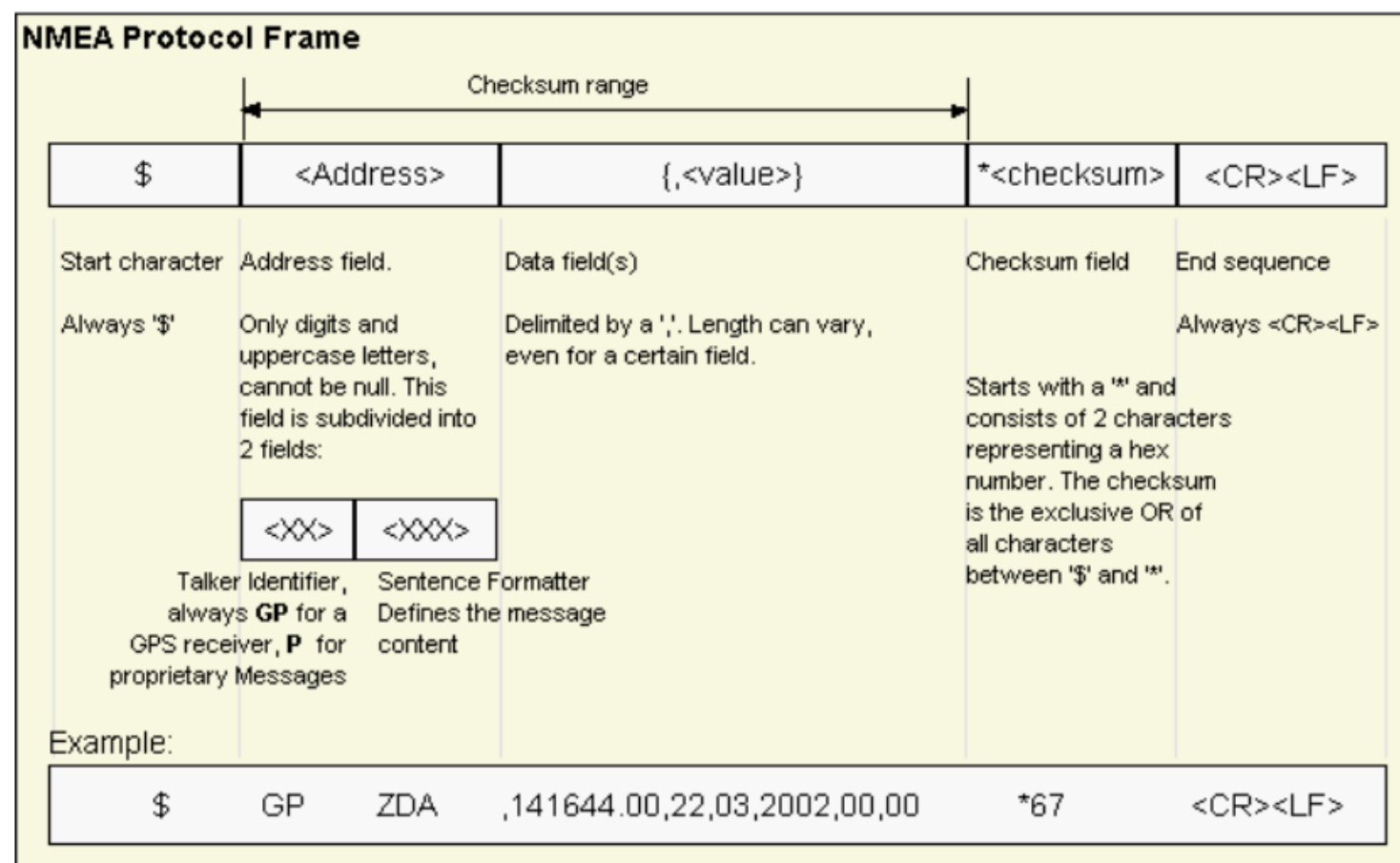
Dagli stream acquisiti vengono estratte le **stringhe (sentences) NMEA** e i **messaggi UBX-RXM-RAWX** da cui, a loro volta, vengono estratti i **time-stamp** necessari alla sincronizzazione dei tempi tra il GNSS e computer locale.

Al termine delle operazioni di acquisizione è possibile **generare i files RINEX (Receiver INdependent EXchange format)** relativi alle osservazioni e alle navigazioni a partire dagli stream .ubx precedentemente salvati, mediante l'utilizzo del tool *CONVBIN RTKLib*.

# Funzionamento

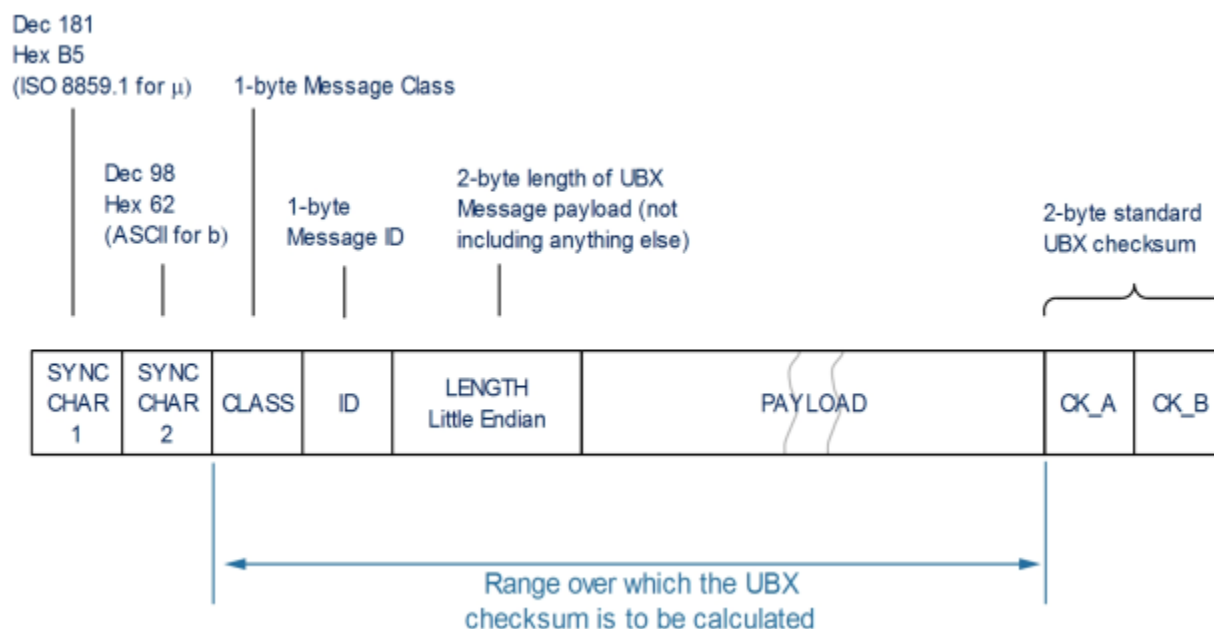
## Struttura Messaggio NMEA

NMEA messages sent by the GNSS receiver are based on NMEA 0183 Version 4.10. The following figure shows the structure of a NMEA protocol message.



# Funzionamento

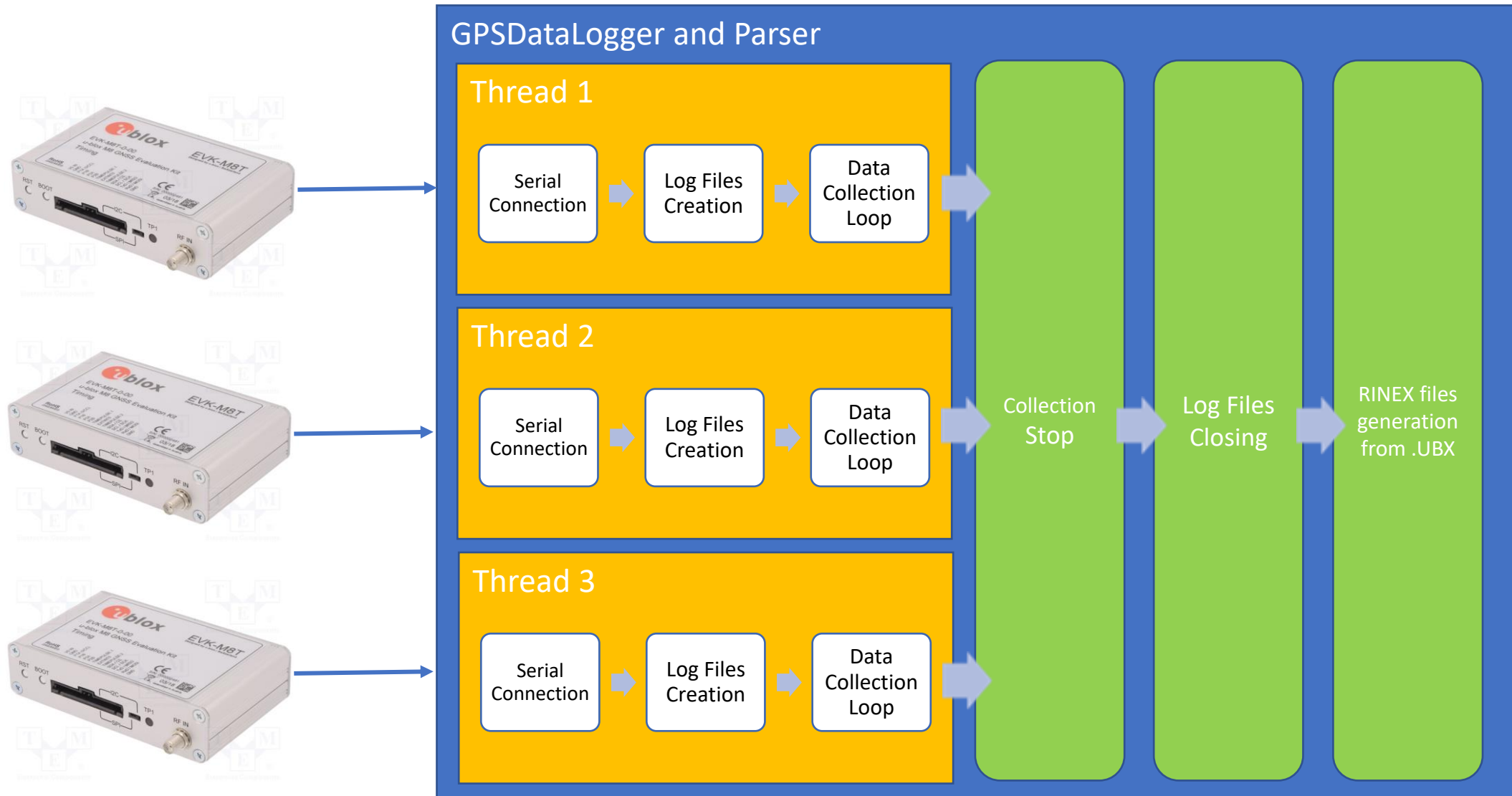
## Struttura Messaggio UBX



Message	UBX-RXM-RAWX					
Description	Multi-GNSS raw measurements					
Firmware	Supported on: <ul style="list-style-type: none"><li>u-blox 8 / u-blox M8 protocol versions 18, 19, 19.1, 19.2, 20, 20.01, 20.1, 20.2, 20.3, 22, 22.01, 23 and 23.01 (only with ADR or High Precision GNSS or Time Sync products)</li></ul>					
Type	Periodic/Polled					
Comment	<p>This message contains the information needed to be able to generate a RINEX 3 multi-GNSS observation file (see <a href="ftp://ftp.igs.org/pub/data/format/">ftp://ftp.igs.org/pub/data/format/</a>).</p> <p>This message contains pseudorange, Doppler, carrier phase, phase lock and signal quality information for GNSS satellites once signals have been synchronized. This message supports all active GNSS.</p> <p>The only difference between this version of the message and the previous version (<b>UBX-RXM-RAWX-DATA0</b>) is the addition of the version field.</p>					
Message Structure	Header	Class	ID	Length (Bytes)	Payload	Checksum
	0xB5 0x62	0x02	0x15	16 + 32*numMeas	see below	CK_A CK_B
Payload Contents:						
Byte Offset	Number Format	Scaling	Name	Unit	Description	
0	R8	-	rcvTow	s	Measurement time of week in receiver local time approximately aligned to the GPS time system. The receiver local time of week, week number and leap second information can be used to translate the time to other time systems. More information about the difference in time systems can be found in the RINEX 3 format documentation. For a receiver operating in GLONASS only mode, UTC time can be determined by subtracting the leapS field from GPS time regardless of whether the GPS leap seconds are valid.	
8	U2	-	week	weeks	GPS week number in receiver local time.	
10	I1	-	leapS	s	GPS leap seconds (GPS-UTC). This field represents the receiver's best knowledge of the leap seconds offset. A flag is given in the recStat bitfield to indicate if the leap seconds are known.	
11	U1	-	numMeas	-	Number of measurements to follow	

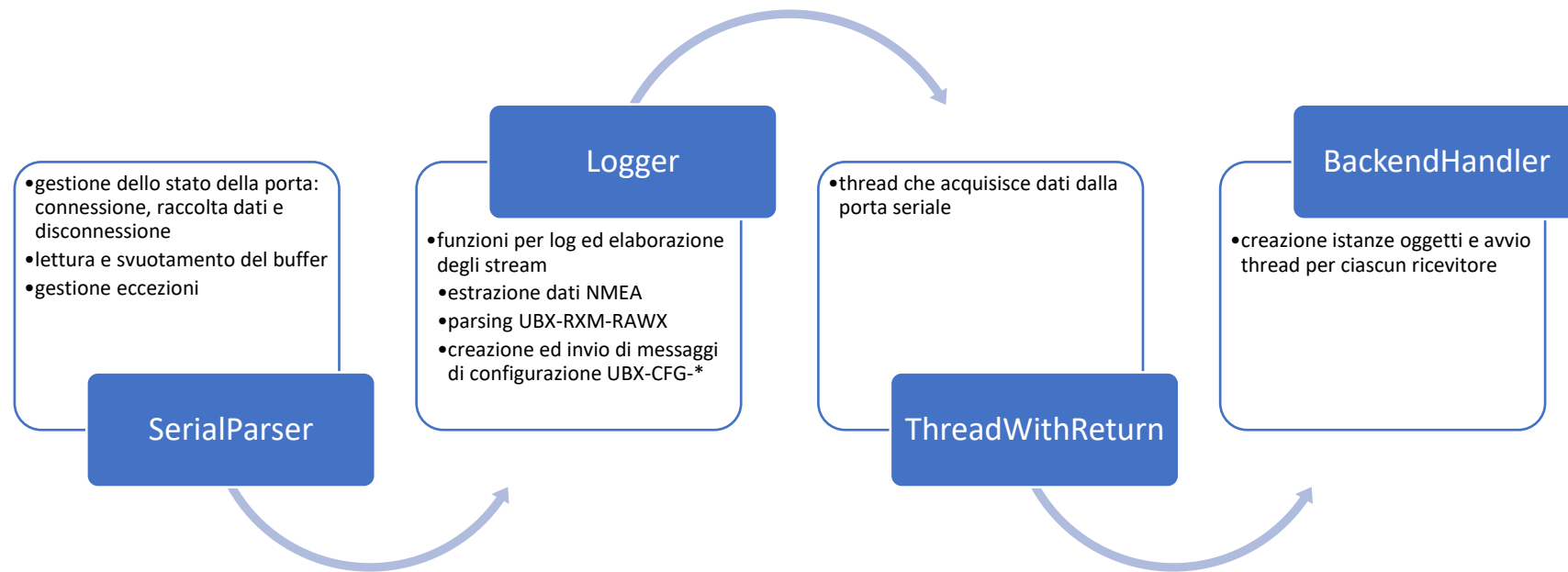


# Funzionamento



# Architettura BackEnd

Il software è costituito da moduli ed è stato sviluppato seguendo un approccio *bottom-up*.



main.py

GUI  
(PyQt5)

+

esecuzione tool  
conversione RINEX

Backend  
Handler

per ogni ricevitore selezionato, crea un istanza di Logger, SerialParser e  
ThreadWithReturn

Logger

Contiene tutte le funzioni per la  
codifica/decodifica dei messaggi  
da/per il ricevitore.  
logData è la funzione eseguita  
dal Thread per l'ascolto dei dati  
dal ricevitore

Serial Parser

gestisce la porta  
seriale ed eventuali  
eccezioni

ThreadWithReturn

avvia un thread  
eseguendo la  
funzione logData  
contenuta in Logger

# Demo

# Installazione Python

[Download Python | Python.org](#)

# Installazione delle dipendenze

```
pip install pyqt5 pyserial shutil
```

# Lancio

```
python main.py
```

# Demo



# Demo

1

NMEA and RINEX  
output path: ud/uni/GPSDataLoggerParser/acquisizione Choose

Sources

Serial Port

UBX Files

Discover Devices

Baud Rate: 9600 ▼

Record

Stop

Constellations

- ☐ GPS
- ☐ SBAS
- ☐ Galileo
- ☐ BeiDou
- ☐ IMES
- ☐ QZSS
- ☐ GLONASS

Messages and Logs

1. Scelta della directory di lavoro

RINEX Conversion

RINEX Version

☒ 2.12

☐ 3.02

Run Conversion

☐ Split .nav in different files per constellation

# Demo

1

NMEA and RINEX  
output path: d:/uni/GPSDataLoggerParser/acquisizione Choose

Sources

Serial Port

UBX Files

Discover Devices

Baud Rate: 9600

Record

Stop

Messages and Logs

1. Scelta della directory di lavoro
2. Scelta dei GNSS(s)

2

Constellations

- ☐ GPS
- ☐ SBAS
- ☐ Galileo
- ☐ BeiDou
- ☐ IMES
- ☐ QZSS
- ☐ GLONASS

RINEX Conversion

RINEX Version

☒ 2.12

☐ 3.02

Run Conversion

☐ Split .nav in different files per constellation

# Demo

1

NMEA and RINEX output path:  Choose

3

Sources

Serial Port    **UBX Files**

☒ /dev/ttyACM2  
☒ /dev/ttyACM1  
☒ /dev/ttyACM0

Discover Devices

Baud Rate: 9600

Record

Stop

2

Constellations

☒ GPS  
☒ SBAS  
☒ Galileo  
☐ BeiDou  
☐ IMES  
☒ QZSS  
☒ GLONASS

Messages and Logs

Detecting u-blox(s) connected to COM ports:  
u-blox receiver detected on port /dev/ttyACM0  
u-blox receiver detected on port /dev/ttyACM1  
u-blox receiver detected on port /dev/ttyACM2  
No u-blox(s) device detected...

RINEX Conversion

RINEX Version

☒ 2.12

☐ 3.02

Run Conversion

☐ Split .nav in different files per constellation

1. Scelta della directory di lavoro
2. Scelta dei GNSS(s)
3. Configurazione delle sorgenti (o caricamento dei file) e avvio dell'acquisizione.



























# Demo

The screenshot shows a software interface with the following sections:

- NMEA and RINEX output path:** A text field containing "press 'Choose' button to select the pat..." and a "Choose" button.
- Sources:** A section with two tabs: "Serial Port" (active) and "UBX Files".
  - Under "Serial Port": A large empty rectangular area for device selection.
  - Buttons: "Discover Devices", "Record", and "Stop".
  - Baud Rate: A dropdown menu currently set to "9600".
- Constellations:** A list of satellite constellations with checkboxes:
  - ☐ GPS
  - ☐ SBAS
  - ☐ Galileo
  - ☐ BeiDou
  - ☐ IMES
  - ☐ QZSS
  - ☐ GLONASS
- Messages and Logs:** A large empty rectangular area for displaying messages and logs.
- RINEX Conversion:** A section for converting RINEX data.
  - RINEX Version:** Two radio buttons: "2.12" (selected) and "3.02".
  - Run Conversion:** A button to start the conversion process.
  - ☐ Split .nav in different files per constellation

Timelapse acquisizione dati da 3 ricevitori contemporaneamente in un arco temporale di 5 ore

# Demo

	_dev_ttyACM0_20230114_172218_NMEA		14/01/2023 22:10	Documento di testo	1.310 KB
	_dev_ttyACM0_20230114_172218_NMEA_times		14/01/2023 22:10	Documento di testo	504 KB
	_dev_ttyACM0_20230114_172218_rover		14/01/2023 22:10	u-blox Log File	14.142 KB
	_dev_ttyACM0_20230114_172218_times		14/01/2023 22:10	Documento di testo	160 KB
	_dev_ttyACM1_20230114_172218_NMEA		14/01/2023 22:10	Documento di testo	1.311 KB
	_dev_ttyACM1_20230114_172218_NMEA_times		14/01/2023 22:10	Documento di testo	505 KB
	_dev_ttyACM1_20230114_172218_rover		14/01/2023 22:10	u-blox Log File	15.808 KB
	_dev_ttyACM1_20230114_172218_times		14/01/2023 22:10	Documento di testo	154 KB
	_dev_ttyACM2_20230114_172218_NMEA		14/01/2023 22:10	Documento di testo	1.310 KB
	_dev_ttyACM2_20230114_172218_NMEA_times		14/01/2023 22:10	Documento di testo	504 KB
	_dev_ttyACM2_20230114_172218_rover		14/01/2023 22:10	u-blox Log File	15.923 KB
	_dev_ttyACM2_20230114_172218_times		14/01/2023 22:10	Documento di testo	159 KB

_dev_ttyACM2_20230114_172218_times - Blocco note di Windows		
File	Modifica	Formato Visualizza ?
2023-01-14	17:23:44	577442.004
2023-01-14	17:23:45	577443.004
2023-01-14	17:23:46	577444.004
2023-01-14	17:23:49	577447.004
2023-01-14	17:23:50	577448.004
2023-01-14	17:23:52	577450.004
2023-01-14	17:23:55	577453.004
2023-01-14	17:24:01	577459.004
2023-01-14	17:24:02	577460.004
2023-01-14	17:24:04	577462.004
2023-01-14	17:24:05	577463.004
2023-01-14	17:24:06	577464.004
2023-01-14	17:24:08	577466.004
2023-01-14	17:24:09	577467.004
2023-01-14	17:24:11	577469.004
2023-01-14	17:24:13	577471.004
2023-01-14	17:24:17	577475.004
2023-01-14	17:24:18	577476.004
2023-01-14	17:24:19	577477.004
2023-01-14	17:24:23	577481.004
2023-01-14	17:24:24	577482.004
2023-01-14	17:24:26	577484.004
2023-01-14	17:24:30	577488.004
2023-01-14	17:24:32	577490.004
2023-01-14	17:24:35	577493.004
2023-01-14	17:24:37	577495.004
2023-01-14	17:24:39	577497.004
2023-01-14	17:24:40	577498.004
2023-01-14	17:24:42	577500.004
2023-01-14	17:24:50	577508.004
2023-01-14	17:24:53	577511.004
2023-01-14	17:24:55	577513.004
2023-01-14	17:24:57	577515.004
2023-01-14	17:24:59	577517.004
2023-01-14	17:25:00	577518.004
2023-01-14	17:25:01	577519.004
2023-01-14	17:25:05	577523.004
2023-01-14	17:25:11	577530.004

File Sincronizzazione  
Tempo PC/Tempo UBX-RXM-RAWX

_dev_ttyACM2_20230114_172218_NMEA - Blocco note di Windows		
File	Modifica	Formato Visualizza ?
\$GNGGA	162343.00	4529.82808,N,00911.08358,E,1,07,3.06,132.6,M,47.1,M,,*4A
\$GNGGA	162344.00	4529.82807,N,00911.08354,E,1,07,3.06,132.7,M,47.1,M,,*4F
\$GNGGA	162345.00	4529.82810,N,00911.08348,E,1,07,3.06,132.7,M,47.1,M,,*45
\$GNGGA	162346.00	4529.82809,N,00911.08342,E,1,07,3.07,132.8,M,47.1,M,,*4A
\$GNGGA	162347.00	4529.82812,N,00911.08332,E,1,07,3.07,132.8,M,47.1,M,,*46
\$GNGGA	162348.00	4529.82815,N,00911.08324,E,1,07,3.07,132.8,M,47.1,M,,*49
\$GNGGA	162349.00	4529.82816,N,00911.08317,E,1,07,3.07,132.8,M,47.1,M,,*4B
\$GNGGA	162350.00	4529.82816,N,00911.08311,E,1,07,3.07,132.8,M,47.1,M,,*45
\$GNGGA	162351.00	4529.82815,N,00911.08306,E,1,07,3.07,132.9,M,47.1,M,,*40
\$GNGGA	162352.00	4529.82819,N,00911.08295,E,1,07,3.07,132.9,M,47.1,M,,*44
\$GNGGA	162353.00	4529.82824,N,00911.08283,E,1,07,3.07,132.9,M,47.1,M,,*4C
\$GNGGA	162354.00	4529.82829,N,00911.08271,E,1,07,3.07,132.9,M,47.1,M,,*4B
\$GNGGA	162355.00	4529.82835,N,00911.08261,E,1,07,3.07,132.8,M,47.1,M,,*47
\$GNGGA	162356.00	4529.82839,N,00911.08249,E,1,07,3.07,132.8,M,47.1,M,,*42
\$GNGGA	162357.00	4529.82842,N,00911.08239,E,1,07,3.07,132.8,M,47.1,M,,*48
\$GNGGA	162358.00	4529.82845,N,00911.08230,E,1,07,3.07,132.8,M,47.1,M,,*49
\$GNGGA	162359.00	4529.82851,N,00911.08218,E,1,07,3.07,132.8,M,47.1,M,,*47
\$GNGGA	162400.00	4529.82853,N,00911.08209,E,1,07,3.07,132.9,M,47.1,M,,*4F
\$GNGGA	162401.00	4529.82856,N,00911.08197,E,1,07,3.07,132.9,M,47.1,M,,*4E
\$GNGGA	162402.00	4529.82862,N,00911.08184,E,1,07,3.07,132.9,M,47.1,M,,*49
\$GNGGA	162403.00	4529.82865,N,00911.08173,E,1,07,3.07,132.9,M,47.1,M,,*47
\$GNGGA	162404.00	4529.82869,N,00911.08161,E,1,07,3.07,132.9,M,47.1,M,,*4F
\$GNGGA	162405.00	4529.82876,N,00911.08148,E,1,07,3.07,132.9,M,47.1,M,,*4B
\$GNGGA	162406.00	4529.82877,N,00911.08138,E,1,07,3.07,133.0,M,47.1,M,,*46
\$GNGGA	162407.00	4529.82879,N,00911.08129,E,1,07,3.07,133.1,M,47.1,M,,*48
\$GNGGA	162408.00	4529.82880,N,00911.08122,E,1,07,3.07,133.1,M,47.1,M,,*4A
\$GNGGA	162409.00	4529.82882,N,00911.08114,E,1,07,3.07,133.1,M,47.1,M,,*4C
\$GNGGA	162410.00	4529.82883,N,00911.08107,E,1,07,3.07,133.1,M,47.1,M,,*47
\$GNGGA	162411.00	4529.82881,N,00911.08102,E,1,07,3.07,133.2,M,47.1,M,,*42
\$GNGGA	162412.00	4529.82883,N,00911.08094,E,1,07,3.08,133.2,M,47.1,M,,*42
\$GNGGA	162413.00	4529.82886,N,00911.08087,E,1,07,3.08,133.3,M,47.1,M,,*45
\$GNGGA	162414.00	4529.82884,N,00911.08084,E,1,07,3.08,133.3,M,47.1,M,,*43
\$GNGGA	162415.00	4529.82878,N,00911.08084,E,1,07,3.08,133.5,M,47.1,M,,*47
\$GNGGA	162416.00	4529.82877,N,00911.08081,E,1,07,3.08,133.5,M,47.1,M,,*4E
\$GNGGA	162417.00	4529.82874,N,00911.08081,E,1,07,3.08,133.6,M,47.1,M,,*4F
\$GNGGA	162418.00	4529.82872,N,00911.08079,E,1,07,3.04,133.7,M,47.1,M,,*4C
\$GNGGA	162419.00	4529.82868,N,00911.08079,E,1,07,3.04,133.8,M,47.1,M,,*49
\$GNGGA	162420.00	4529.82862,N,00911.08081,E,1,07,3.04,133.9,M,47.1,M,,*4E

File NMEA

_dev_ttyACM2_20230114_172218_NMEA_times - Blocco note di Windows		
File	Modifica	Formato Visualizza ?
2023-01-14	17:23:43	162343.00
2023-01-14	17:23:44	162344.00
2023-01-14	17:23:45	162345.00
2023-01-14	17:23:46	162346.00
2023-01-14	17:23:47	162347.00
2023-01-14	17:23:48	162348.00
2023-01-14	17:23:49	162349.00
2023-01-14	17:23:50	162350.00
2023-01-14	17:23:51	162351.00
2023-01-14	17:23:52	162352.00
2023-01-14	17:23:53	162353.00
2023-01-14	17:23:54	162354.00
2023-01-14	17:23:55	162355.00
2023-01-14	17:23:56	162356.00
2023-01-14	17:23:57	162357.00
2023-01-14	17:23:58	162358.00
2023-01-14	17:23:59	162359.00
2023-01-14	17:24:00	162400.00
2023-01-14	17:24:01	162401.00
2023-01-14	17:24:02	162402.00
2023-01-14	17:24:03	162403.00
2023-01-14	17:24:04	162404.00
2023-01-14	17:24:05	162405.00
2023-01-14	17:24:06	162406.00
2023-01-14	17:24:07	162407.00
2023-01-14	17:24:08	162408.00
2023-01-14	17:24:09	162409.00
2023-01-14	17:24:10	162410.00
2023-01-14	17:24:11	162411.00
2023-01-14	17:24:12	162412.00
2023-01-14	17:24:13	162413.00
2023-01-14	17:24:14	162414.00
2023-01-14	17:24:15	162415.00
2023-01-14	17:24:16	162416.00
2023-01-14	17:24:17	162417.00
2023-01-14	17:24:18	162418.00
2023-01-14	17:24:19	162419.00
2023-01-14	17:24:20	162420.00

File Sincronizzazione  
Tempo PC/Tempo NMEA

# Demo

The screenshot shows the GPSDataLoggerParser application interface. The interface is divided into several sections:

- Top Left:** "NMEA and RINEX output path:" with a text field containing "ud/uni/GPSDataLoggerParser/acquisizione" and a "Choose" button. This area is annotated with a red "1".
- Top Right:** "Messages and Logs" section showing detection messages for u-blox receivers. This area is annotated with a red "2".
- Middle Left:** "Sources" section with "Serial Port" and "UBX Files" tabs. Under "Serial Port", three ports are checked: "/dev/ttyACM2", "/dev/ttyACM1", and "/dev/ttyACM0". There is a "Discover Devices" button, a "Baud Rate" dropdown set to "9600", and "Record" and "Stop" buttons. This entire section is enclosed in a red box and annotated with a red "3/4".
- Bottom Left:** "Constellations" section with a list of satellite systems: GPS, SBAS, Galileo, BeiDou, IMES, QZSS, and GLONASS. The first six are checked. This section is annotated with a red "2".
- Bottom Right:** "RINEX Conversion" section with "RINEX Version" radio buttons for "2.12" (selected) and "3.02", a "Run Conversion" button, and a checkbox for "Split .nav in different files per constellation". This section is annotated with a red "5".




On the right side of the image, there is a list of five steps in red text:




1. Scelta della directory di lavoro
2. Scelta dei GNSS(s)
3. Configurazione delle sorgenti (o caricamento dei file) e avvio dell'acquisizione
4. Interruzione acquisizione
5. Avvio conversione RINEX

# Demo

```
$ ./RTKLIB-master/app/convbin/gcc/convbin  
    /.../acquisizione/_dev_ttyACM2_20230114_172218_rover.ubx  
    -od -os -oi -ot -ol -v 3.02  
input file :  
    /.../acquisizione/_dev_ttyACM2_20230114_172218_rover.ubx (u-  
blox)  
->rinex obs :  
    /.../acquisizione/_dev_ttyACM2_20230114_172218_rover.obs  
->rinex nav :  
    /.../acquisizione/_dev_ttyACM2_20230114_172218_rover.nav  
->rinex lnav: ?w  
->sbas log :  
    /.../acquisizione/_dev_ttyACM2_20230114_172218_rover.sbs  
2023/01/14 16:24:02-01/14 21:10:30: O=17189 N=452 S=51570 E=28
```

# Demo

 \_dev\_ttyACM2\_20230114\_172218\_rover  
 \_dev\_ttyACM2\_20230114\_172218\_rover  
 \_dev\_ttyACM2\_20230114\_172218\_rover.sbs

 16/01/2023 12:07 File NAV 174 KB  
 16/01/2023 12:07 File OBS 19.946 KB  
 16/01/2023 12:07 File SBS 4.029 KB

```
_dev_ttyACM2_20230114_172218_rover - Blocco note di Windows
File Modifica Formato Visualizza ?
3.02 N: GNSS NAV DATA M: Mixed RINEX VERSION / TYPE
CONVBIN 2.4.2 20230116 110710 UTC PGM / RUN BY / DATE
log: /home/luca/Nextcloud/uni/GPSDataLoggerParser/acquisizioCOMMENT
format: u-blox COMMENT
GPSA 2.7940E-08 2.2352E-08 -1.1921E-07 5.9605E-08 IONOSPHERIC CORR
GPSB 1.5155E+05 -1.6384E+05 0.0000E+00 1.3107E+05 IONOSPHERIC CORR
GAL 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 IONOSPHERIC CORR
QZSA 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 IONOSPHERIC CORR
QZSB 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 IONOSPHERIC CORR
GPUT 1.8626451492E-09 4.440892099E-15 147456 2245 TIME SYSTEM CORR
GAUT 0.0000000000E+00 0.000000000E+00 0 0 TIME SYSTEM CORR
QZUT 0.0000000000E+00 0.000000000E+00 0 0 TIME SYSTEM CORR
BDUT 0.0000000000E+00 0.000000000E+00 0 0 TIME SYSTEM CORR
18 LEAP SECONDS
END OF HEADER
G25 2023 1 14 18 0 0 .411274377257E-03 .341060513165E-11 .000000000000E+00
.610000000000E+02 .589375000000E+02 .480662878681E-08 .199526457345E+01
.284239649773E-05 .111140634399E-01 .668875873089E-05 .515356175995E+04
.583200000000E+06 -.180676579475E-06 .264909940674E+01 -.229105353355E-06
.954365204479E+00 .245562500000E+03 .101495003299E+01 -.819105547605E-08
.382158775590E-10 .100000000000E+01 .224400000000E+04 .000000000000E+00
.240000000000E+01 .000000000000E+00 .558793544769E-08 .610000000000E+02
.577446000000E+06 .400000000000E+01
G 2 2023 1 14 18 0 0 -.627320259809E-03 .227373675443E-11 .000000000000E+00
.380000000000E+02 -.201875000000E+02 .409909931537E-08 .248770603739E+01
-.992789864540E-06 .201005858835E-01 .793486833572E-05 .515369124222E+04
.583200000000E+06 .225380063057E-06 -.160982667394E+01 .111758708954E-07
.966835306903E+00 .226468750000E+03 -.134030254130E+01 -.758745890526E-08
-.746459664470E-10 .100000000000E+01 .224400000000E+04 .000000000000E+00
.240000000000E+01 .000000000000E+00 -.176951289177E-07 .380000000000E+02
.577446000000E+06 .400000000000E+01
G12 2023 1 14 18 0 0 -.328070484102E-03 -.454747350886E-11 .000000000000E+00
.710000000000E+02 .539687500000E+02 .451554523344E-08 .207604933092E+01
.256486237049E-05 .883725425228E-02 .637024641037E-05 .515367742729E+04
.583200000000E+06 -.558793544769E-08 .272983685783E+01 -.163912773132E-06
.966808231215E+00 .255562500000E+03 .132473105401E+01 -.803176312660E-08
-.153577825704E-10 .100000000000E+01 .224400000000E+04 .000000000000E+00
.710000000000E+02 .000000000000E+00 -.125728547573E-07 .710000000000E+02
```

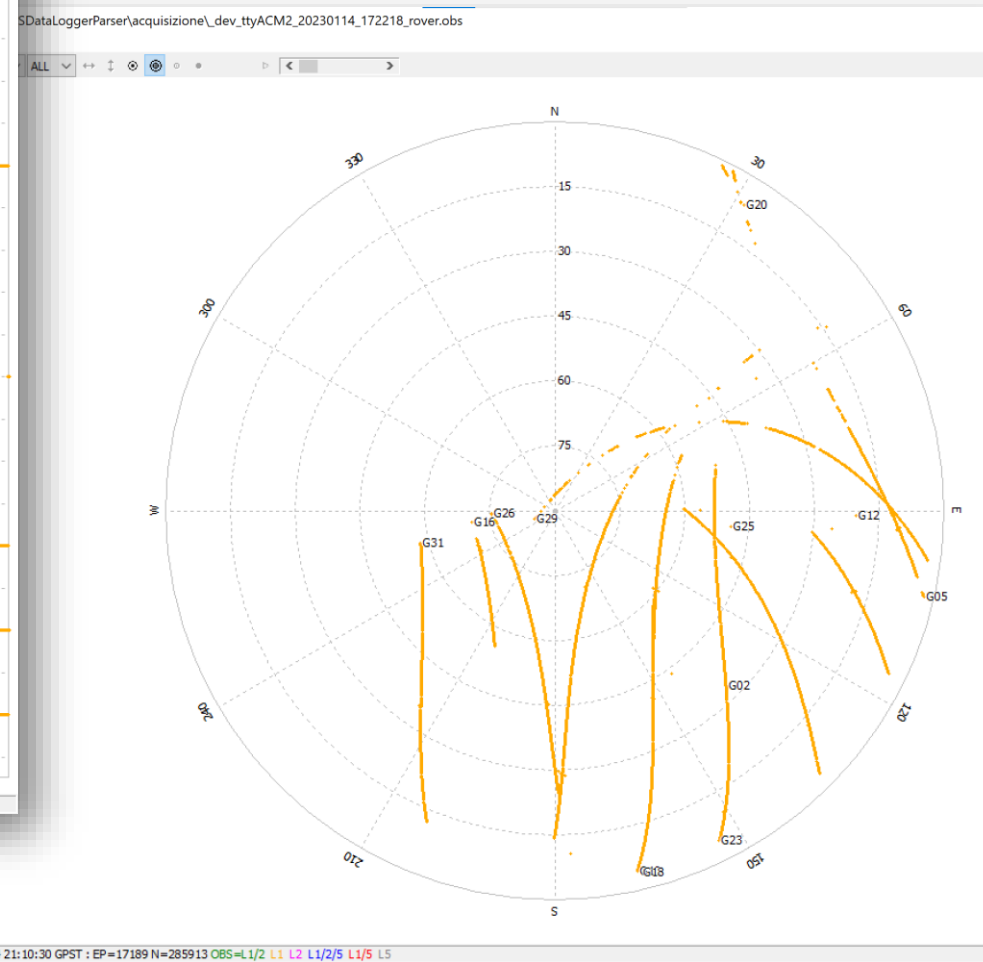
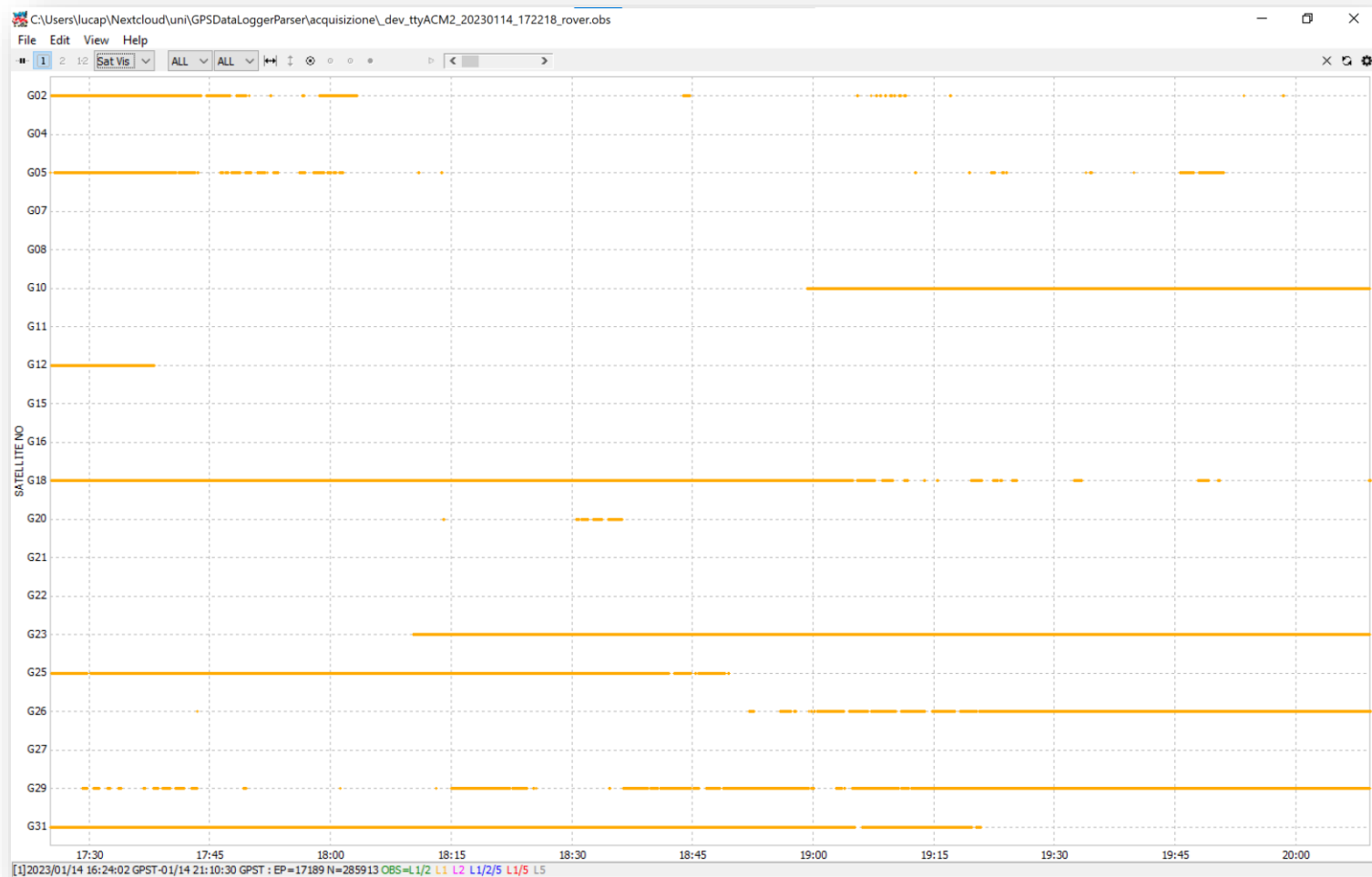
File .nav

```
_dev_ttyACM2_20230114_172218_rover - Blocco note di Windows
File Modifica Formato Visualizza ?
3.02 OBSERVATION DATA M: Mixed RINEX VERSION / TYPE
CONVBIN 2.4.2 20230116 110710 UTC PGM / RUN BY / DATE
log: /home/luca/Nextcloud/uni/GPSDataLoggerParser/acquisizioCOMMENT
format: u-blox COMMENT
MARKER NAME
MARKER NUMBER
MARKER TYPE
OBSERVER / AGENCY
REC # / TYPE / VERS
ANT # / TYPE
APPROX POSITION XYZ
ANTENNA: DELTA H/E/N
SYS / # / OBS TYPES
SYS / # / OBS TYPES
SYS / # / OBS TYPES
SYS / # / OBS TYPES
SYS / # / OBS TYPES
SYS / # / OBS TYPES
SYS / # / OBS TYPES
TIME OF FIRST OBS
TIME OF LAST OBS
SYS / PHASE SHIFT
SYS / PHASE SHIFT
SYS / PHASE SHIFT
SYS / PHASE SHIFT
SYS / PHASE SHIFT
SYS / PHASE SHIFT
GLONASS SLOT / FRQ #
GLONASS COD/PHS/BIS
END OF HEADER
> 2023 1 14 16 24 2.0040000 0 12
G 2 22775391.833 119685485.835 47.000
G12 23835417.420 125255949.977 40.000
G25 21655703.079 113801483.424 41.000
R17 20453979.988 109453346.387 44.000
S36 39030254.231 205105371.632 43.000
R18 23828307.717 127197032.311 40.000
G 5 26629830.863 3169.224 22.000
E15
```

File .obs



# RTKPLOT (.obs)



# RTKPOST

