GIS-E5050
Unit 5: GNSS positioning practice

Real-time hands-on

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Recall Unit 3: Next session

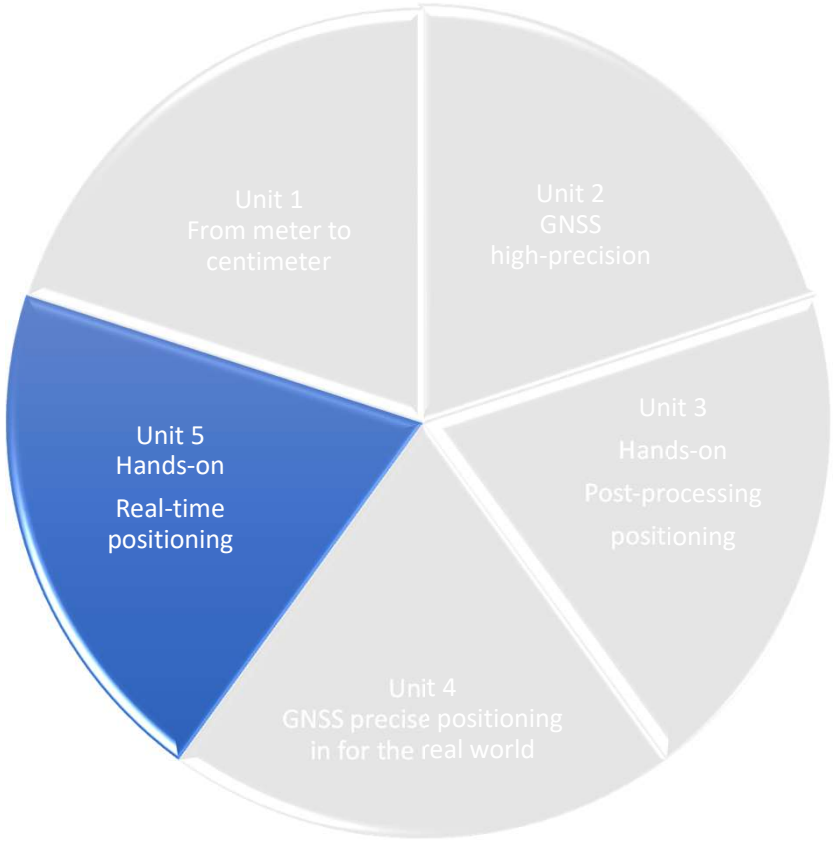
- We are going to do some of these things in **real-time!**
  - RTK
  - NRTK (VRS)
  - More PPP (perhaps … we shall see how we manage time)

Internet connection is needed!

- **NOTE:** To try RT-PPP one needs access to the necessary correction data streams. IGS RTS streams require additional user registration at https://register.rtcm-ntrip.org/cgi-bin/registration.cgi

Module structure

- Hands on with
- RTK
- NRTK (VRS)
- PPP (?)



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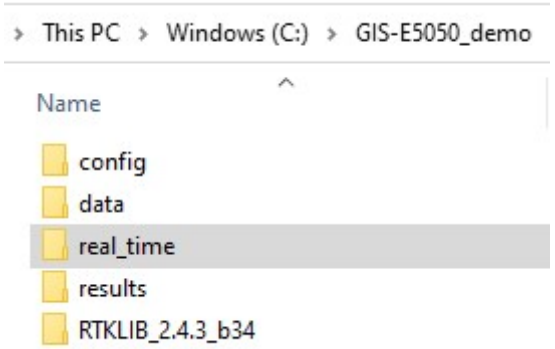
Real-Time Point

Preparation & simple example

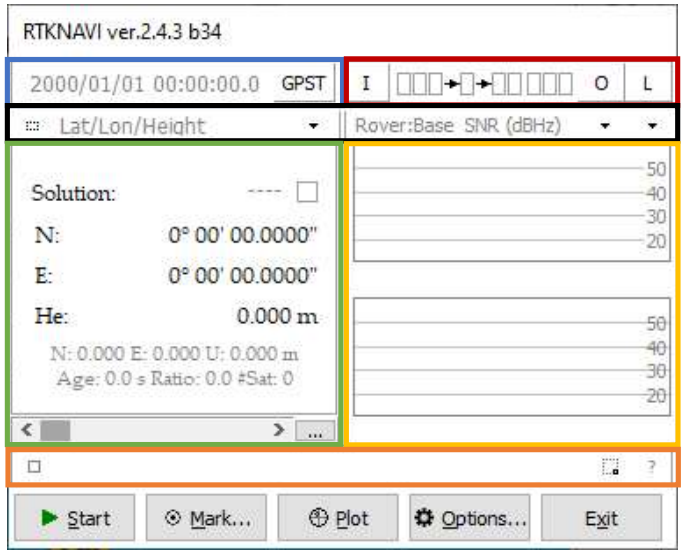
Preparation

- Fetch the real-time.zip from MyCouses
- Unzip
- Move the real-time directory to **X:\GIS-5050**



RTKNAVI

- **Time display**
- **Input/Output/Log settings**
- **Display switch**
  - Layout, Solution, Plot
- **Solution**
- **Information**
  - Signal level
  - Satellite visibility
- **Monitor & message**



More details in the manual, section 3.2!

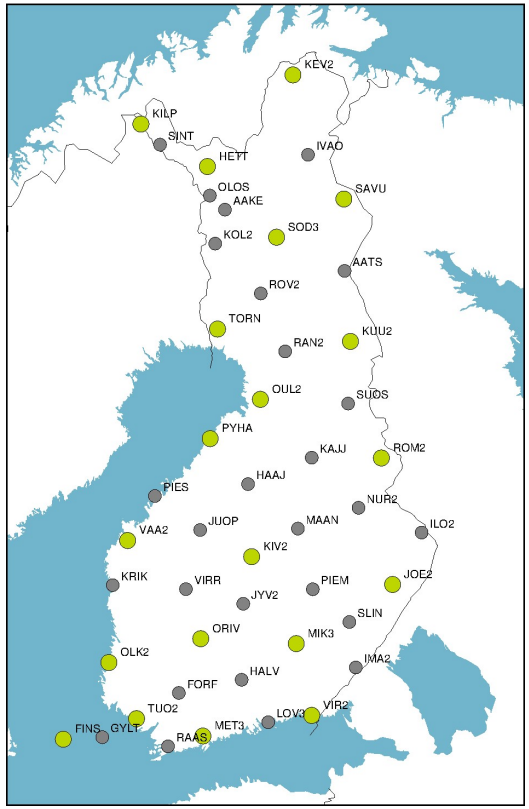
Quick demo

- **Rover stream (observation)**
- Type: NTRIP Client
  - Click Options
  - Caster: opencaster.nls.fi
  - Port: 2103
  - Mountpoint: RAW_MET3
  - UserID: *by email*
  - Password: *by email*
- Format: RTCM3

- **Correction stream (navigation)**
- Type: NTRIP Client
  - Click Options
  - Caster: ntrip.use-snip.com
  - Port: 2101
  - Mountpoint: RTCM3EPH
  - UserID:
  - Password:
- Format: RTCM3

Try different data stream

- Replace **MET3** with your favourite pick
- Go to Plot and change the Coordinate Origin
  - Manually, or
  - Use e1_finnref.pos
-
- How accurate is the solution?
- Could you improve the accuracy?



Further exploration

- **Congratulations!** Now, you are able to carry out positioning in real-time at your favorite FINNREF site.
- Explore further things based on your curiosity.

- Remember you can always come back to me at any time.

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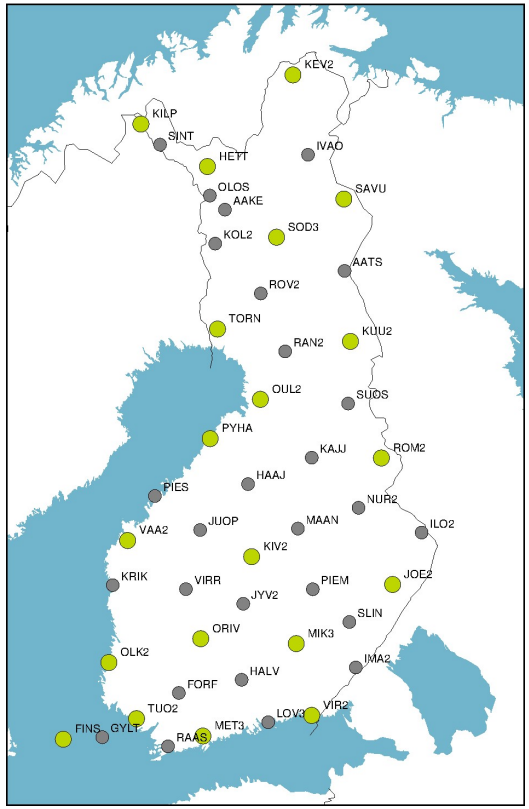
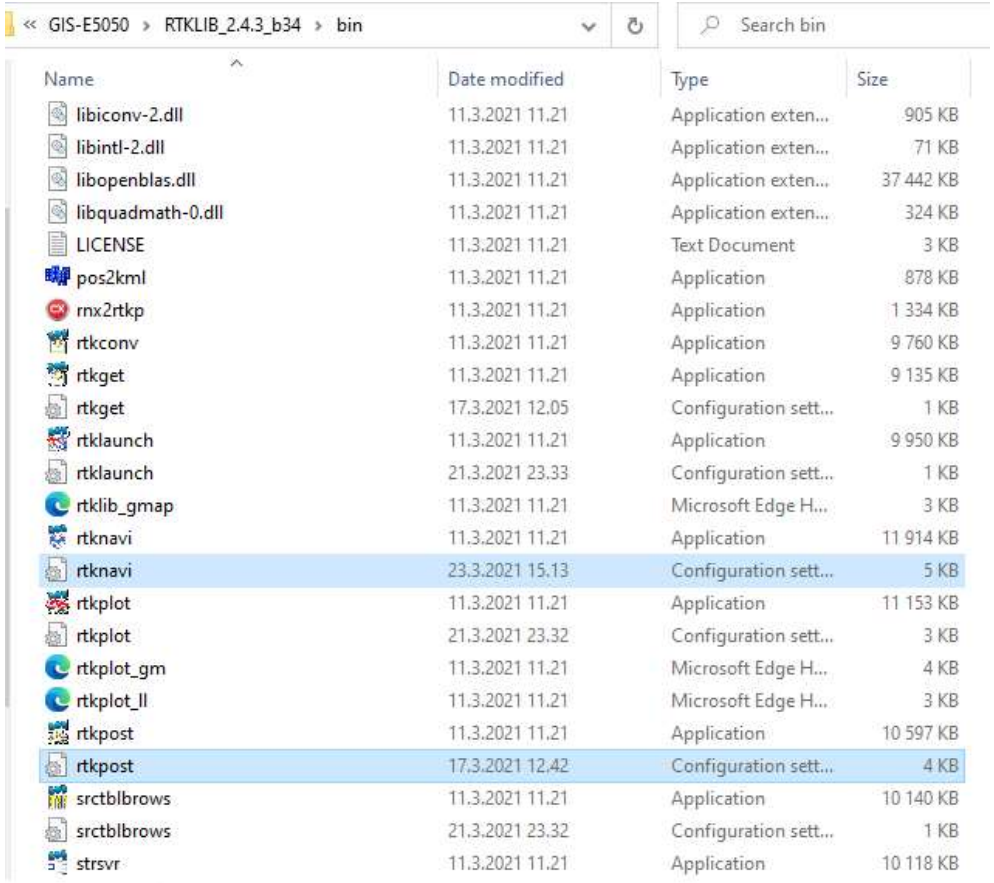
Real-Time Differential

DGPS in real-time with your favorite streams



Remember: Close-Remove-Restart

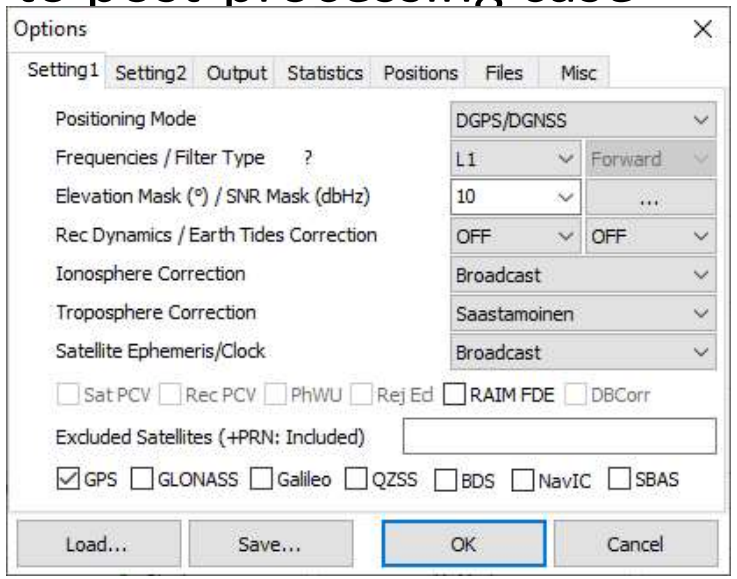
- If in trouble or loose track of the settings.
  - **Close** the app
  - **Remove** its *.ini file
  - **Restart** the app
- This is a fresh start, so …
- **Be patient** if the restart is slow. The receiver has no other a priori information.



Differential GPS

- Set the **Base** data stream in similar fashion you did for the **Rover**
- Pick the base location of your own
- Adjust the processing engine settings similarly to post-processing case (unit 3)

- Any challenges? Did we miss something?
- Does the solution type change?
- Is the solution more accurate?
- What is the distance between rover & base?



Show-and-Share

- Quick Share screen round (?)

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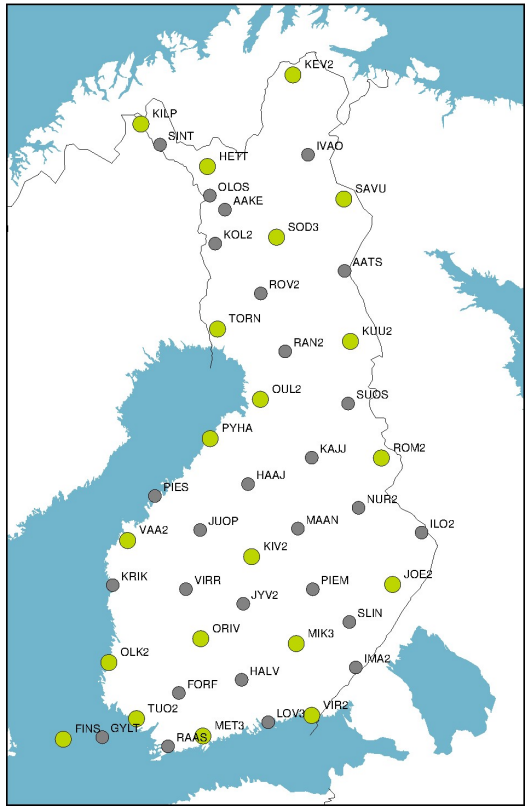
Real-Time Relative

RTK positioning @MET3 using MPAS



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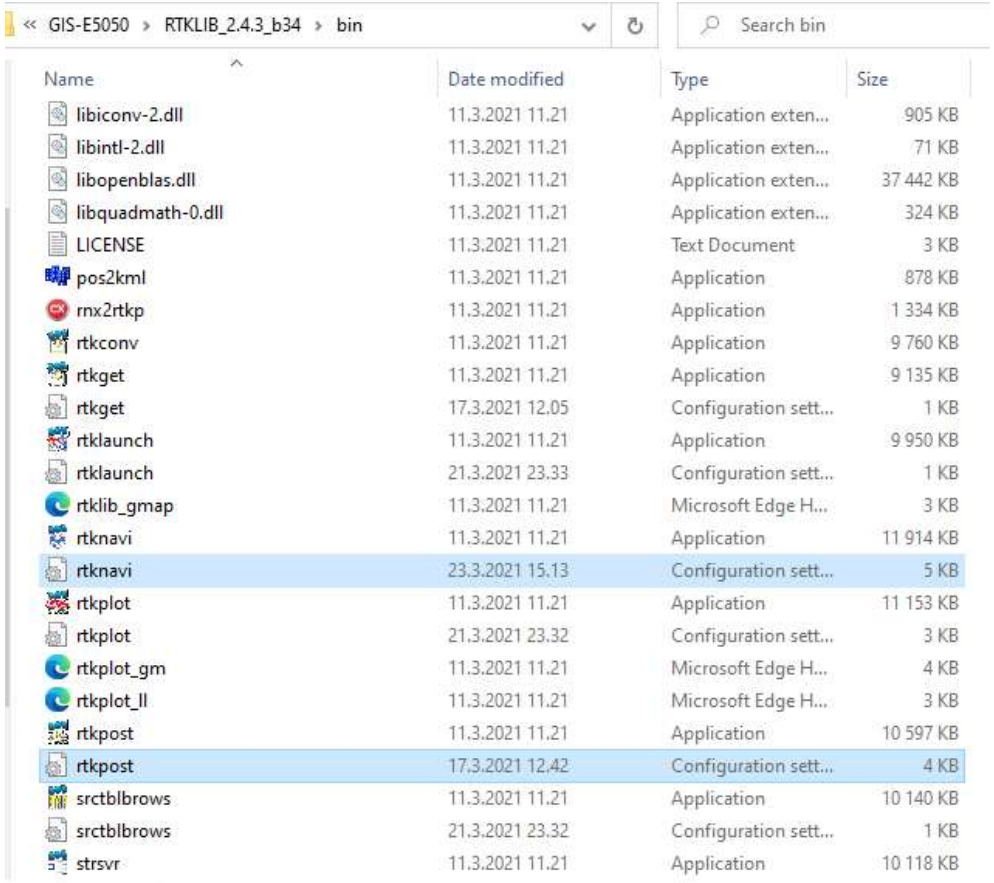
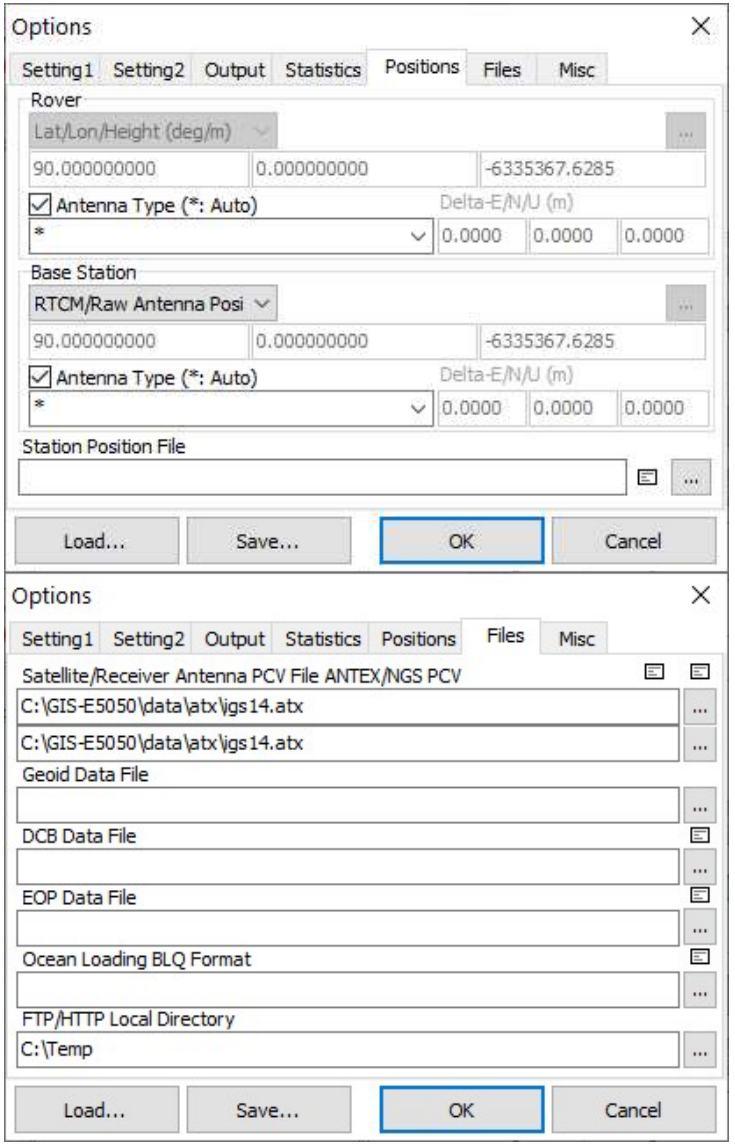


Set the RTK processing engine

- Load the **rtk.config** from X:\GIS-E5050\real-time\rtk
- Check the *Positions & Files* windows
- These windows set:
  - the type of antenna at base & rover
  - the PCOs & PCVs associated with these types
  - The base station coordinates
    - FINNREF streams carry base station coordinates in the EUREF-FIN coordinate frame
- Set them according to your app/case/scenario!



Set-or-Check data streams (1/2)

- **Rover stream (observation)**
- Type: NTRIP Client
  - Click Options
  - Caster: opencaster.nls.fi
  - Port: 2103
  - Mountpoint: RAW_MET3
  - UserID: *by email*
  - Password: *by email*
- Format: RTCM3

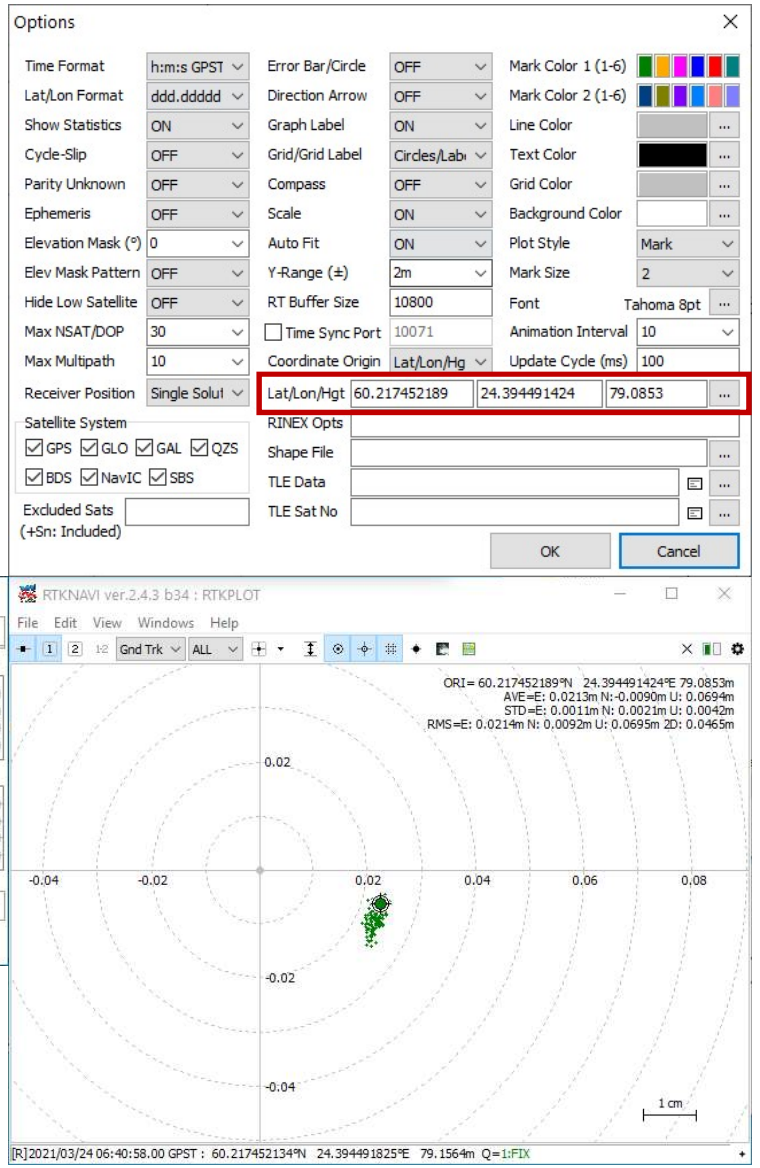
- **Correction stream (navigation)**
- Type: NTRIP Client
  - Click Options
  - Caster: ntrip.use-snip.com
  - Port: 2101
  - Mountpoint: RTCM3EPH
  - UserID:
  - Password:
- Format: RTCM3

Set-or-Check data streams (2/2)

- **Base stream (observation)**
- Type: NTRIP Client
  - Click Options
  - Caster: opencaster.nls.fi
  - Port: 2103
  - Mountpoint: RAW_MPAS
  - UserID: *by email*
  - Password: *by email*
- Format: RTCM3

Ajust the origin if needed

- According to the reference frame used by the base station (or the point(s) with respect to which you compute your position)
  - EUREF-FIN
  - ITRF2014
  - WGS84
  - Etc.
- Use coordinate convertion or transformation to switch between different representations



Show-and-Share

- Quick Share screen round (?)

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Further exploration

- **Congratulations!** Now, you are able to carry out real-time relative positioning using RTK method.
- Try a different baseline, such as OLOS – AAKE (~30 km)
- Check the impact of other constellations.
- Explore further things based on your own curiosity.

- Remember you can always come back to me at any time.

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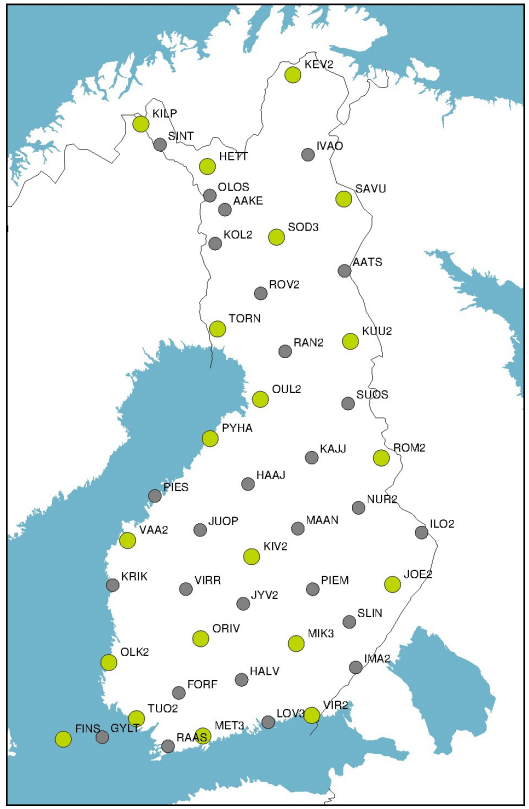
Network Real-Time

VRS-based positioning



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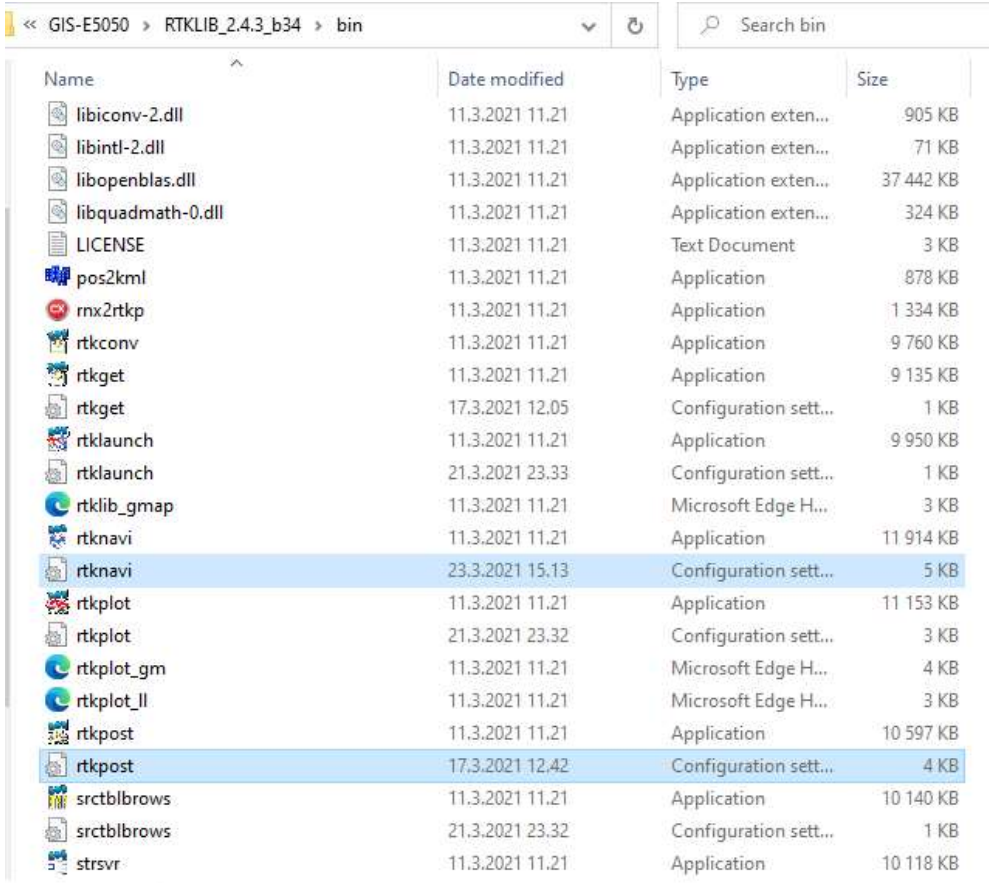


Set the VRS processing engine

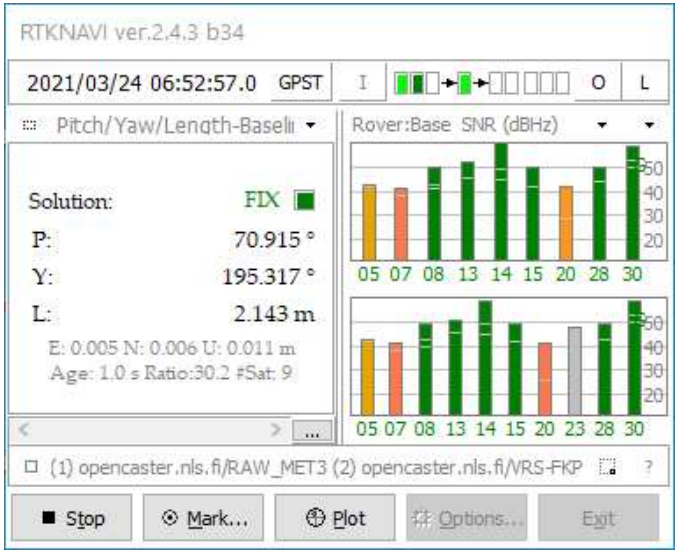
- Load the **vrs.config** from X:\GIS-E5050\real-time\nrtk
- Check the *Positions & Files* windows (as previously)

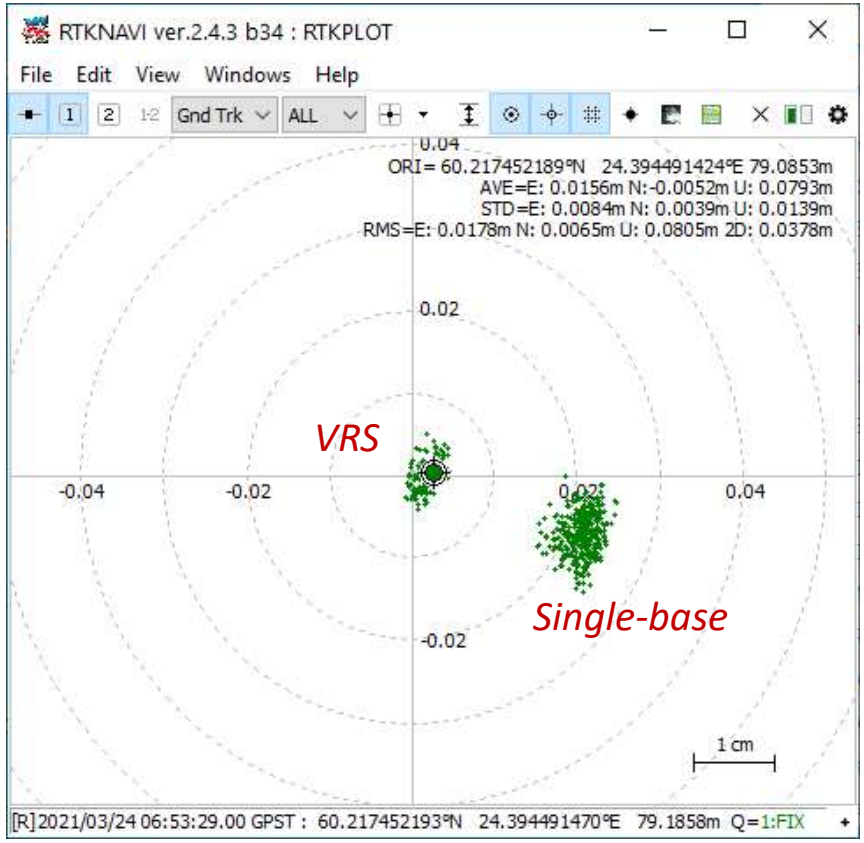
Set/Check the data streams

- **Rover stream (observation)**
- Type: NTRIP Client
  - Click Options
  - Caster: opencaster.nls.fi
  - Port: 2103
  - Mountpoint: RAW_MET3
  - UserID: *by email*
  - Password: *by email*
- Format: RTCM3

- **Base stream (correction data)**
- Type: NTRIP Client
  - Click Options
  - Caster: opencaster.nls.fi
  - Port: 2101
  - Mountpoint: VRS-FKP
  - UserID: *by email*
  - Password: *by email*
- Format: RTCM3

Start & Plot


RTKNAVI ver.2.4.3 b34
2021/03/24 06:52:57.0 GPST
Pitch/Yaw/Length-Baseli
Rover:Base SNR (dBHz)
Solution: FIX
P: 70.915 °
Y: 195.317 °
L: 2.143 m
E: 0.005 N: 0.006 U: 0.011 m
Age: 1.0 s Ratio:30.2 #Sat: 9
05 07 08 13 14 15 20 28 30
05 07 08 13 14 15 20 23 28 30
(1) opencaster.nls.fi/RAW_MET3 (2) opencaster.nls.fi/VRS-FKP
Stop
Mark...
Plot
Options...
Exit


RTKNAVI ver.2.4.3 b34 : RTKPLOT
File Edit View Windows Help
Gnd Trk
ALL
ORI= 60.217452189°N 24.394491424°E 79.0853m
AVE=E: 0.0156m N:-0.0052m U: 0.0793m
STD=E: 0.0084m N: 0.0039m U: 0.0139m
RMS=E: 0.0178m N: 0.0065m U: 0.0805m 2D: 0.0378m
0.04
0.02
-0.04
-0.02
-0.02
VRS
Single-base
1 cm
[R]2021/03/24 06:53:29.00 GPST : 60.217452193°N 24.394491470°E 79.1858m Q=1:FIX

Further exploration

- **Congratulations!** Now, you are able to carry out Network-based RTK positioning using VRS correction data.
- Try and pick up a different data stream.
- Recall you may need to change the coordinate origin in RTKPLOT.
- Test the decorrelation error. Simulate you move further from the initial position (i.e., manually give the Latitude/Longitude values in the NMEA GGA message)
- Explore further things based on your own curiosity.
- Remember you can always come back to me at any time.

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Show-and-Share

- Quick Share screen round (?)

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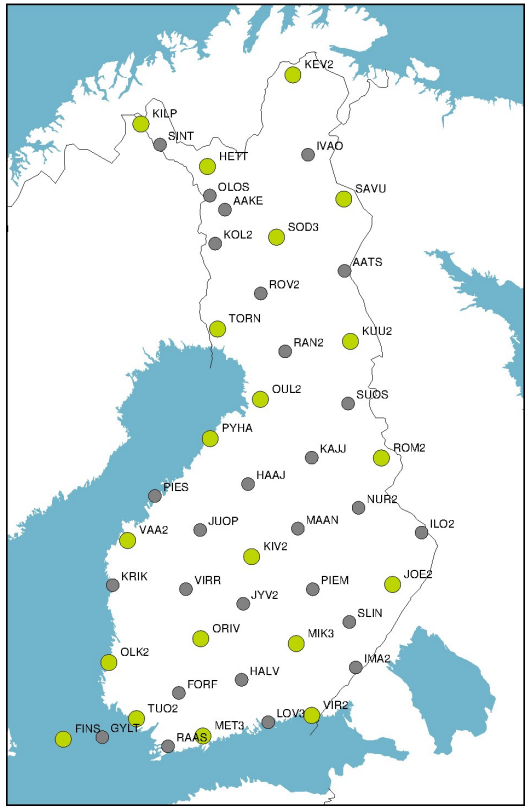
RT-PPP with IGS (optiona

Separate access to the IGS streams is needed



Obtain access to IGS RTS data streams

- To try RT-PPP one needs access to the necessary correction data streams. IGS RTS streams require additional user registration at https://register.rtcm-ntrip.org/cgi-bin/registration.cgi

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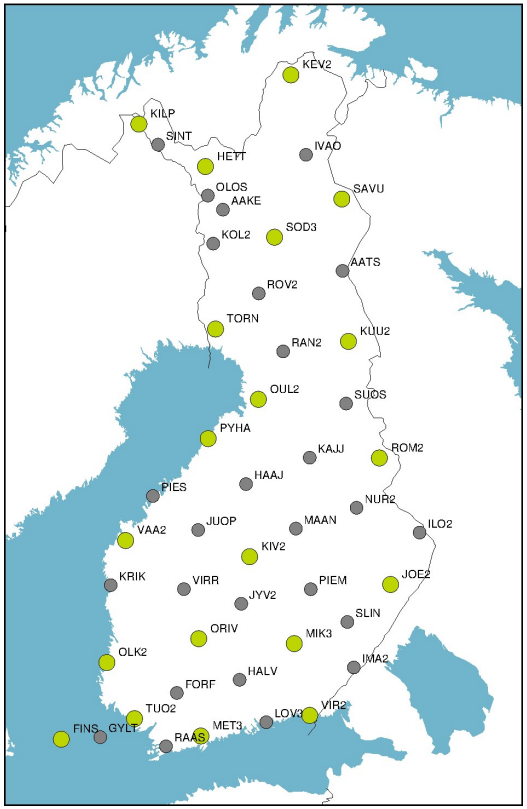
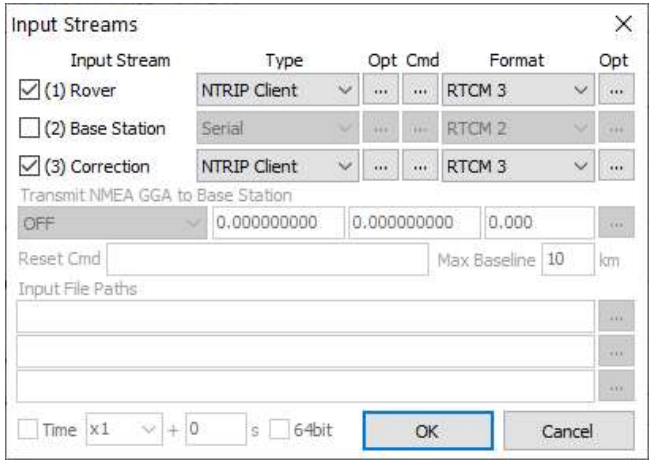
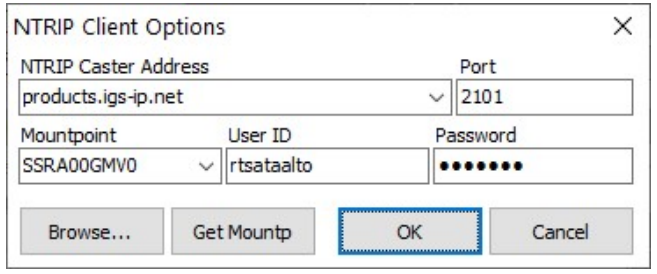
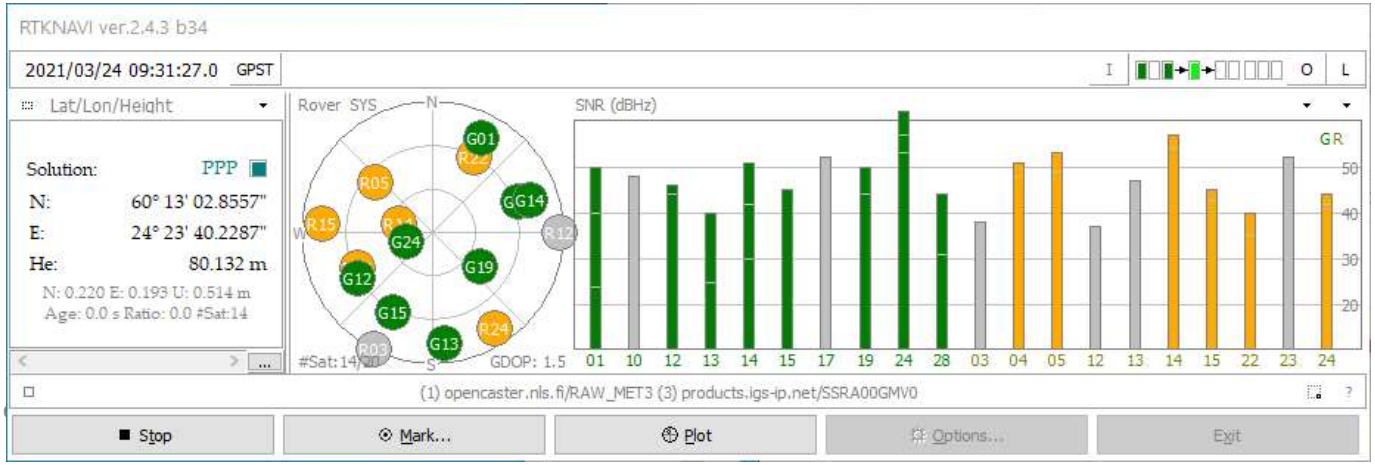
Rover + correction data



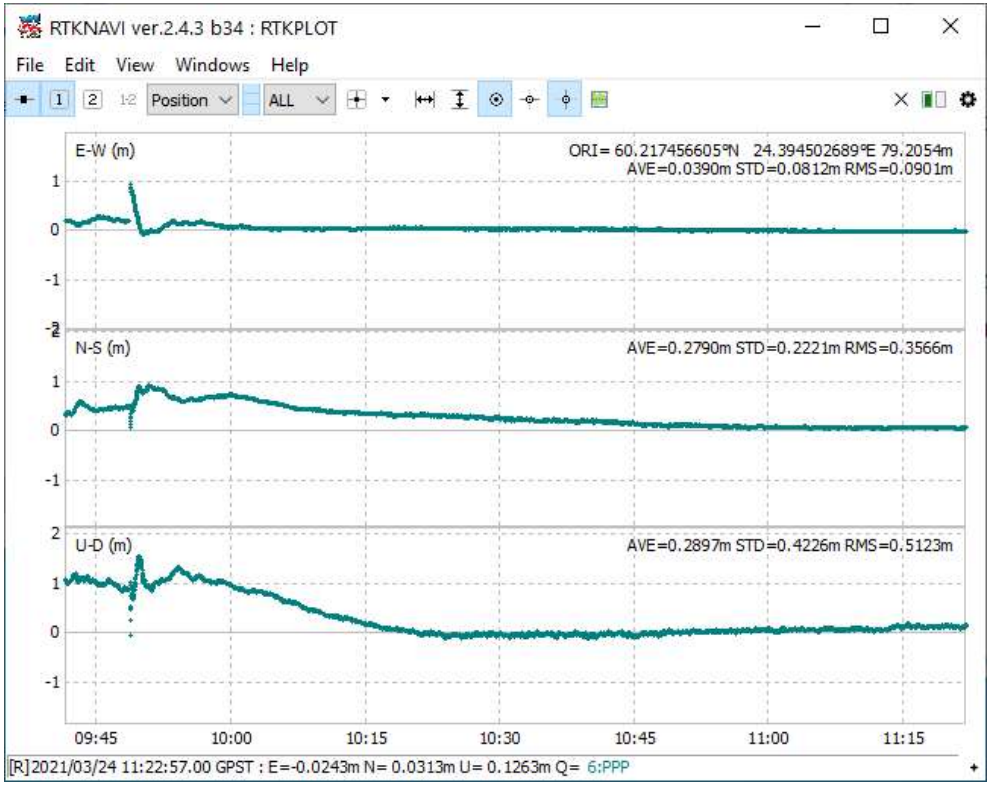


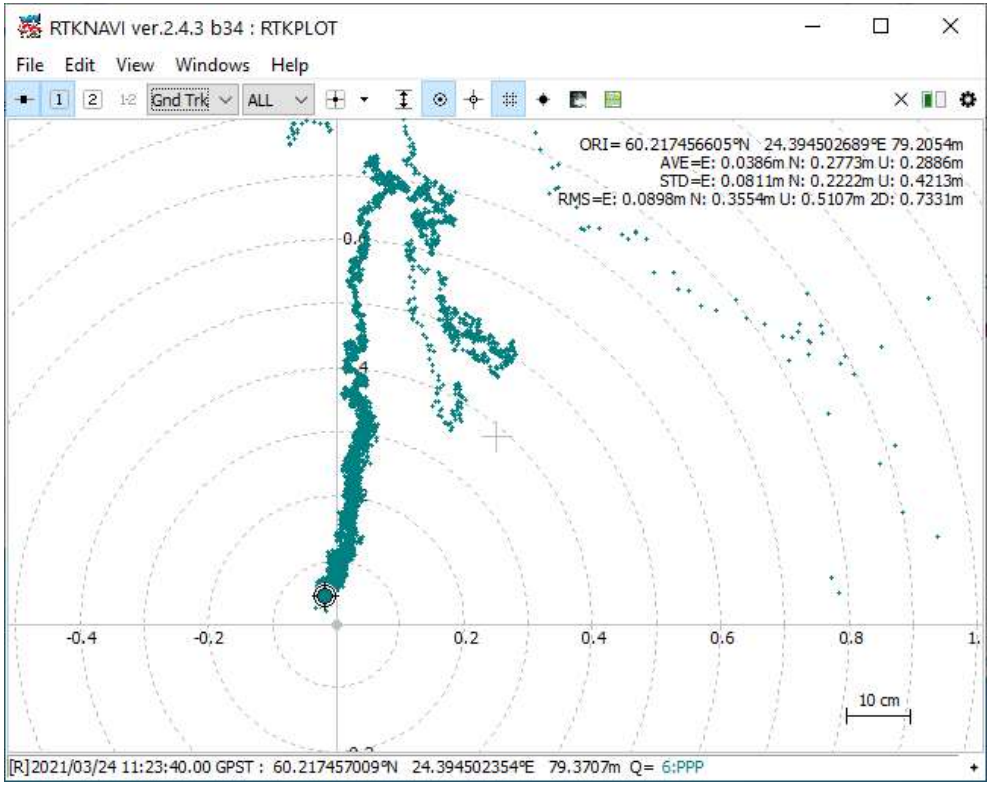




Email:

Convergence time





Time to wrap-up

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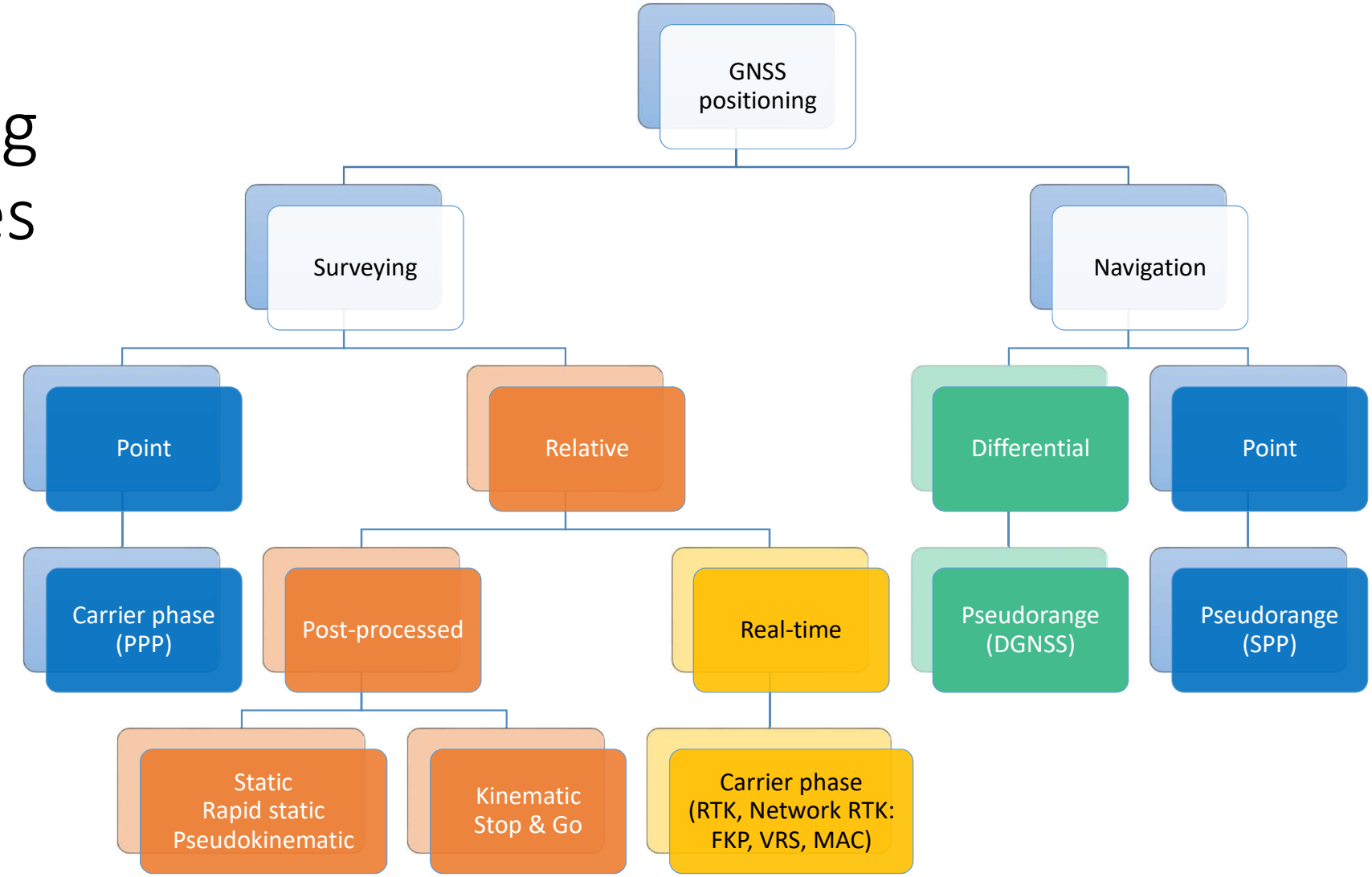
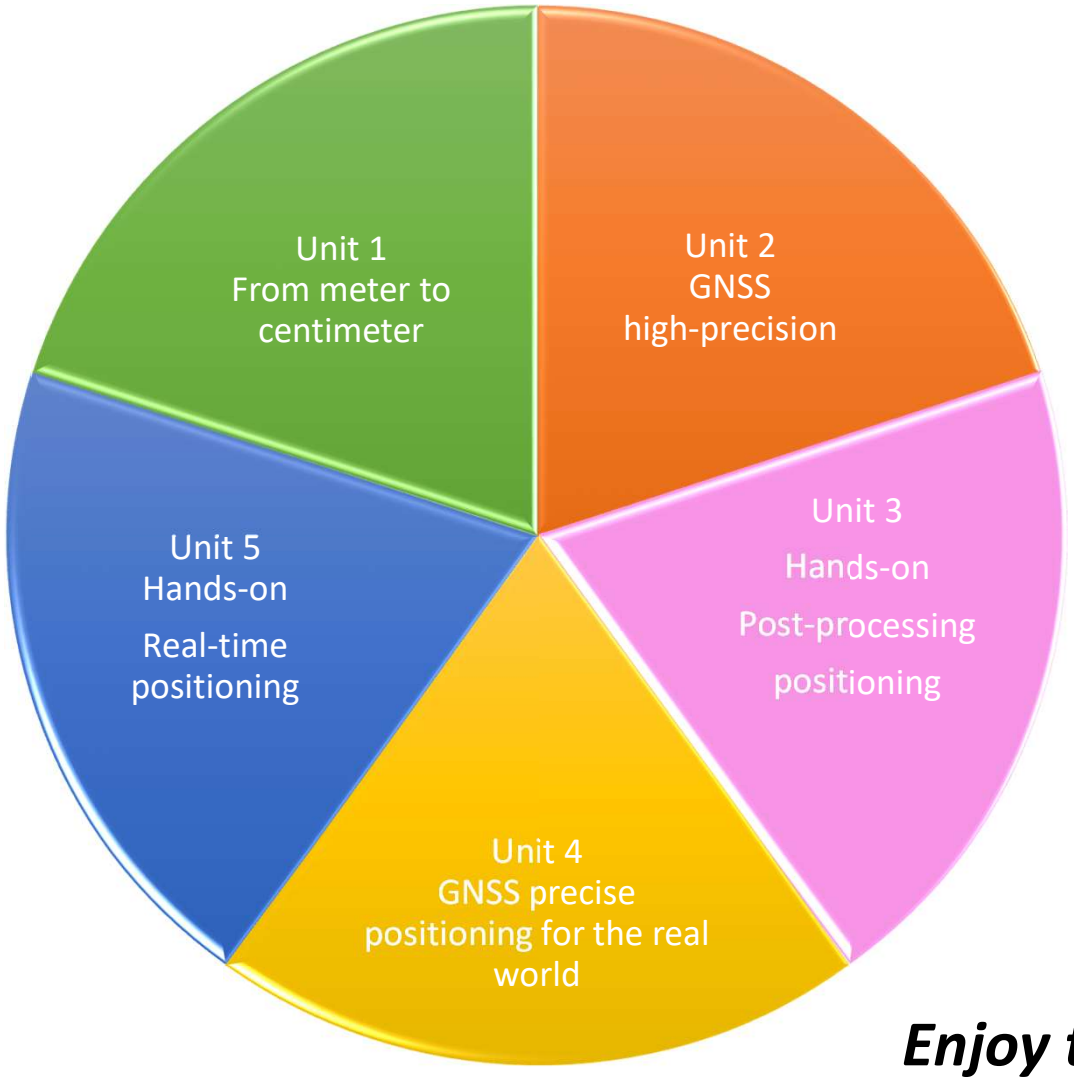
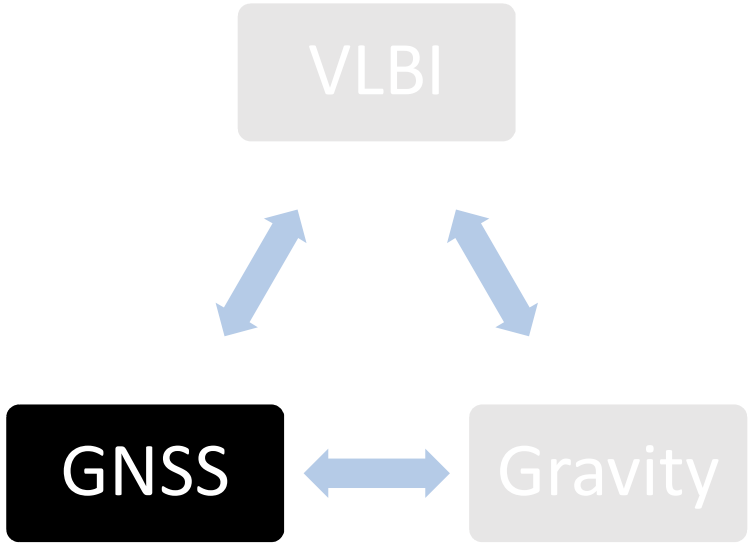
GNSS positioning techniques







Enjoy the rest of the course. Thank you!

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