Federal Agency for Cartography and Geodesy

Performance and Monitoring of the GNSS Data Center at BKG

GNSS DATA CENTER

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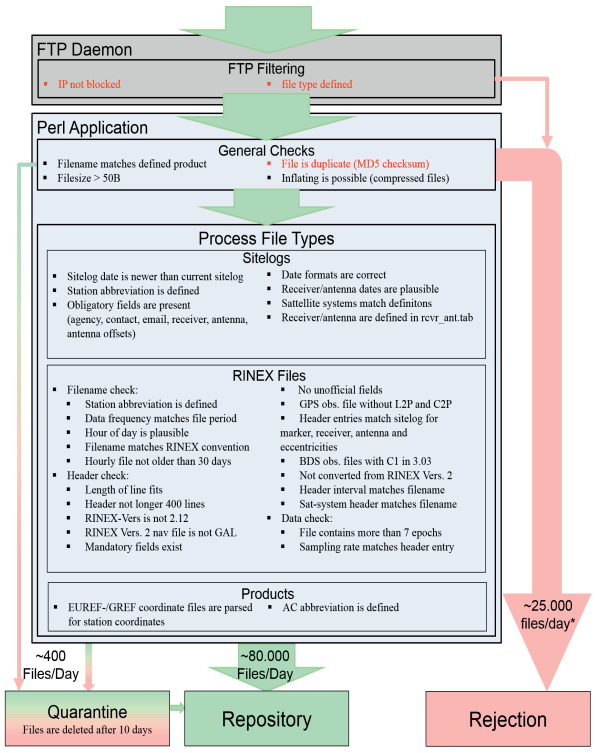
Processing Workflow

BKG's GNSS Data Center (GDC) is providing GNSS observational and navigational data and products for global, regional and national purposes. It is organized by projects (Fig. 1). This way, BKG-GDC can easily be extended for specific purposes. The access is possible via ftp (~ 80.000 uploads, ~ 600.000 downloads daily) and via http (~ 450 visitors per day).

To provide a viable basis of data for Analysis Centers and other clients BKG-GDC routinely performs data-checks for all incoming files (referring to filename, file type, size and content, see flowchart Fig. 2).

GREF	BRDC	YYYY	DDD		Spliced RINEX Navigaton Files
	BRDC_v3	YYYY	DDD		
	highrate	YYYY	DDD	HH	RINEX Navigation and Observation Data (1Hz)
	highrate_v3	YYYY	DDD	HH	
	nrt	DDD	HH		RINEX Navigation and Observation Data (30 s)
	nrt_v3	DDD	HH		
	obs	YYYY	DDD		
	obs_v3	YYYY	DDD		
	products	wwww			Geocentric Station Coordinates, Atmospheric Parameters
	station				Metadata on Stations
	reports				Information on File Availability
EUREF	BRDC	YYYY	DDD		Spliced RINEX Navigaton Files
	BRDC_v3	YYYY	DDD		
	highrate	YYYY	DDD	HH	RINEX Navigation and Observation Data (1Hz)
	highrate_v3	YYYY	DDD	HH	
	nrt	DDD	HH		RINEX Navigation and Observation Data (30 s)
	nrt_v3	DDD	HH		
	obs	YYYY	DDD		
	obs_v3	YYYY	DDD		
	products	wwww			Geocentric Station Coordinates, Atmospheric Parameters
	station				Metadata on Stations
	reports				Information on File Availability
EPNreproz	products	wwww			Geocentric Station Coordinates, Atmospheric Parameters
IGS	BRDC	YYYY	DDD		Spliced RINEX Navigaton Files
	BRDC_v3	YYYY	DDD		
	highrate	YYYY	DDD	HH	RINEX Navigation and Observation Data (1Hz)
	highrate_v3	YYYY	DDD	HH	
	nrt	DDD	HH		RINEX Navigation and Observation Data (30 s)
	nrt_v3	DDD	HH		
	obs	YYYY	DDD		
	obs_v3	YYYY	DDD		
	products	EOP_ERP			Earth Rotation Parameters
		glo_orbits	wwww		Orbit and Clock Corrections, Atmospheric Parameters
		orbits	wwww		
		mgex	wwww		
	station				Metadata on Stations
	reports				Information on File Availability
MGEX	BRDC	YYYY	DDD		Spliced RINEX Navigation Files
	BRDC_v3	YYYY	DDD		
	highrate	YYYY	DDD	HH	RINEX Navigation and Observation Data (1Hz)
	highrate_v3	YYYY	DDD	HH	
	nrt	DDD	HH		RINEX Navigation and Observation Data (30 s)
	nrt_v3	DDD	HH		
	obs	YYYY	DDD		
	obs_v3	YYYY	DDD		
	station				Metadata on Stations
	reports				Information on File Availability
NTRIP	BRDC	YYYY	DDD		Spliced RINEX Navigation Files
	BRDC_v3	YYYY	DDD		

Fig. 1: Projects, sub-directory structure and contents of each sub-directory (Goltz et al., 2018)



* On 26th of May 2017 we had 105.000 duplicates, with one station uploading 87075 duplicates!

Fig.2: Scheme of Data Processing

The quality of the RINEX files is monitored and documented on a daily basis. BKG-GDC checks RINEX2 files using teqc[1], for RINEX3 files Anubis[2] and BNC[3] are default. The extracted metadata is stored in the database and key performance indicators are available for each station in a public station list.
The metadata is only used for monitoring and documentation; no automated reporting to station operators is currently implemented. Station operators can filter the list by using e. g. "bkg" as agency to get relevant information.

Figs. 3 and 4: Information about files and processing errors is available via file download or web interfaces.

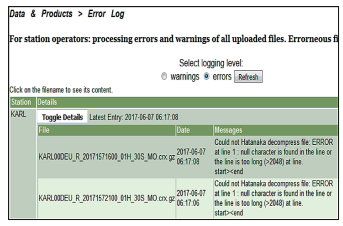


Fig. 3: Error Reporting (example)

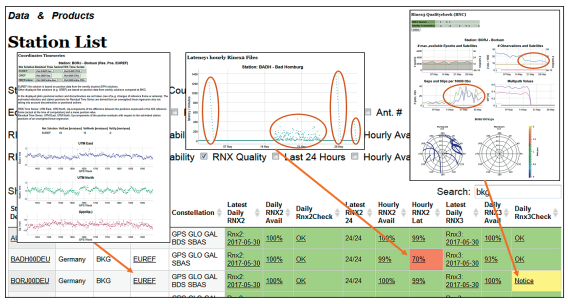


Fig. 4: Examples for metadata accessible in menu "Station List"

Performance of BKG-GDC

The performance of the data center is very much affected by erroneous uploads and downloads of the files.

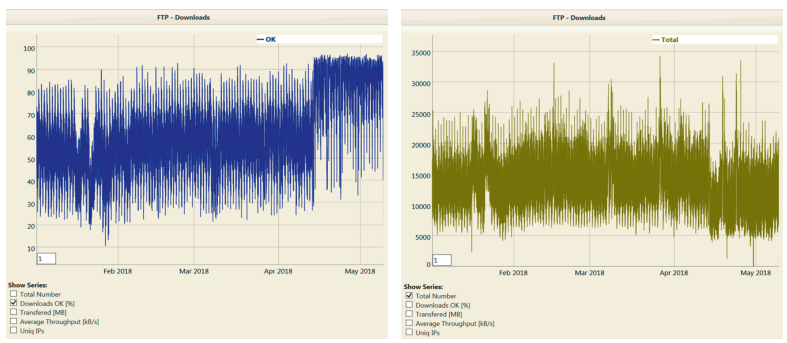


Fig. 6:
Percentage of successful ftp downloads in 2018. The apparent jump (improvement) around April 12 can be explained by a significant reduction of the absolute number of downloaded files (right), probably caused by one single user.

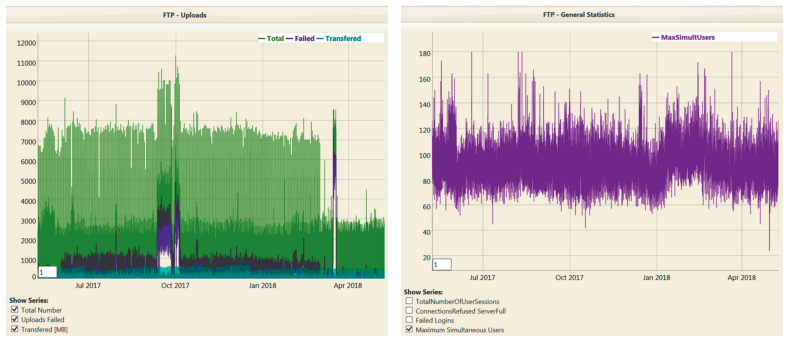


Fig. 7:
(left): The total number of uploads, the amount of transferred data and the upload failures show some incidents. From mid March 2018 on, one major incident seems to be eliminated.
The right figure shows that the number of simultaneous users is quite stable in the range of 90 to 100.

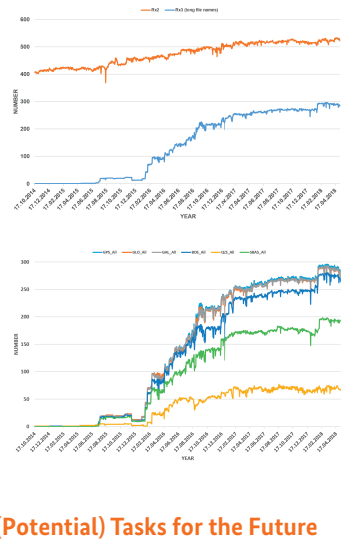
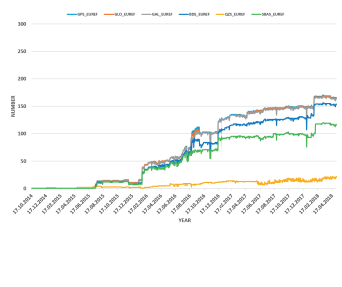


Fig. 5 (left): Number of RINEX2 and RINEX3 files (long filenames) stored in BKG-GDC for the last four years

Fig. 5 (bottom): Number of RINEX3 files with GNSS constellations and augmentation systems globally (left) and for EUREF stations



(Potential) Tasks for the Future

- Applying GDPR, optimally in accordance with, e. g. the EUREF GB
- Removing specific sub-directories for RINEX3 files
- Contribution to EU project "Galileo Reference Center-Member States" (GRC-MS): extension of the BKG-GDC by few specific projects, adding new products
- Contribution to EPOS Thematic Core Service "GNSS": implementation of specific software (GLASS) on top of existing system might cause problems

References and links:

[1]teqc https://www.unavco.org/software/data-processing/teqc/teqc.html
[2]Anubis http://www.pecny.cz/gop/index.php/gnss/sw/anubis
[3]BKG Ntrip Client (BNC) https://igs.bkg.bund.de/ntrip/bnc
Goltz et al., 2018:
M. Goltz, P. Neumaier, W. Söhne, A. Stürze, E. Wiesensarter, J. Dostal – BKG Regional Data Center, in: IGS Technical Report 2017, Eds. A. Villiger, R. Dach, pages 138 – 145, May 2018

Further information

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