EPN Central Bureau Upgrades in Support of Evolving EUREF Priorities

C. Bruyninx, Q. Baire, J. Legrand, E. Pottiaux
Royal Observatory of Belgium, epncb@oma.be
http://www.epncb.oma.be/ ; ftp://epncb.oma.be/

Abstract

EUREF Permanent Network (EPN) Central Bureau managed according to directives set up by EUREF Technical Working Group.

EPN Central Bureau (CB) upgraded to respond to:

❑ Growing importance of real-time GNSS data distribution
→Upgraded monitoring procedures for real-time data streams

❑ Multiple GNSS systems, RINEX v3 format & station naming
→Switch to 9-char station name
→Full integration of RINEX v3

❑ EPN Densification Working Group
→New dedicated section of EPN CB web site

Real-time Monitoring

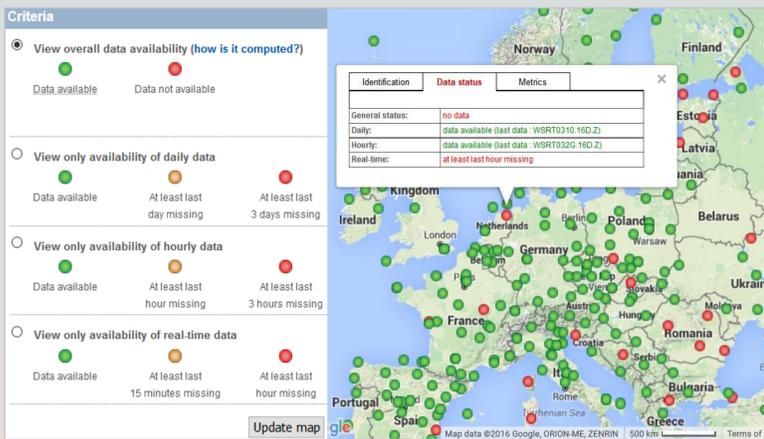❑ New quick overview of network status (278 EPN stations)

Fig. 1: EPN network status web page http://epncb.oma.be/_networkdata/network_status/ showing which stations are tracking now. Status is green when: Real-time stations (45%)→ data available last 15 minutes ; Hourly stations (98%)→data available for the last hour ; Daily stations (all) → data available for the last day.

❑ Update of "Guidelines for EPN Data Centres & EPN Broadcasters"
http://epncb.oma.be/_documentation/guidelines/guidelines_data_centres.pdf
(March 2015) includes rules

✓ For unifying the content of broadcaster sourcetables

✓ To improve consistency of real-time streams (47% of EPN stations) provided at three EPN regional broadcasters (ASI, BKG, and ROB)

Fig. 2: EPN stream availability at three regional EPN broadcasters (ASI – Italy, BKG – Germany, ROB – Belgium)
http://epncb.oma.be/_networkdata/data_access/real_time/status.php

❑ Upgraded real-time monitoring of all EPN broadcasters (ASI, BKG, ROB) :

✓ Crosschecks of equipment metadata in streams with site log and sourcetable

✓ Crosschecks of message types and sampling rates in streams with sourcetable and streams from other broadcasters

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ASI       UNTR0   RCVR in sourcetable TPS ODYSSEY_E <-> TPS NET-G3A in site log
ASI/BKG/ROB TRDS0  Inconsistent format RTCM 3.0/RTCM 3.1/RTCM 3.1
ASI/BKG/ROB JOZ20  Inconsistent messages
          ASI-TBL  1004(1),1006(60),1008(60),1012(1)
          ASI-STR  1004(1),1006(15),1008(15),1012(1),1033(15)
          BKG-TBL  1004(1),1006(15),1008(15),1012(1),1033(15)
          BKG-STR  1004(1),1006(15),1008(15),1012(1),1033(15)
          ROB-TBL  1004(1),1006(15),1008(15),1012(1),1033(15)
          ROB-STR  1004(1),1006(15),1008(15),1012(1),1033(15)
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Fig. 3: EPN stream availability web page at three regional EPN broadcasters (ASI – ITA, BKG – DEU, ROB – BEL)
ftp://epncb.oma.be/pub/center/broadcasters/COMPARE_BRDC.txt

Streams are checked sequentially for limited number of minutes. List of message types detected in streams depends on monitoring time.
More monitoring result details are available from
ftp://epncb.oma.be/pub/station/real_time/.

Multi-GNSS

Update of EPN station guidelines
http://epncb.oma.be/_documentation/guidelines/guidelines_station_operationalcentre.pdf (Oct 2015) :
RINEX v3 (long filename) expected for stations providing more than dual frequency GPS+GLO

❑ MySQL database + major web pages updated for new 9-char station name

❑ RINEX v2 & v3 metadata checks (equipment & observed satellite systems) vs. site log
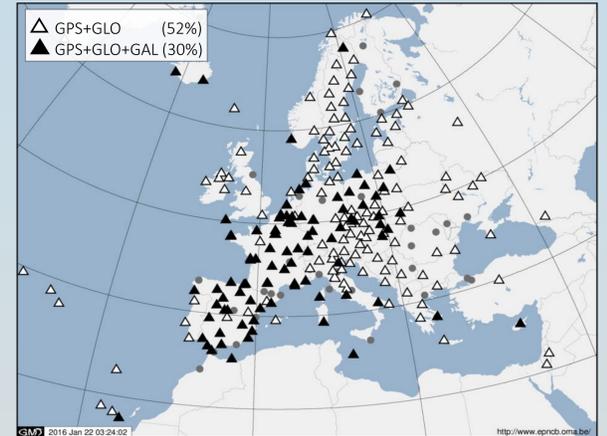
❑ RINEX v2 & v3 data availability monitored

Fig. 4: EPN stations tracking GPS+GLO and GPS+GLO+GAL

Fig. 5: Extract of individual station web page with info on availability if RINEX 3 data (long or short filenames)
http://epncb.oma.be/_networkdata/siteinfo4onestation.php?station=BRUX

❑ Anubis data quality check software (Vaclavovic and Dousa, in press) routinely run on all RINEX 2 and 3 data:

✓ Data quality control results presently kept internally for evaluating capability to detect already known (historical) tracking problems.

✓ Used operationally for monitoring tracked satellite constellations and frequencies:

• Verification of agreement of satellite systems in station log file and actual constellations available in submitted RINEX v2 & v3 files (number of inconsistencies dropped from 50+ to less than 10)
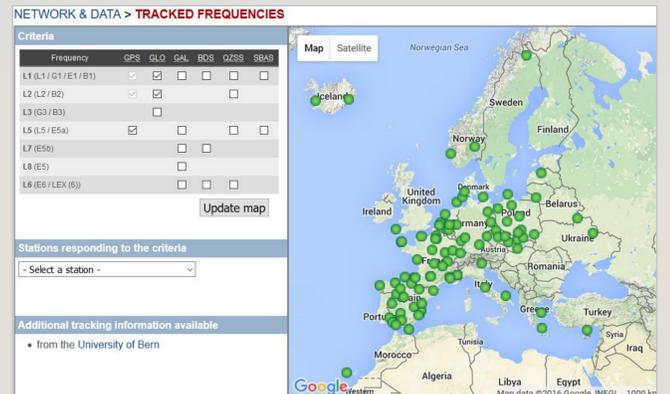
• Map of tracked frequencies

Fig. 6: New web page with overview of the frequencies tracked at each EPN station:
http://epncb.oma.be/_networkdata/trackedfrequencies.php

EPN Densification

❑ Ongoing effort to densify EPN coordinates & velocities with solutions provided by national GNSS networks (lead by A. Kenyeres).

❑ EUREF does NOT collect observations, but collects weekly SNX and station metadata (site logs).

❑ EPN CB on line site log submission adapted (less strict than for EPN stations) to accept site logs from EPN densification sites.

❑ 587 EPN densification station logs collected up to know from 2928 stations

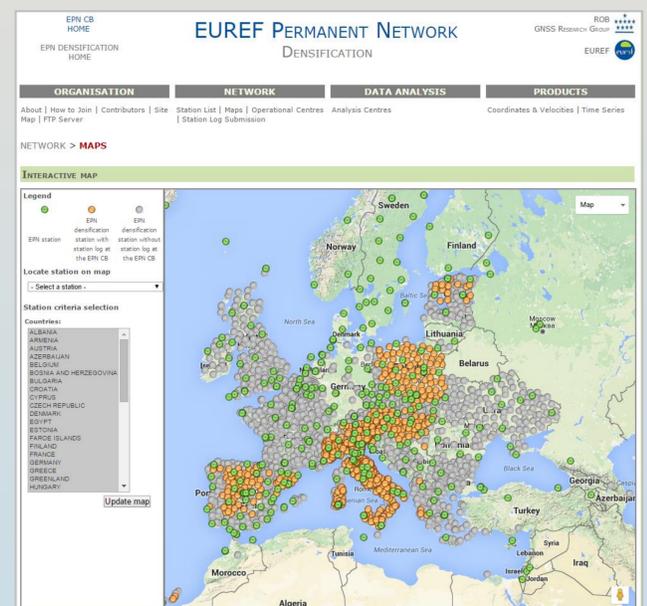Fig. 7: EPN CB content management by operators of EPN densification stations

Fig. 8: New section of the EPN CB web site in response to EPN densification activities:
http://epncb.oma.be/_densification

Plans

❑ Full switch to multi-GNSS RINEX v2 & v3 data quality check software
❑ Machine-to-machine exchange of station metadata :
✓ No separate site log submission for EPN and IGS
✓ Automatic site log updates (web services), needed by operators of large networks
✓ Requested by European Plate Observing System (EPOS)
❑ Re-organization of Analysis Centres (introduction of new types of Analysis Centres)