



Networked Transport of RTCM via Internet Protocol (Ntrip)

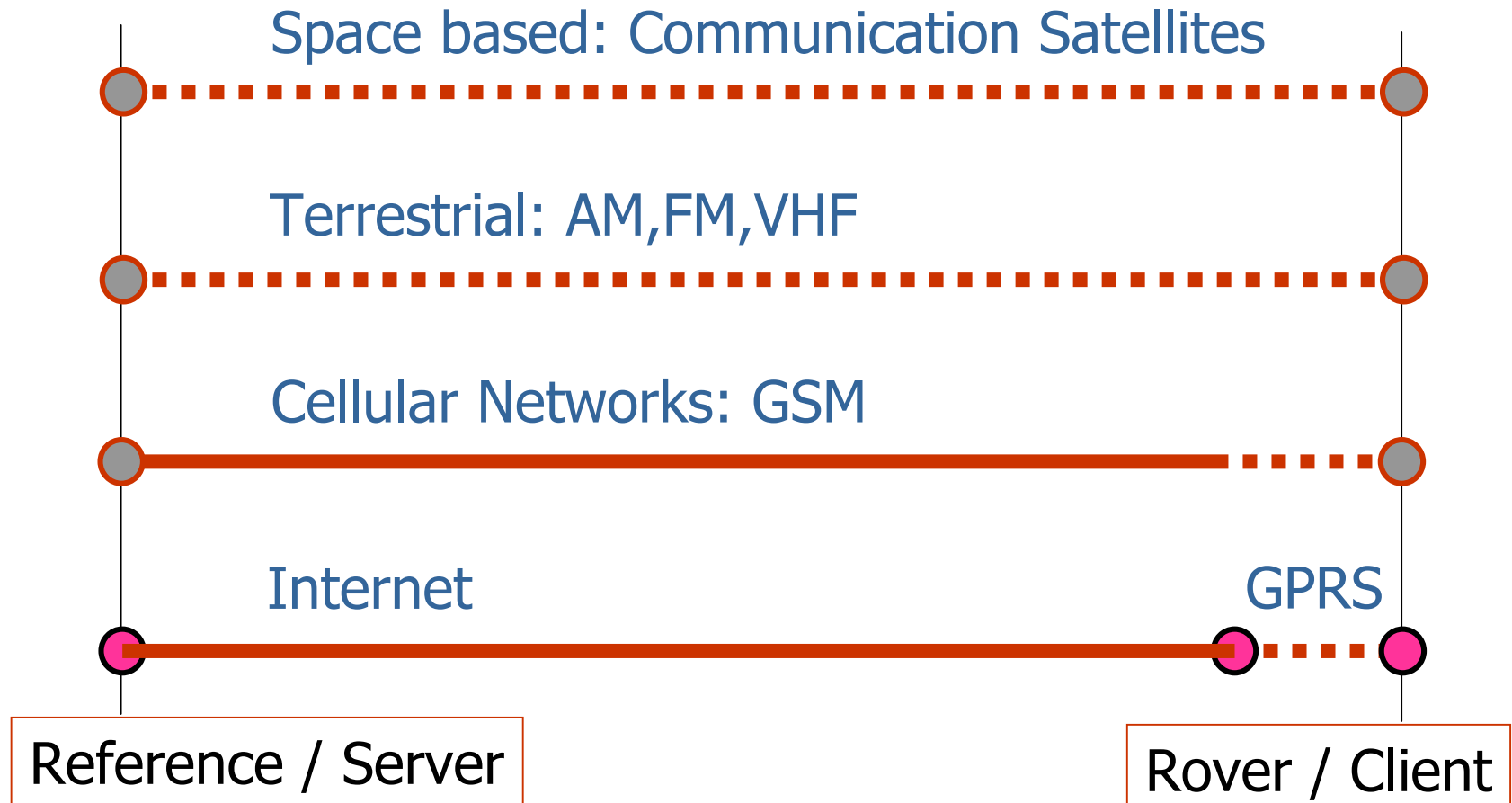
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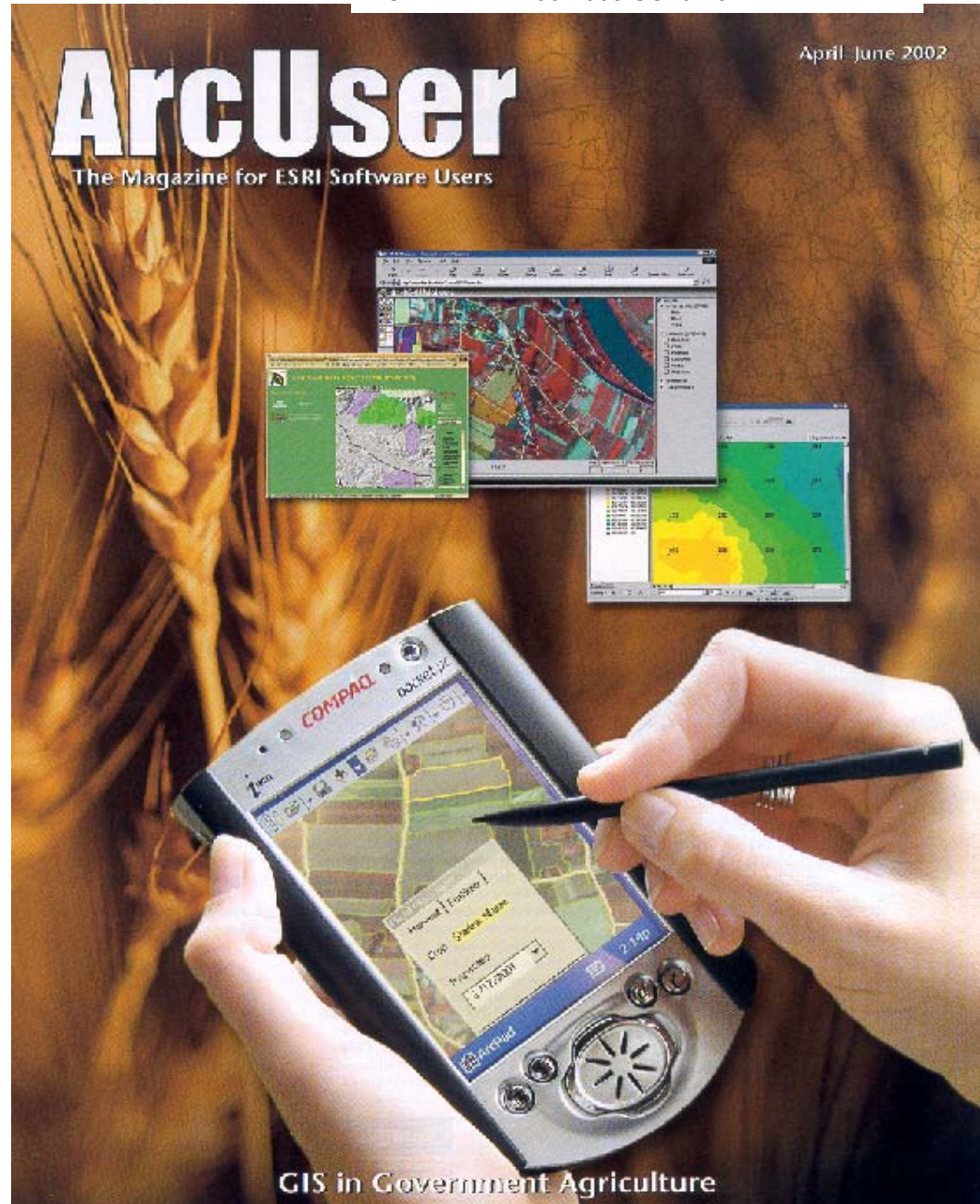
IAG, Saporro, Japan, 2003-07-02

GNSS Real-Time Communication



Simultaneous Real-Time Access to Distributed Data: GIS & DGPS

Pocket PC & GPRS Modem



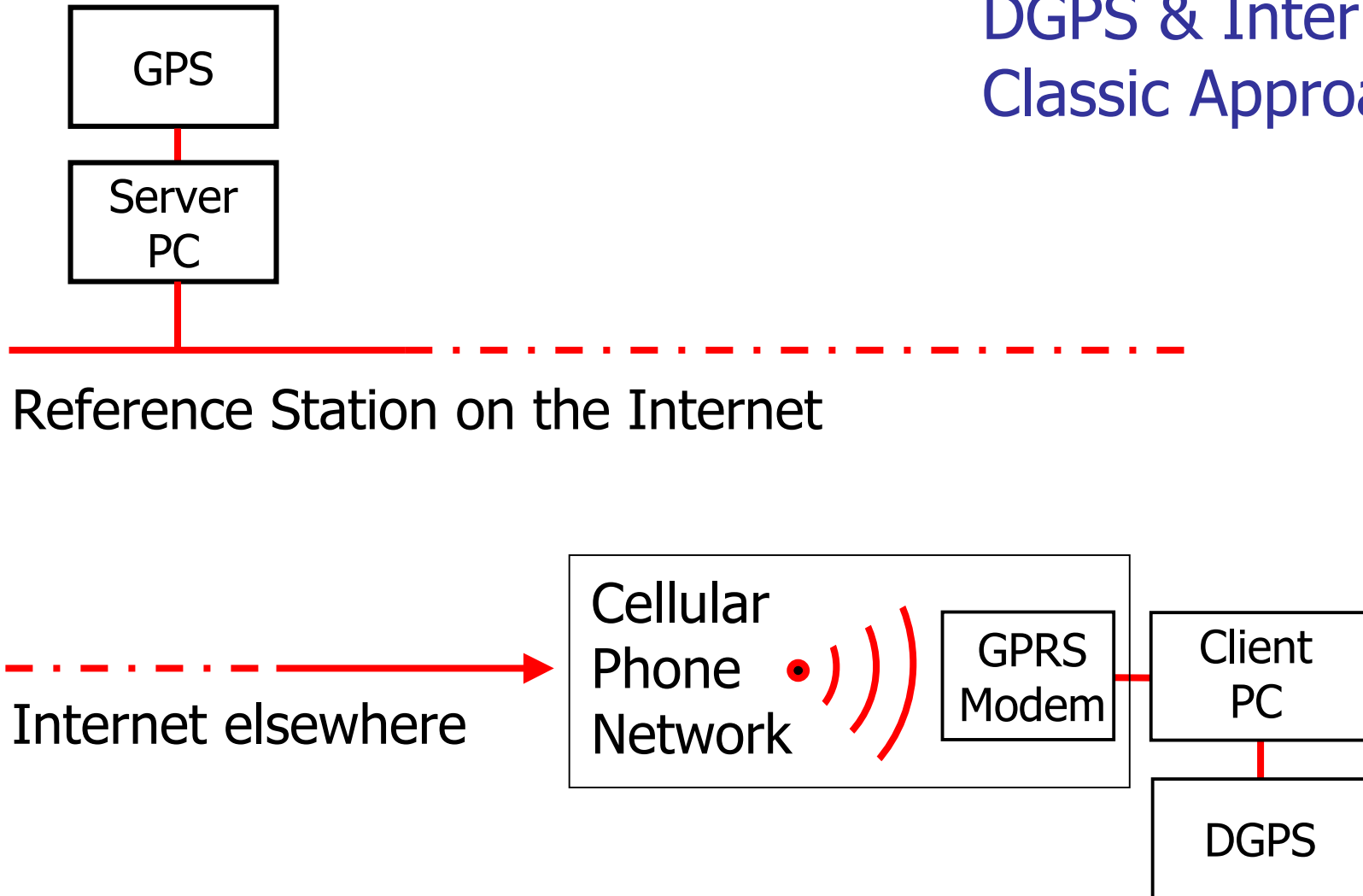


DGPS/RTK Data Rates

- DGPS 0.5 kbits/s
- RTK 5 kbits/s

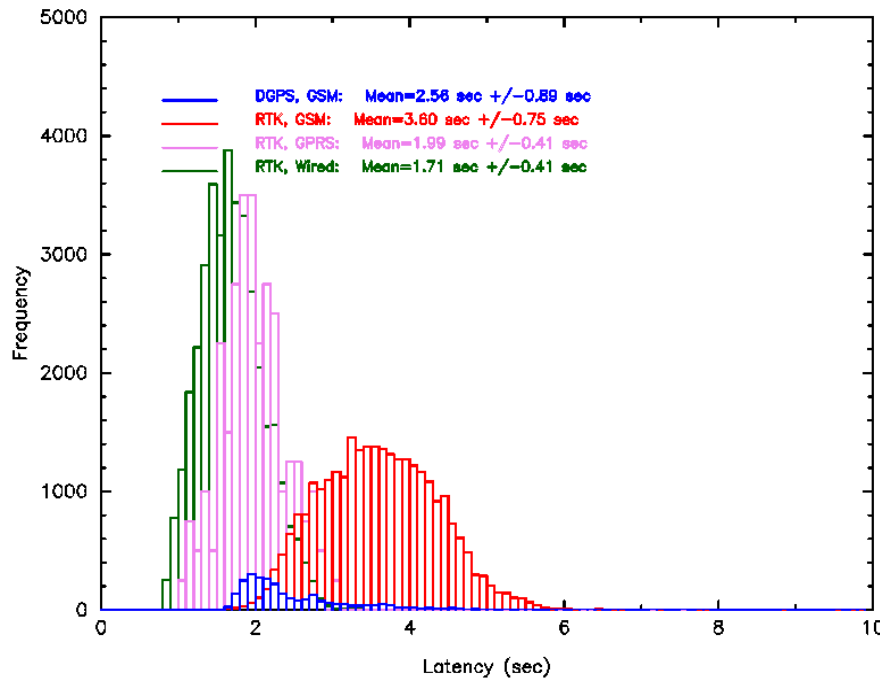
- Much less demanding than Internet Radio, Teleconferencing with ...128... kbits/sec

DGPS & Internet Classic Approach

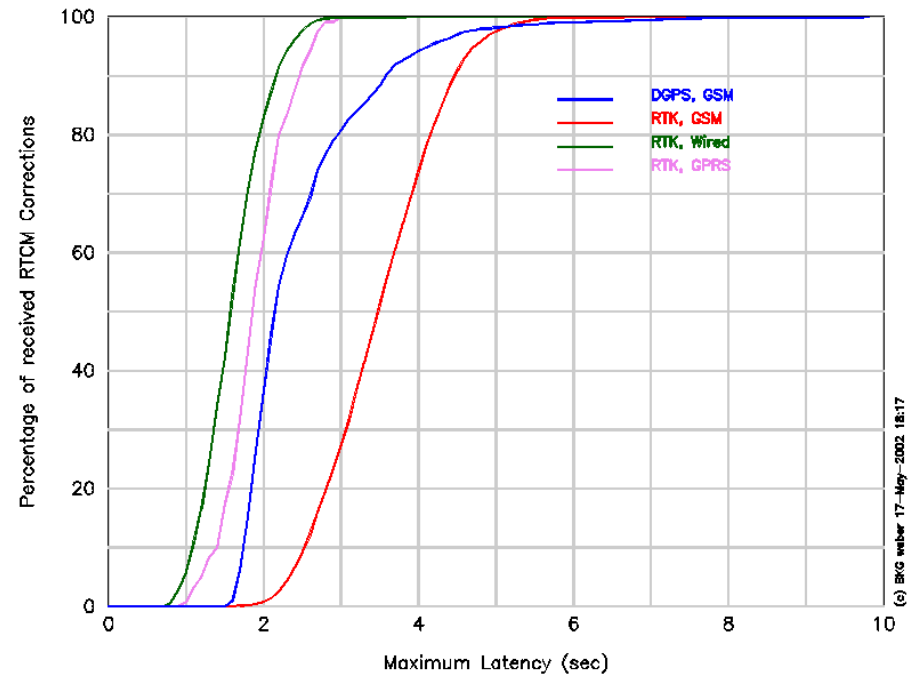


Latency of DGPS and RTK Corrections

Latencies of 2hrs of RTCM Reception via Internet and Mobile/Wired Phone

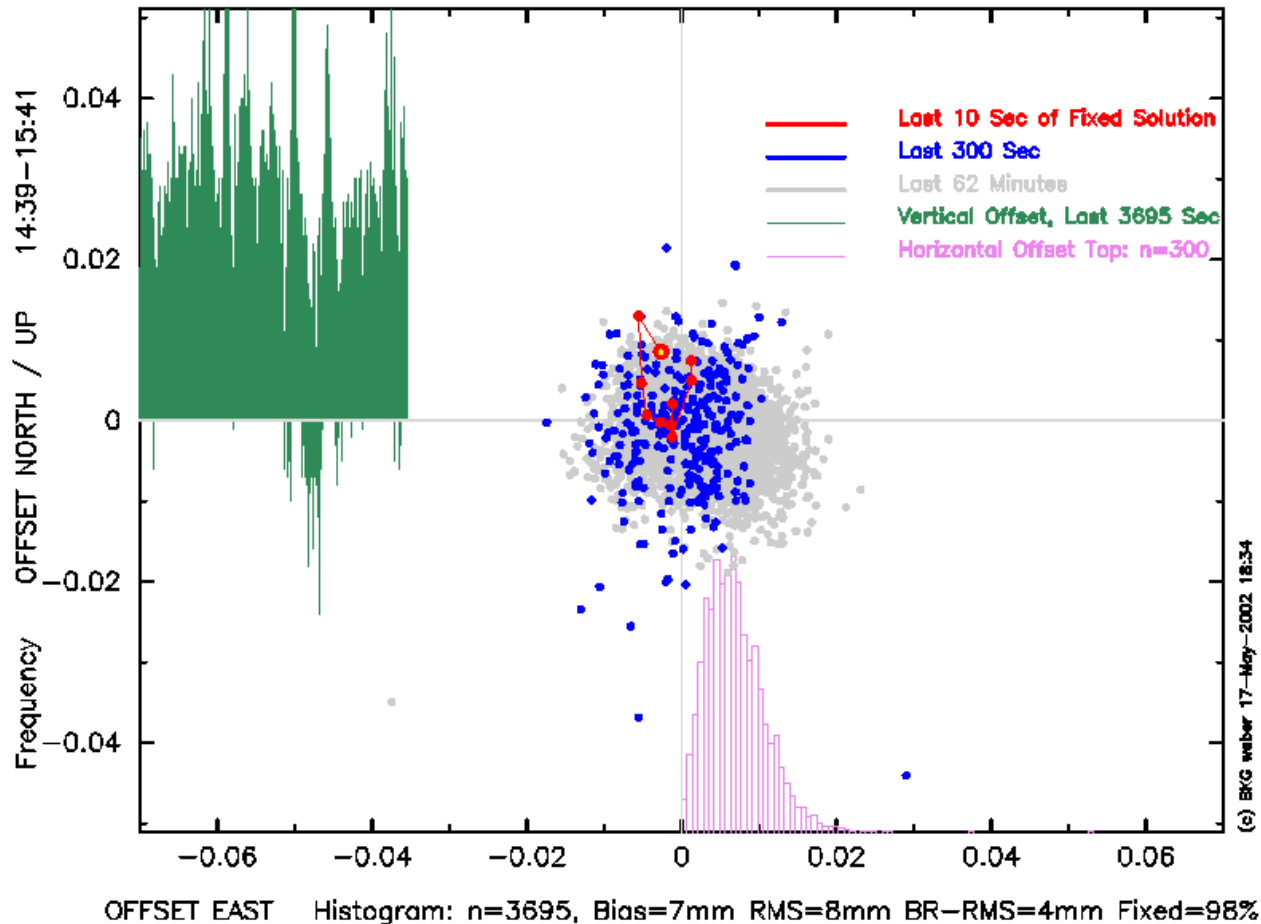


Latencies of 2hrs of RTCM Reception via Internet and Mobile/Wired Phone



RTK over Internet & GPRS

1 Hour of RTK via Internet and GPRS, Reference & Rover in Frankfurt



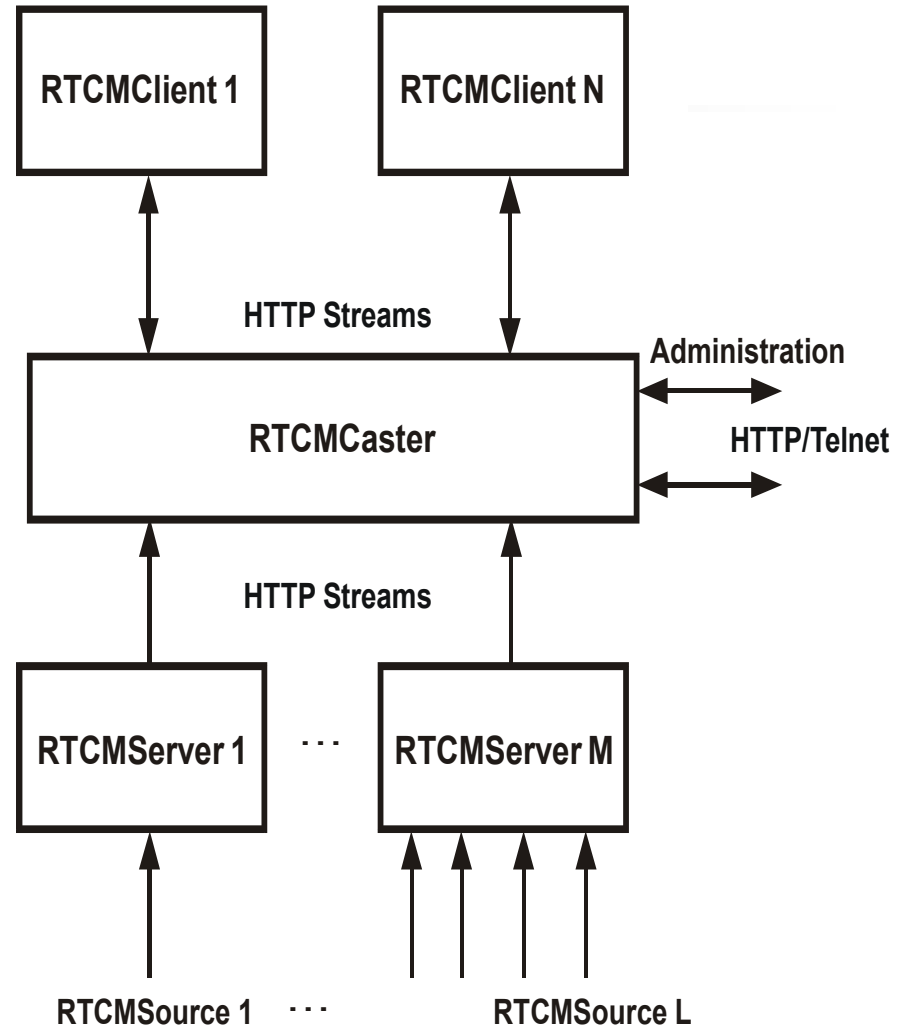


Classic IP-Streaming: Security Problems

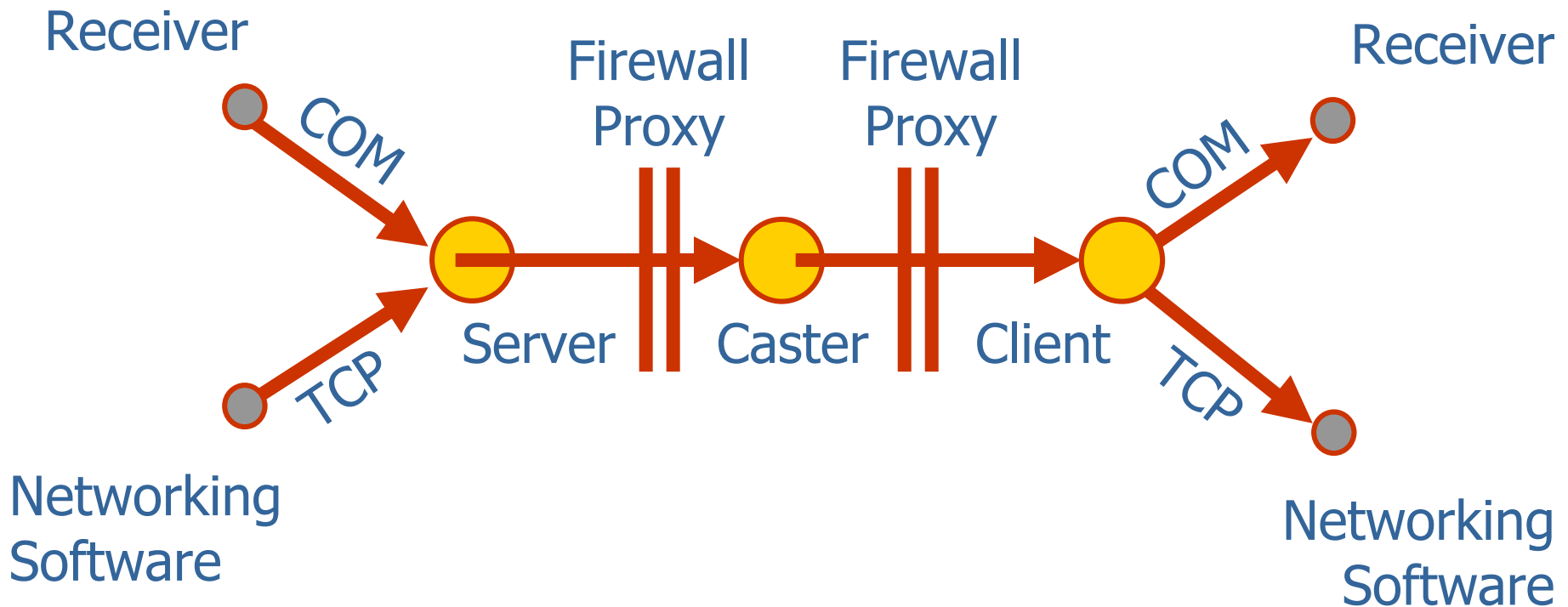
- Client-Server contact
- Usage of various port numbers for different data streams critical with respect to Firewalls
 - DGPS/RTK Internet applications better based on one single port like Telnet, FTP, http etc.

EUREF Development: Ntrip Splitter-Caster

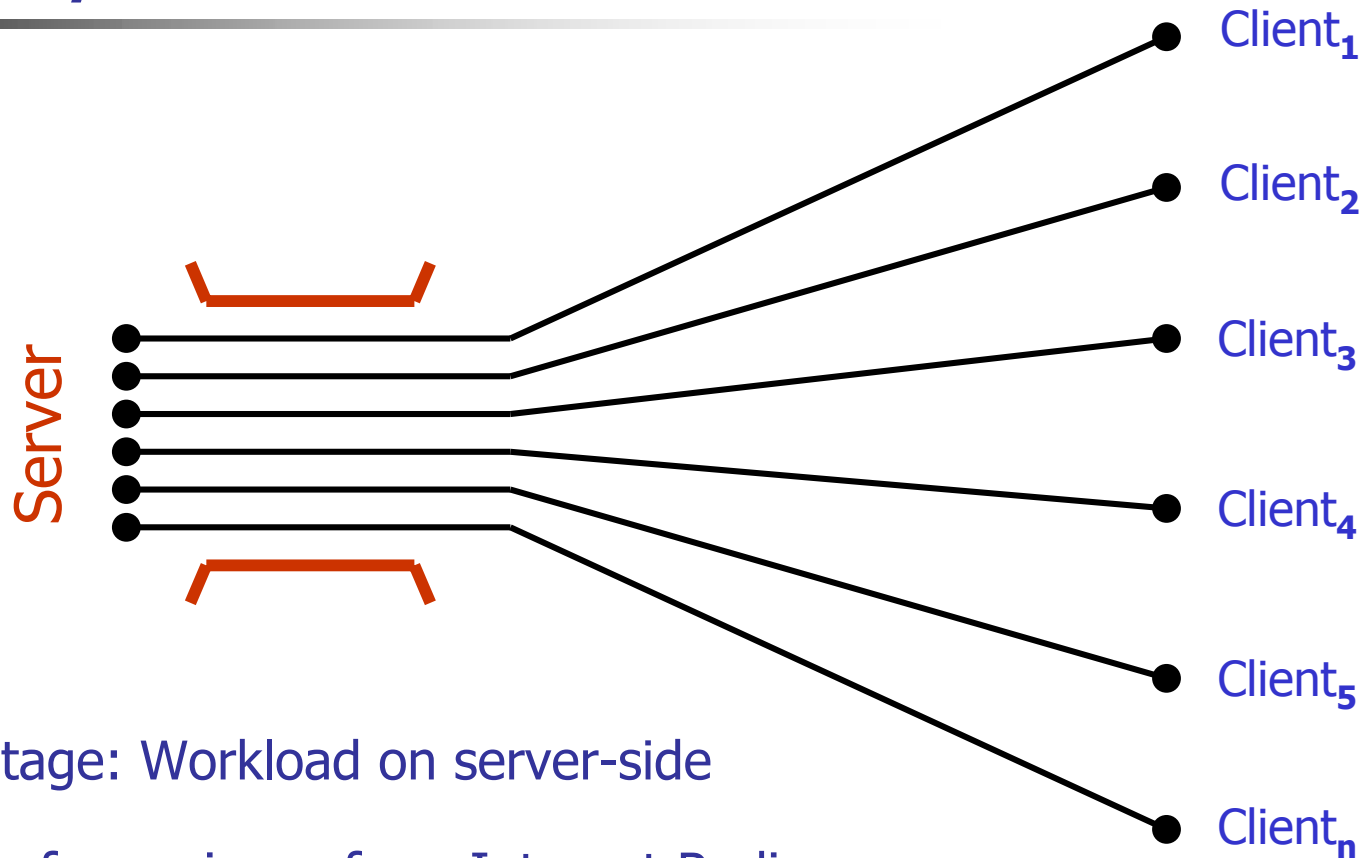
- Http application layer on top of TCP/IP
- Data streaming begins with selective http request
- **Caster / Client / Server** communication handled through http port
- Open documentation
- Major software components developed under „GNU General Public License“



Internet Transport Configuration



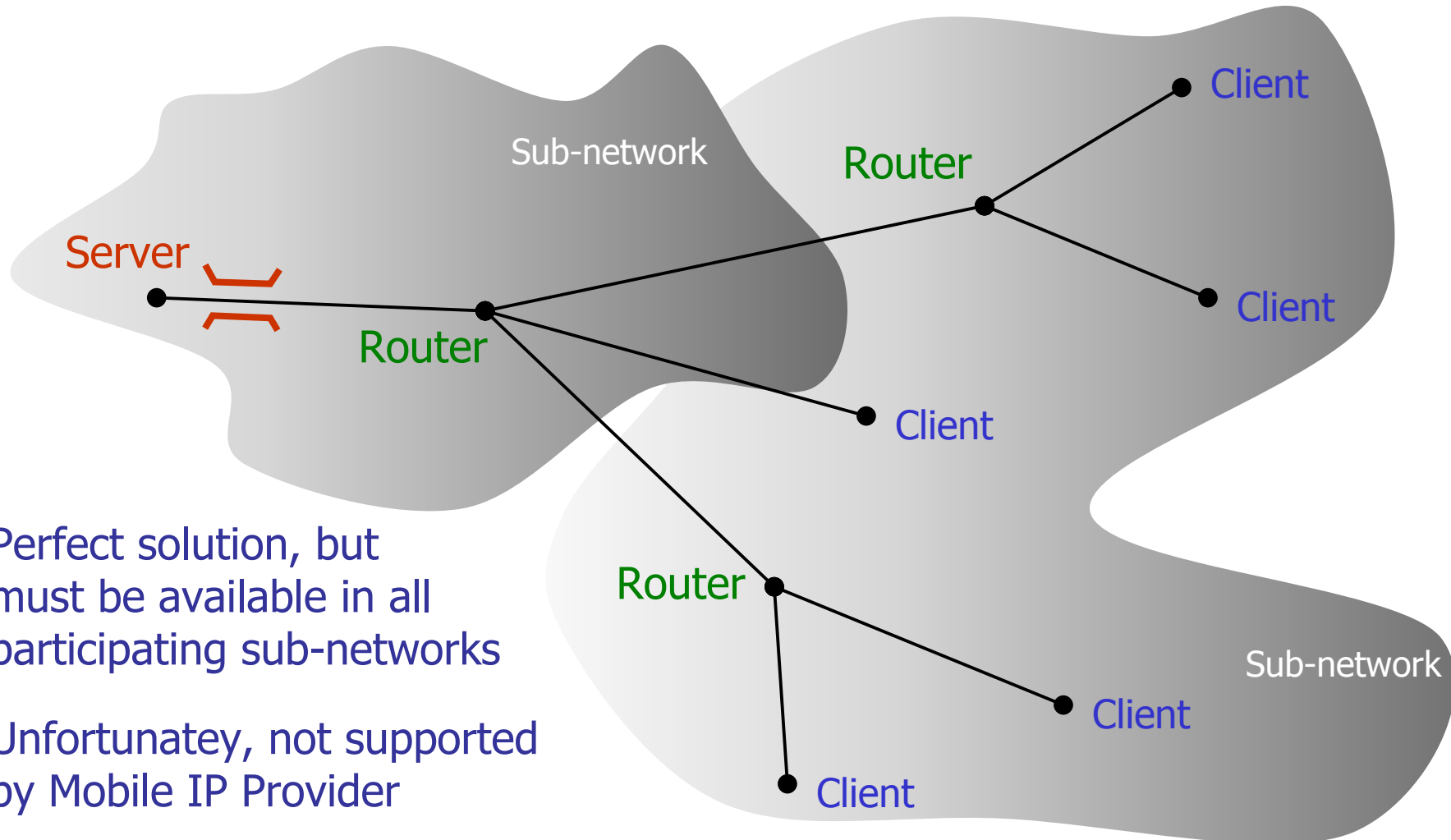
TCP/IP Unicast



Disadvantage: Workload on server-side

But: Lots of experience from Internet Radio,
e.g. with handling of network congestion

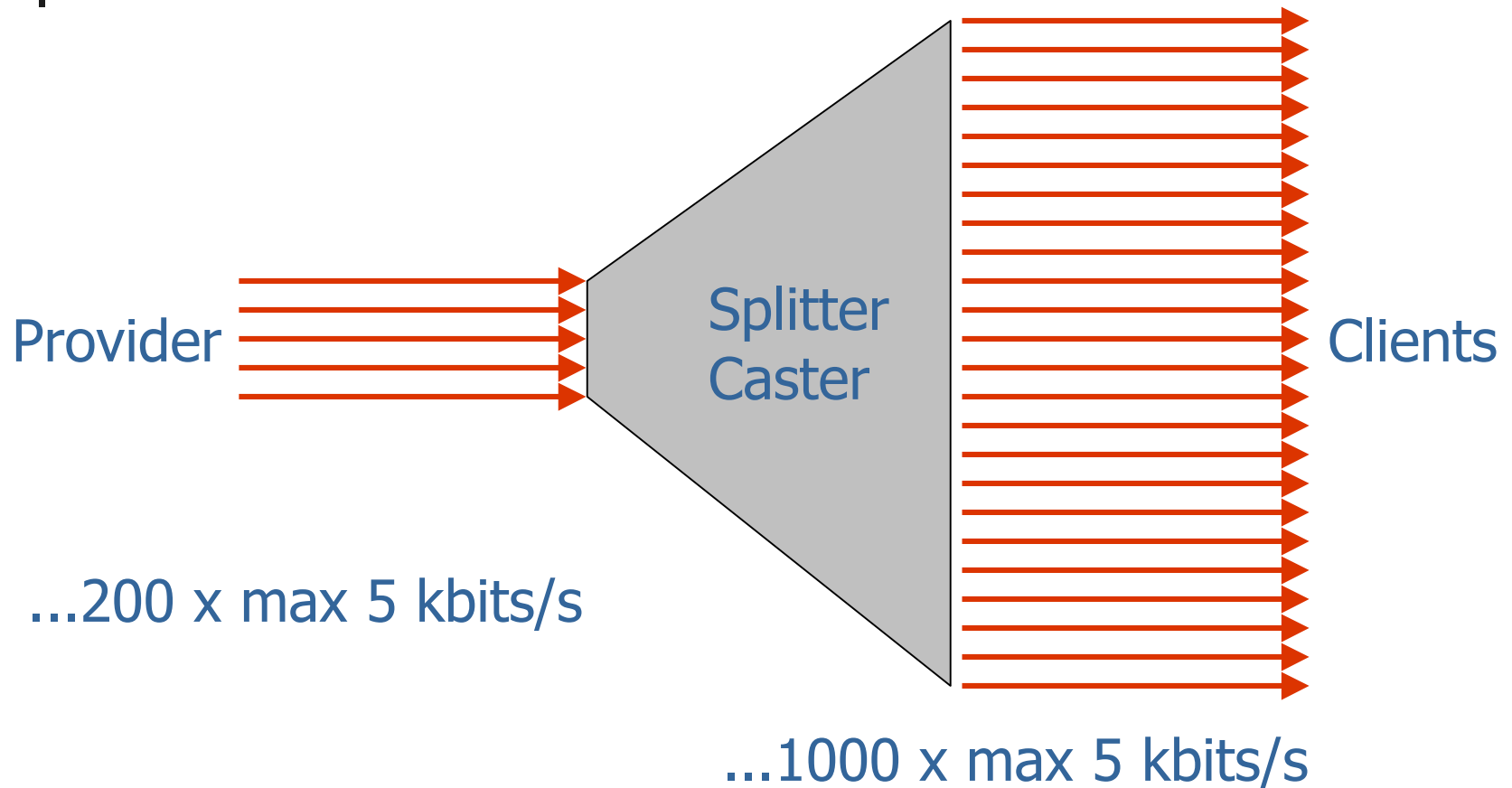
IP Multicast using UDP



Perfect solution, but
must be available in all
participating sub-networks

Unfortunately, not supported
by Mobile IP Provider

Ntrip: Bandwidth



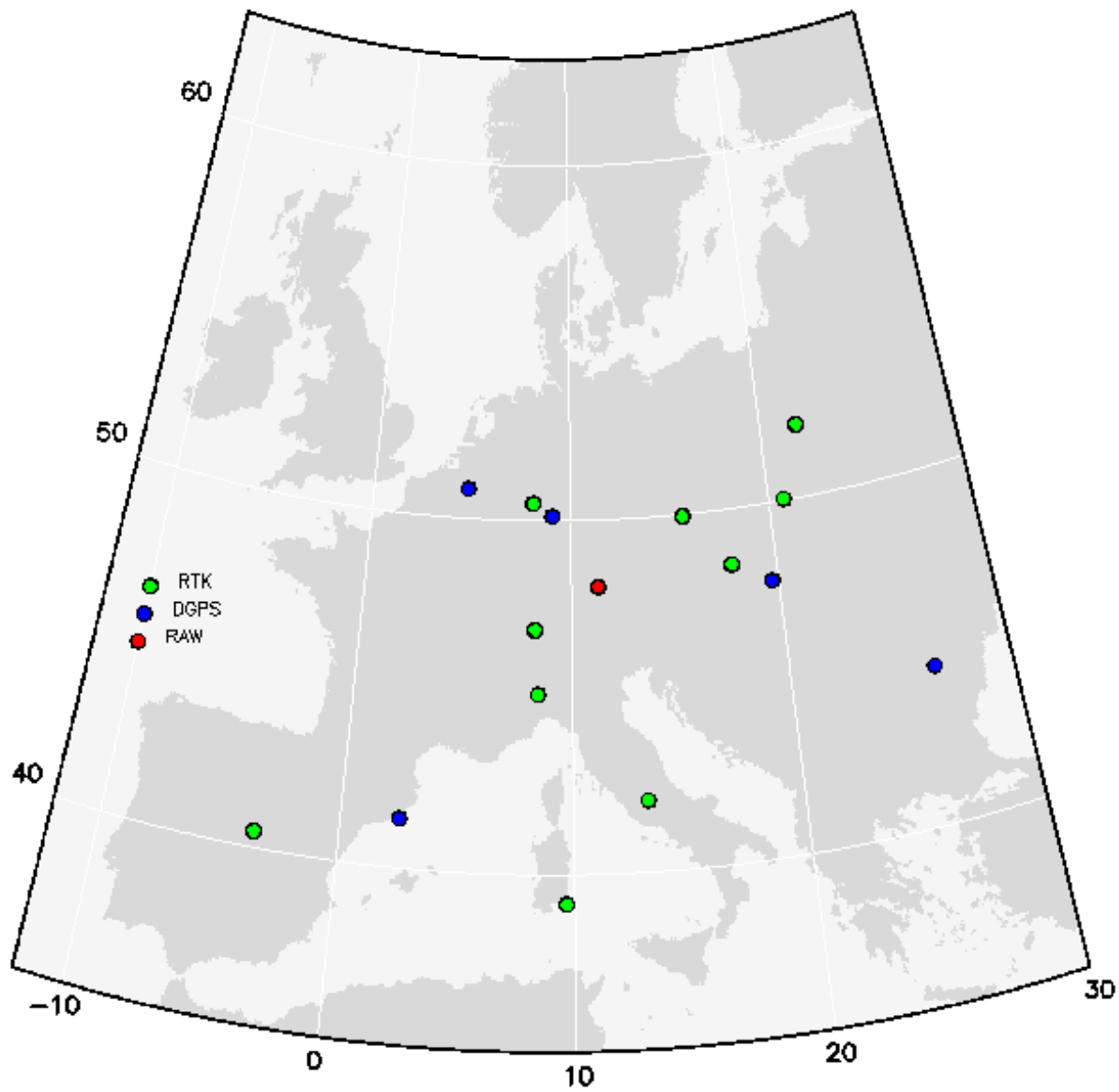
Costs: 18,000 Euro per 1000 simultaneous RTK clients and year



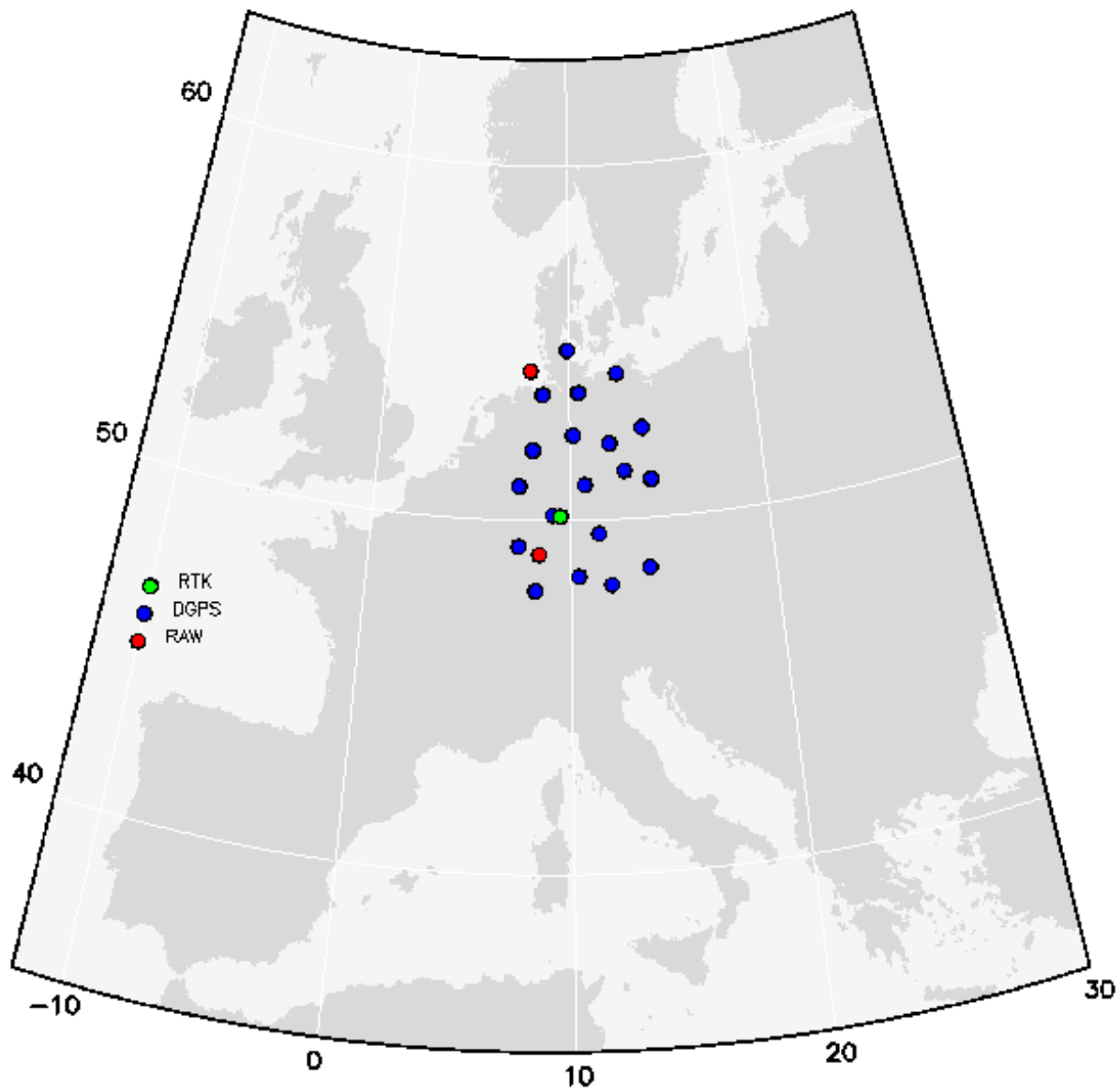
EUREF/IGS Call for Participation Requirements for Provider

- GPS receiver
 - Capable of providing RTCM (or raw) data
 - Next to a PC
 - On the Internet
 - Running server software

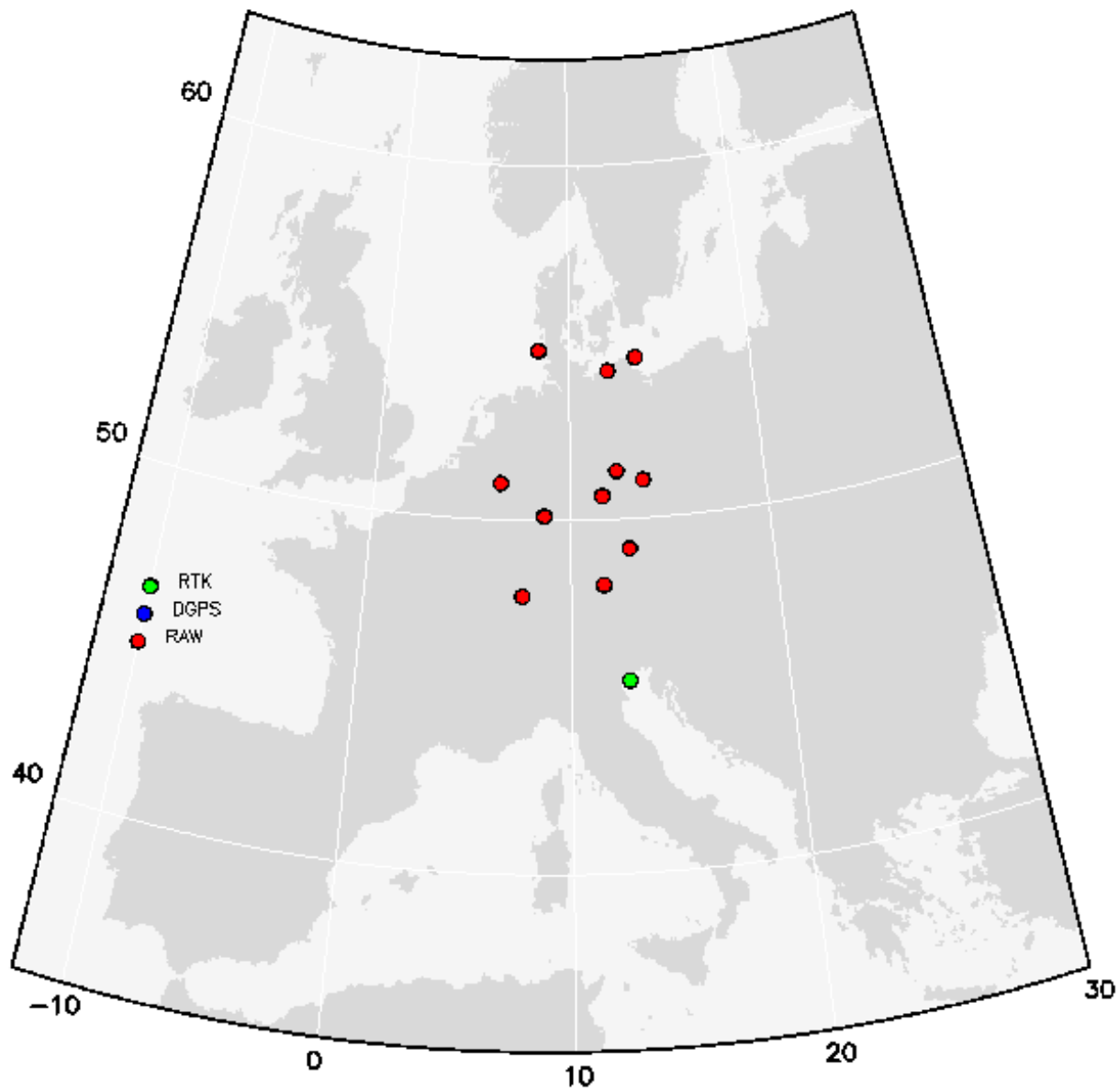
Real-Time GNSS Network EUREF&Misc, Status 030630



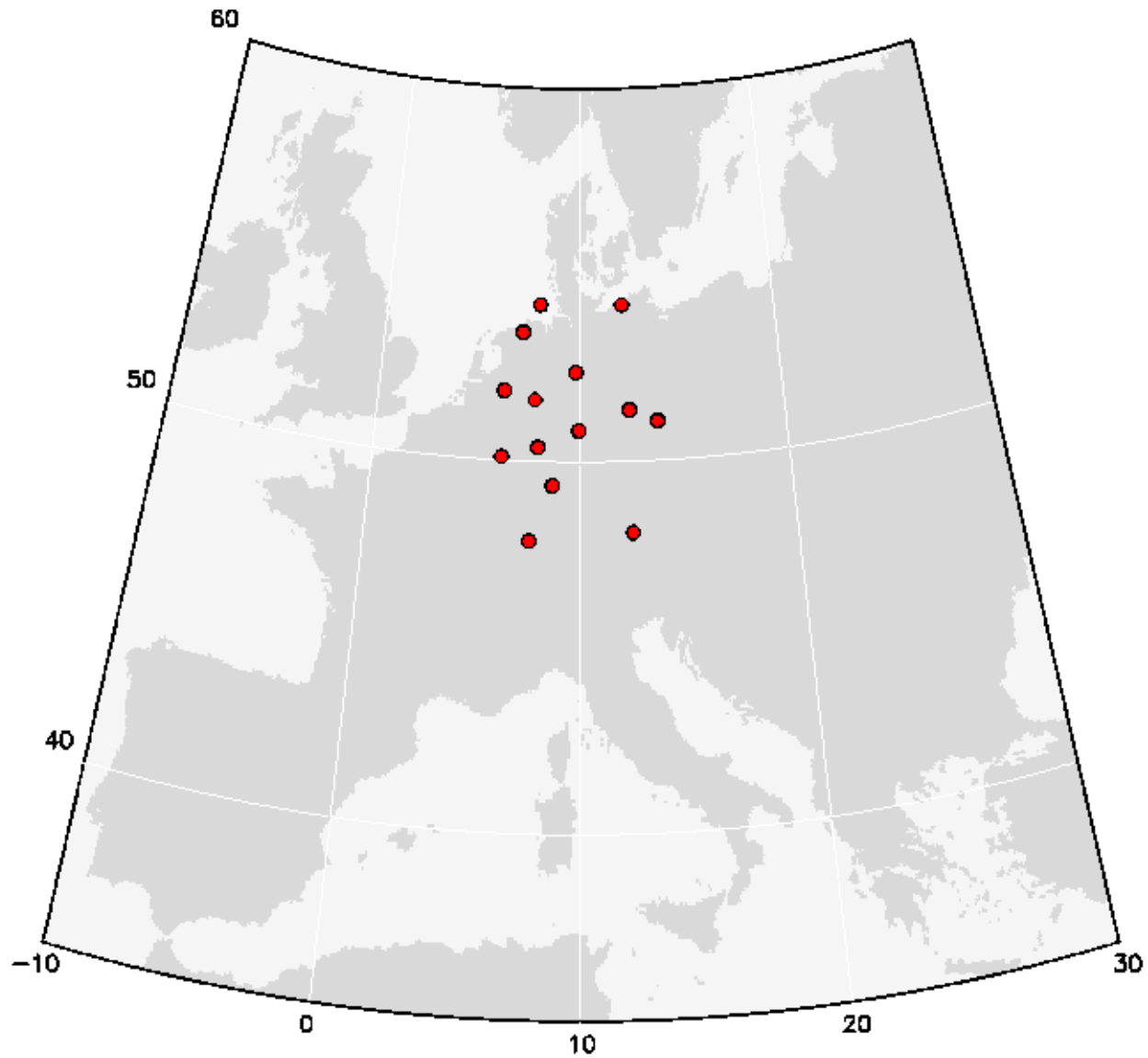
Real-Time GNSS Network GREF, Status 030630



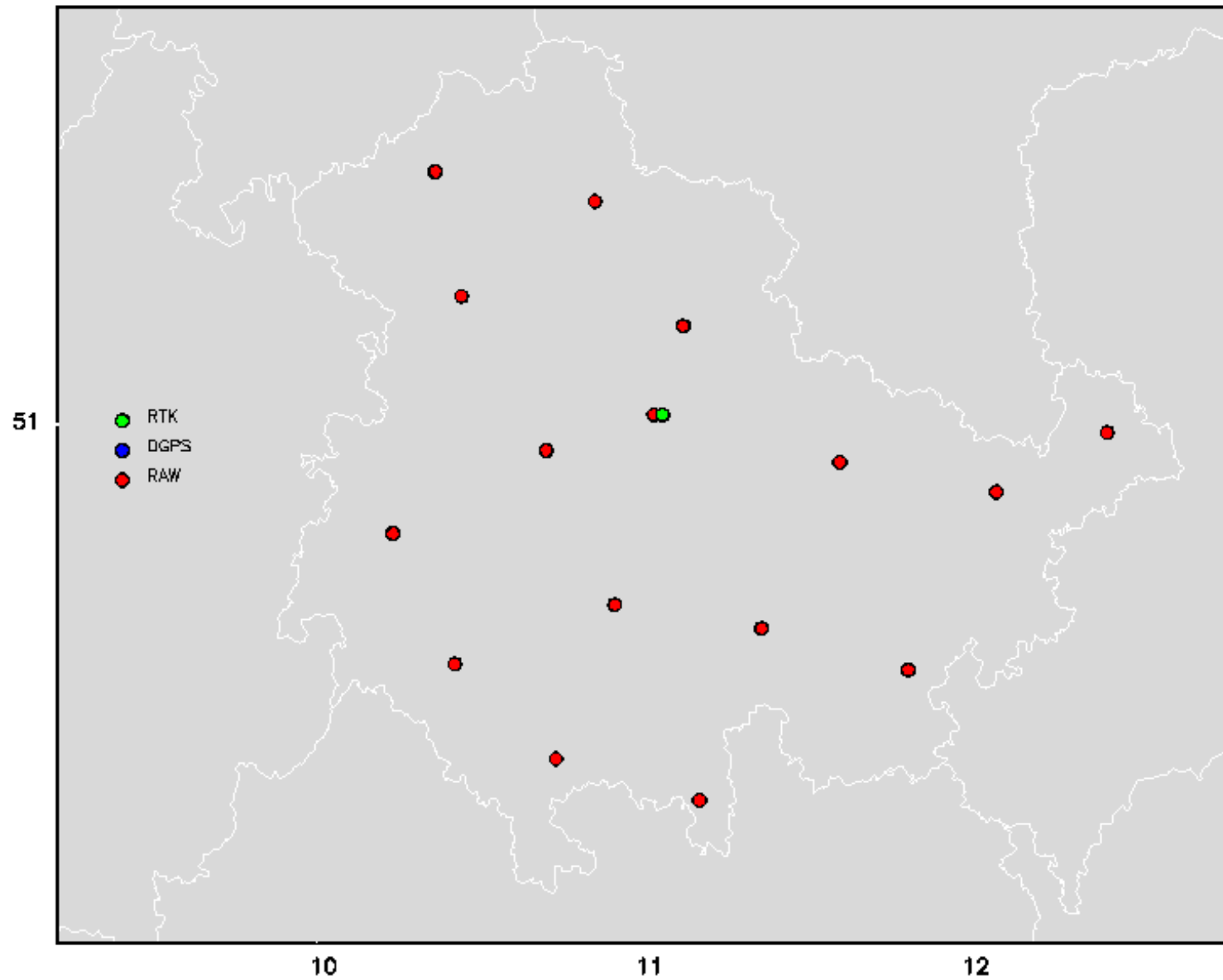
Real-Time GNSS Network IGS, Status 030630



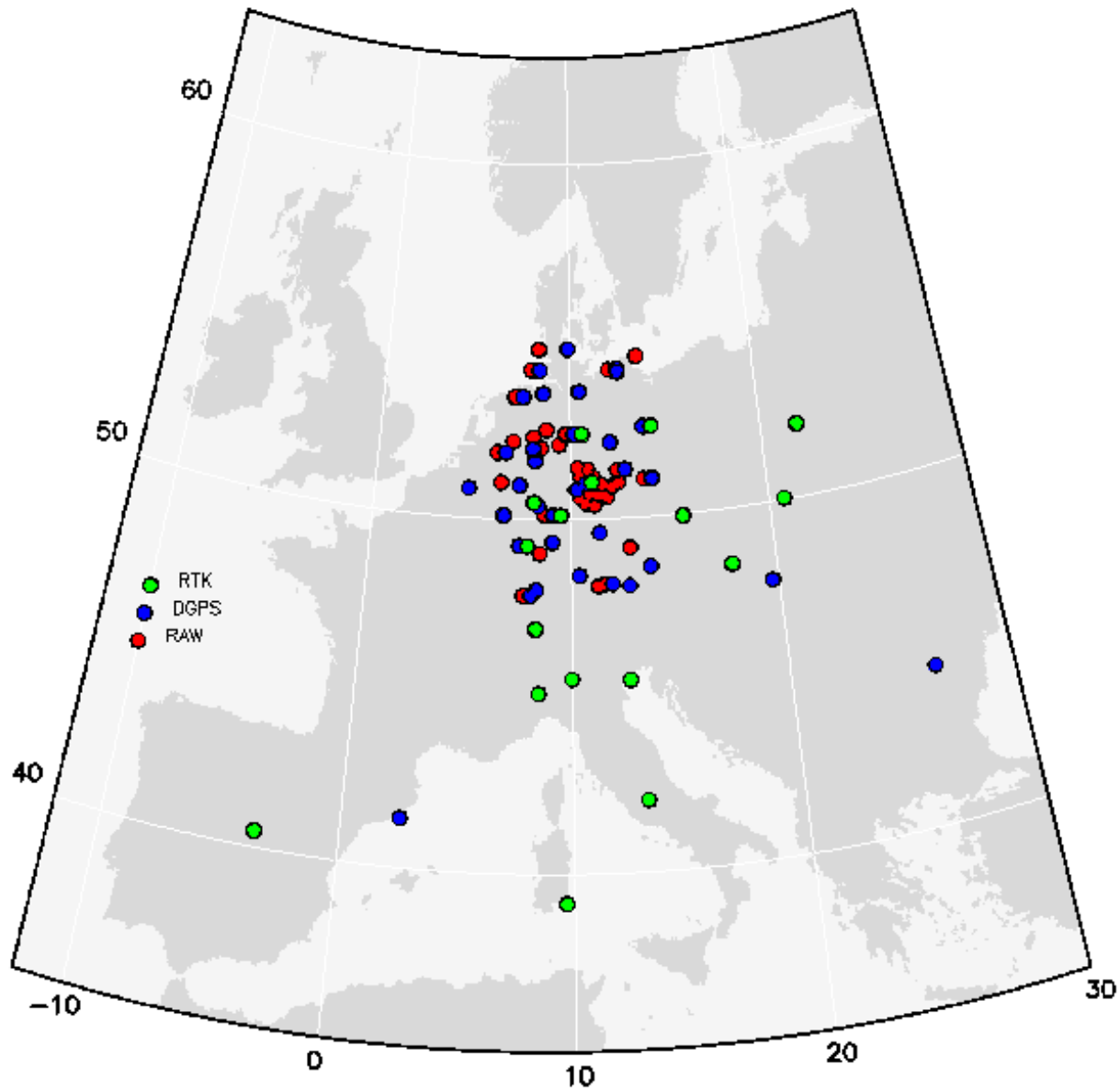
Real-Time Network ascos, Status 030520



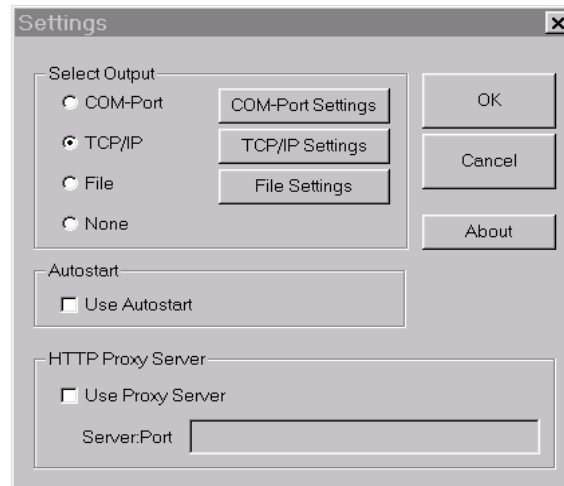
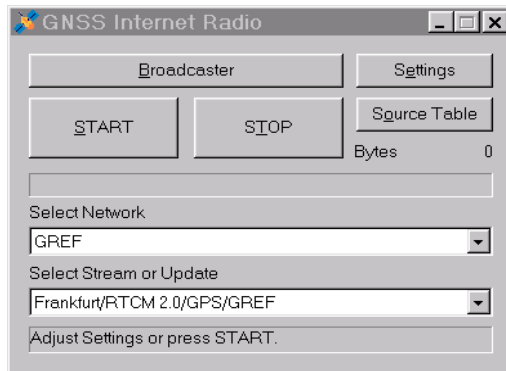
Real-Time GNSS Network SAPOS-THR, Status 030630



Real-Time GNSS Networks All-Europe, Status 030630



„GNSS Internet Radio“





Notice Advisory to Broadcaster Users

NOTICE ADVISORY TO BROADCASTER USERS (NABU) 2003768

SUBJ: GNSS REAL-TIME DATA STREAM(S) FROM EUREF-IP NTRIP BROADCASTER
129.217.182.51 AVAILABLE AFTER OUTAGE

1. NABU TYPE: AVAILAB
NABU NUMBER: 2003768
NABU DTG: 030530 12H50 UTC
2. STREAM(S) AFFECTED: 1
PASS0: PASSAU, REF NABU: 2003767, REF START DTG: 030530 12H44 UTC
3. CONDITION: GNSS REAL-TIME DATA STREAM(S) FROM EUREF-IP NTRIP
BROADCASTER 129.217.182.51 AVAILABLE AFTER OUTAGE
4. POC: BKG AT +49 69 6333-253, EUREF-IP@BKG.BUND.DE,
http://igs.ifag.de/root_ftp/misc/ntrip/nabu

Distributing the Workload: Ntrip Caster Concept



Single Broadcaster



Broadcasting Network



RTCM SC-104 & Ntrip

- New Working Group on „Internet Protocol“
- Chair Person: Robert Snow, Thales
- WG Members from Leica, Trimble, Ashtech, Topcon, U.S. Coast Guard
- Next Meeting: Portland, USA, prior to ION



Ntrip Consequences

- Easy to become a provider
- Driver for development for real-time software
- End of special hardware for receiving RTCM
- No GSM \Rightarrow no access server
- GPRS \Rightarrow Internet
- Support of networking software
- Lots of potential for mass-usage



Conclusion

- Streaming Differential GPS corrections over Internet and cellular phone networks is feasible, begin of IOC
- No significant lack of performance compared to usage of other transportation media
- Advantages for user/service providers
- Developments for various products
- Promising solution for GIS and LBS
- Trial Service within framework of EUREF-IP