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The EUREF Ntrip-Broadcaster: Real-Time GNSS data for Europe

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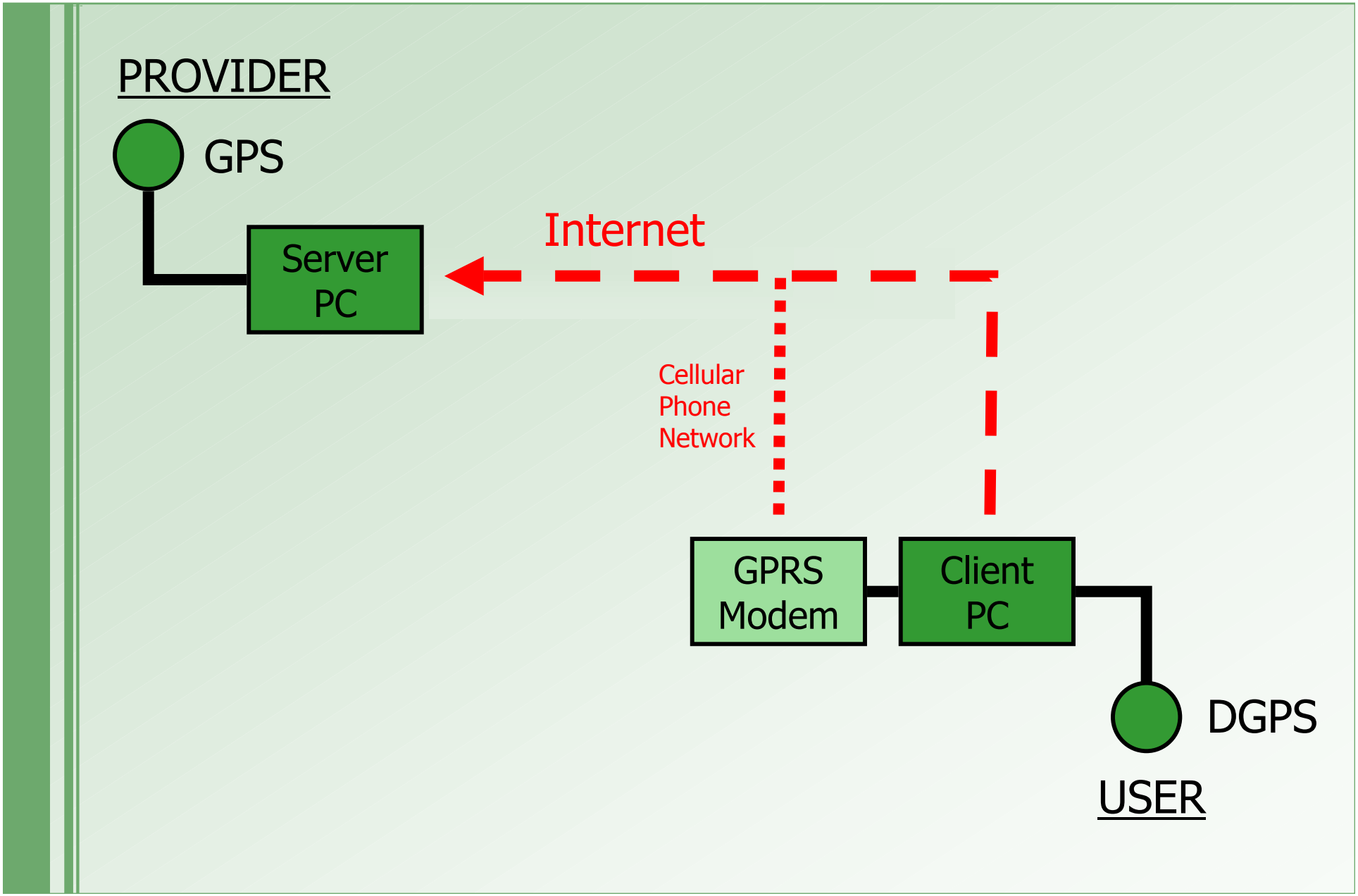
DGPS & Internet - Classical Approach



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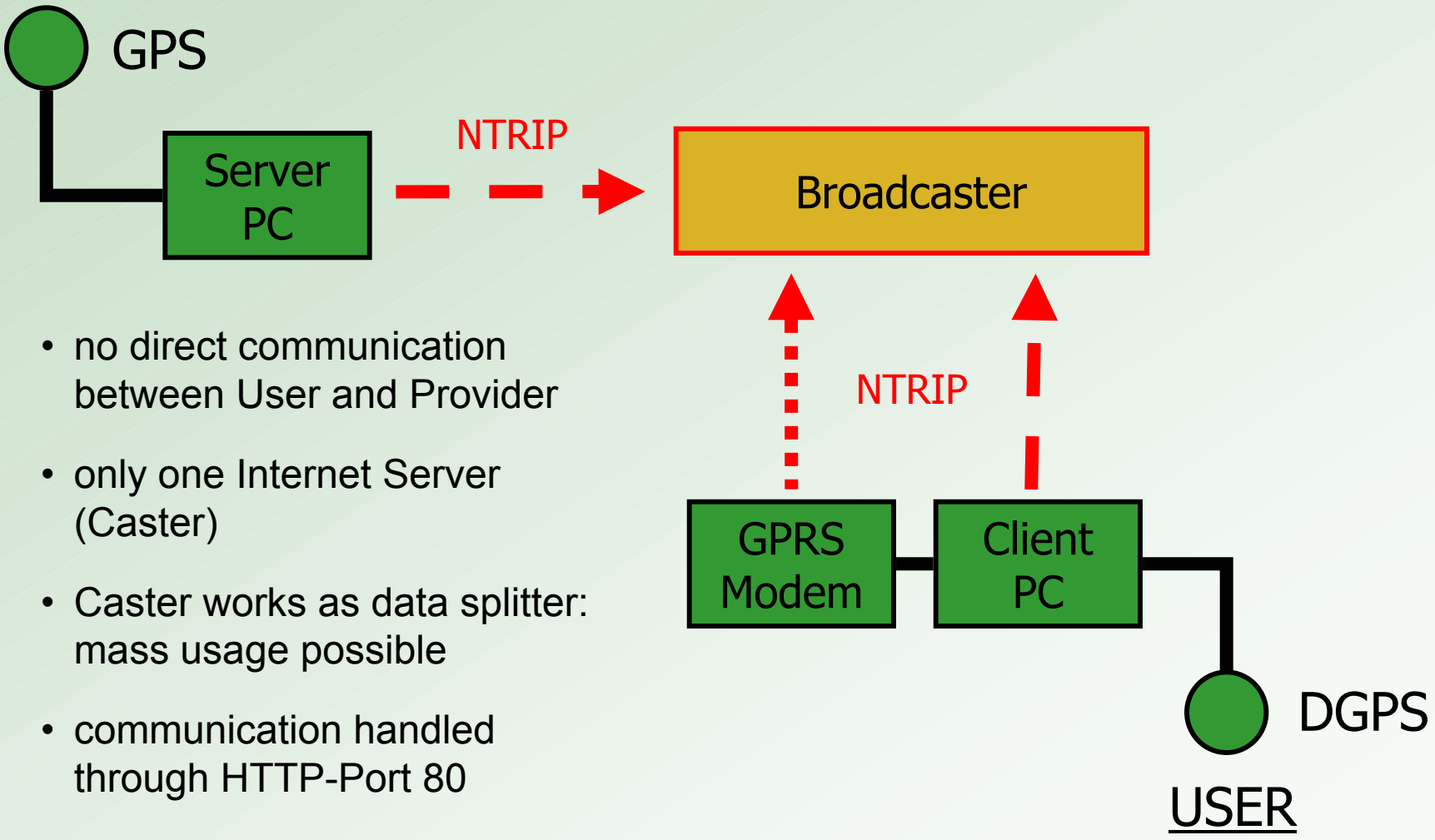
NTRIP: Networked Transport of RTCM via Internet Protocol



- no direct communication between User and Provider
- only one Internet Server (Caster)
- Caster works as data splitter: mass usage possible
- communication handled through HTTP-Port 80

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NTRIP: Networked Transport of RTCM via Internet Protocol

more about NTRIP in the Poster Session:

„Networked Transport of RTCM via Internet Protocol:
A HTTP based technique for streaming GNSS data over the Internet“

presented by: Harald Gebhard

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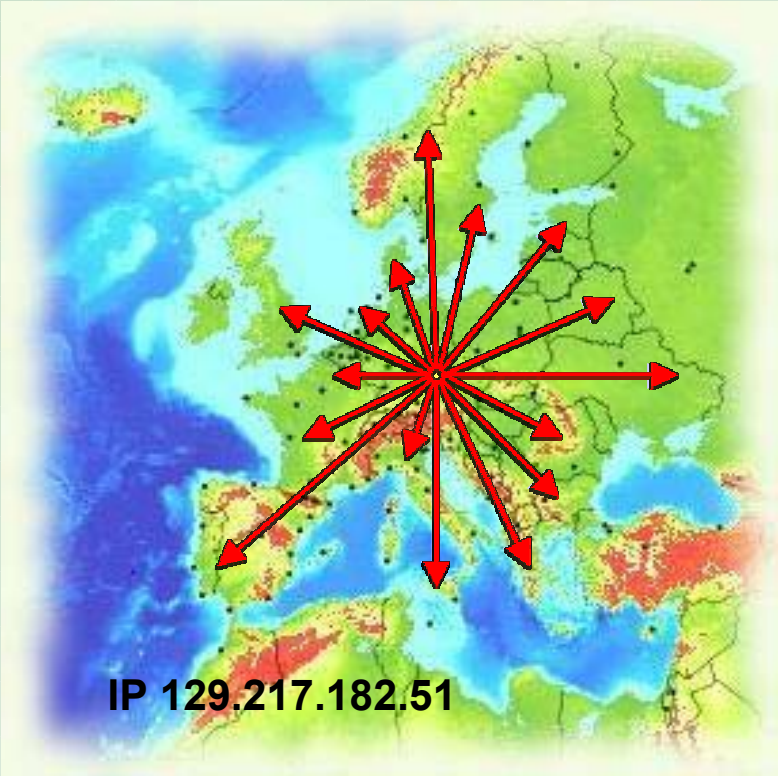
EUREF-IP Ntrip Broadcaster



Capable of handling

- up to 300 real-time data streams
- and 1500 users

Available data streams (02/2004):

- ≈ 145 real time data streams
- 13 networks (EUREF, IGS, CORS,...)
- GPS, GLONASS, EGNOS,...
- different formats:
  - RTCM corrections (DGPS, RTK)
  - raw measurement data
  - RTCA
- most streams from Europe
  - 21 from USA
  - 1 from Chile
  - 1 from Australia

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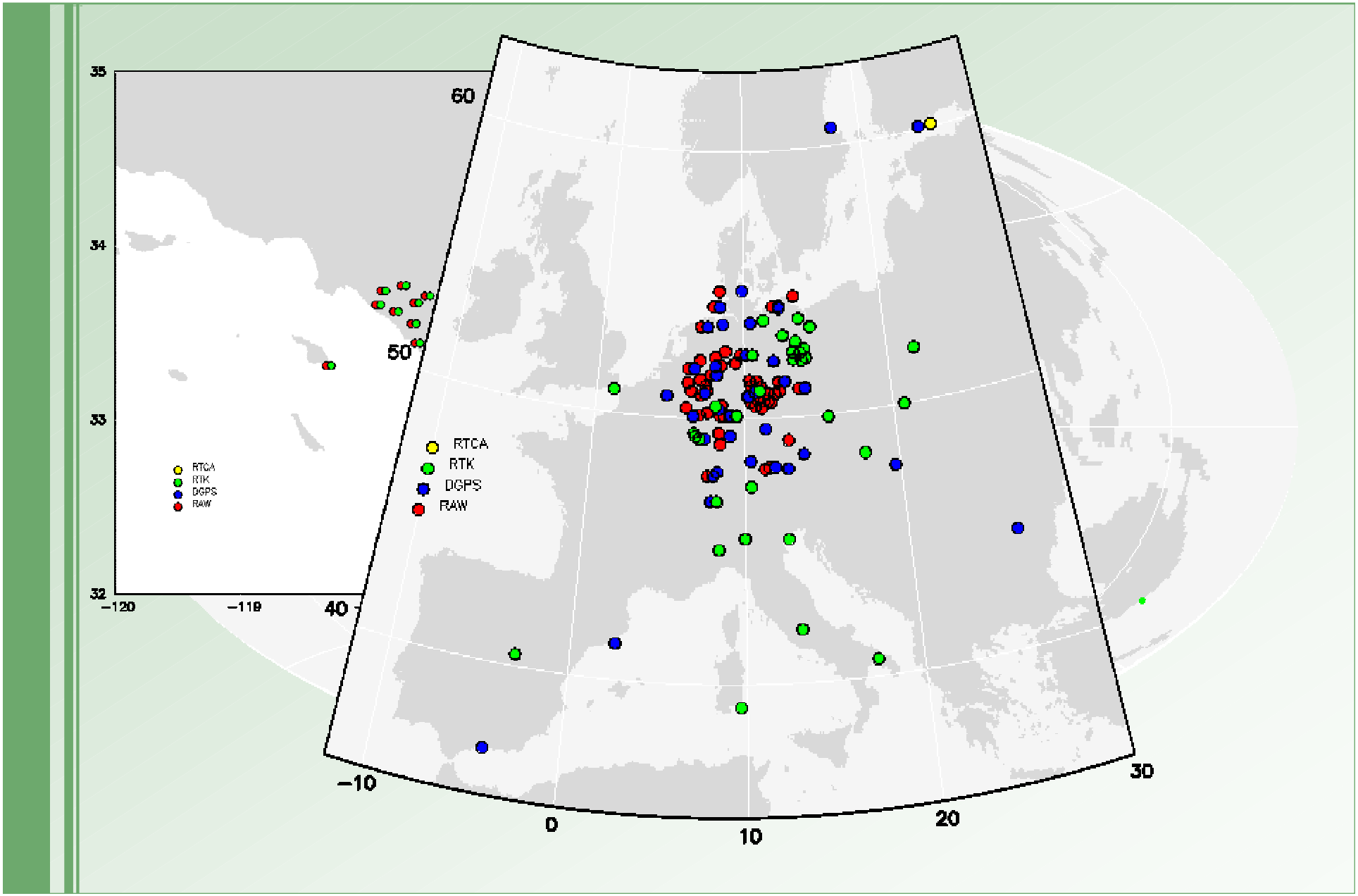
Available Data Streams



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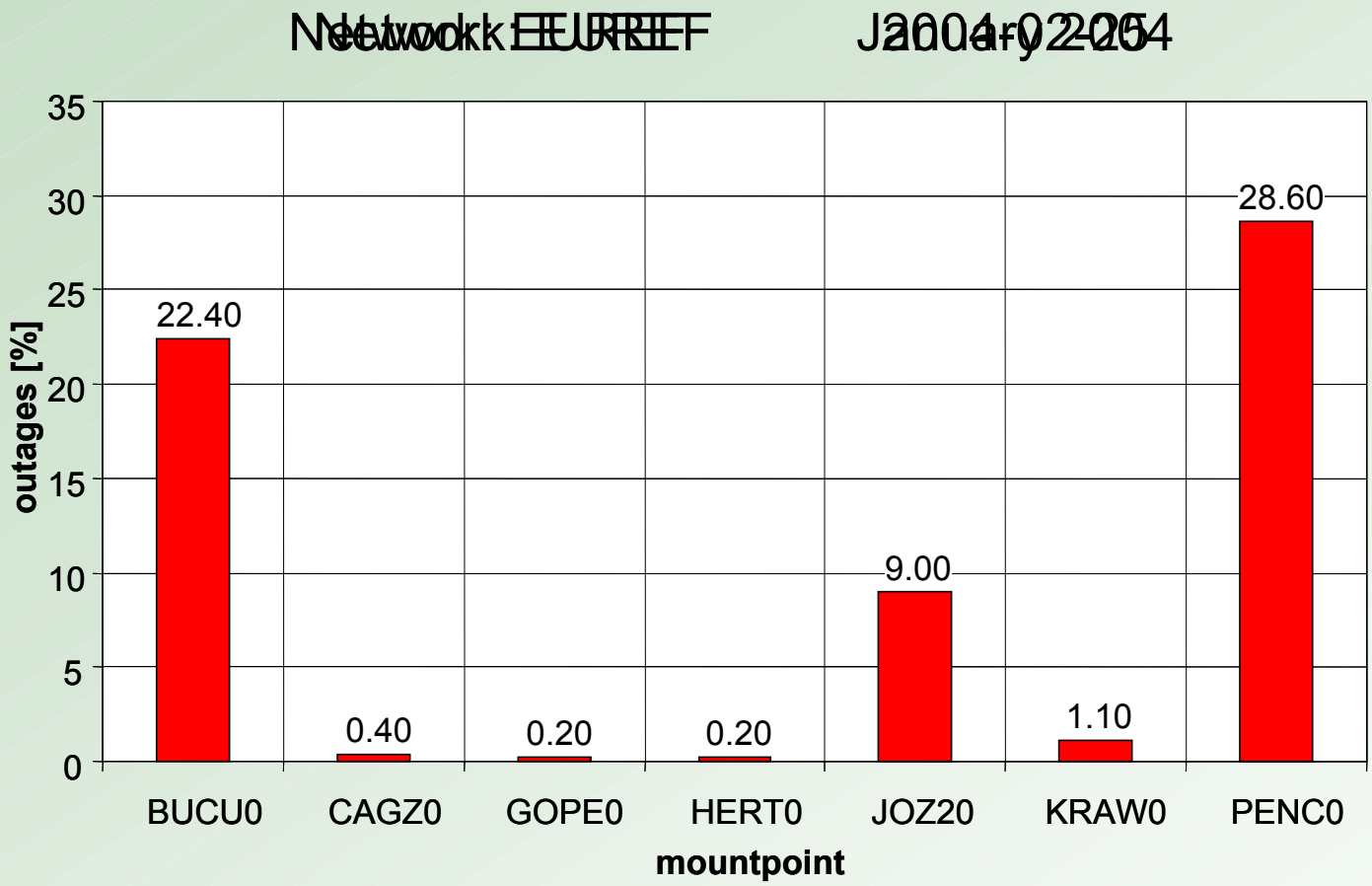
Temporal Availability



All data streams: (14 networks)

- more than 50% show an availability higher than 95%
- 32% of the data streams are available more than 98%

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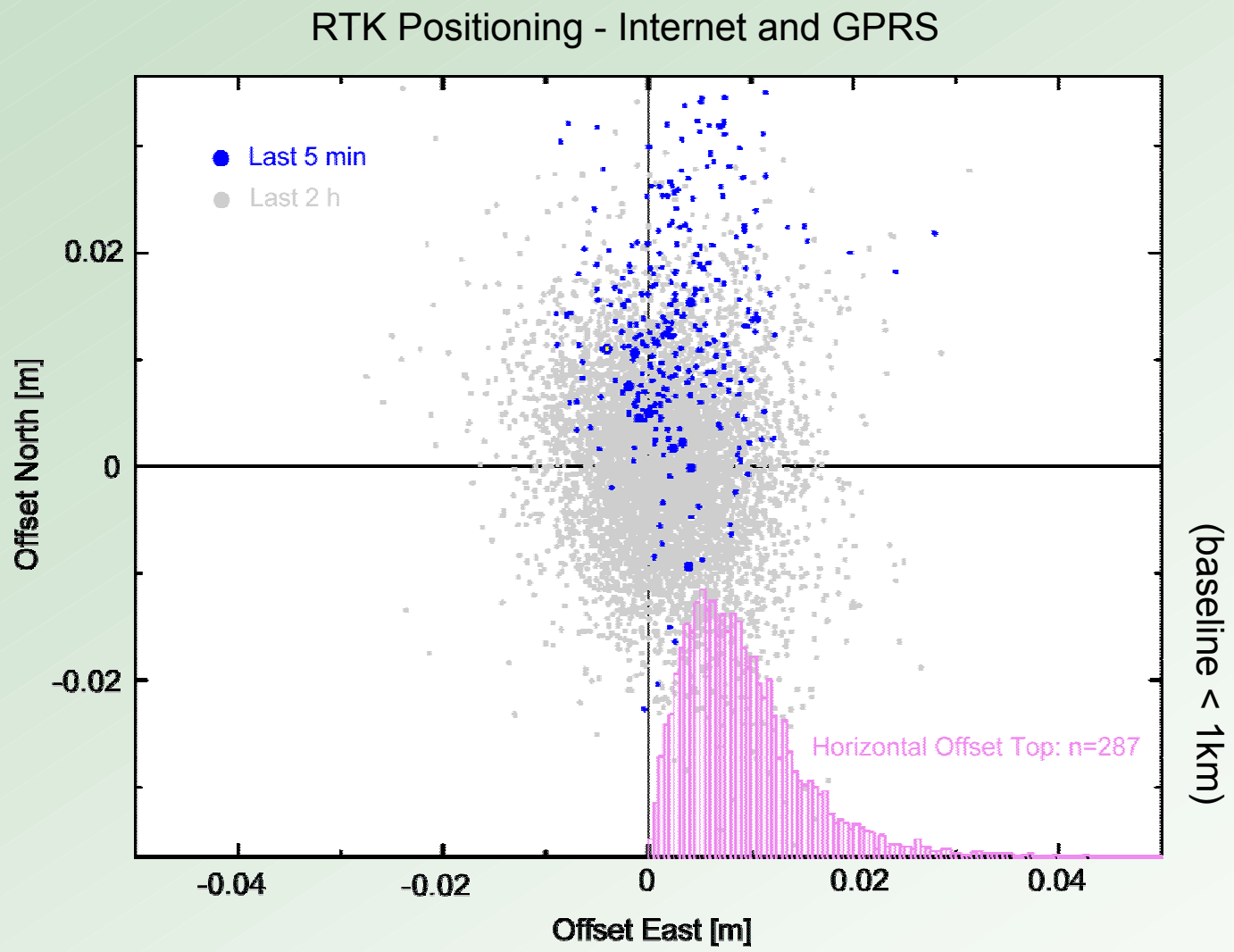
Accuracy



=> No significant degradation of performance compared to usage of other transportation media

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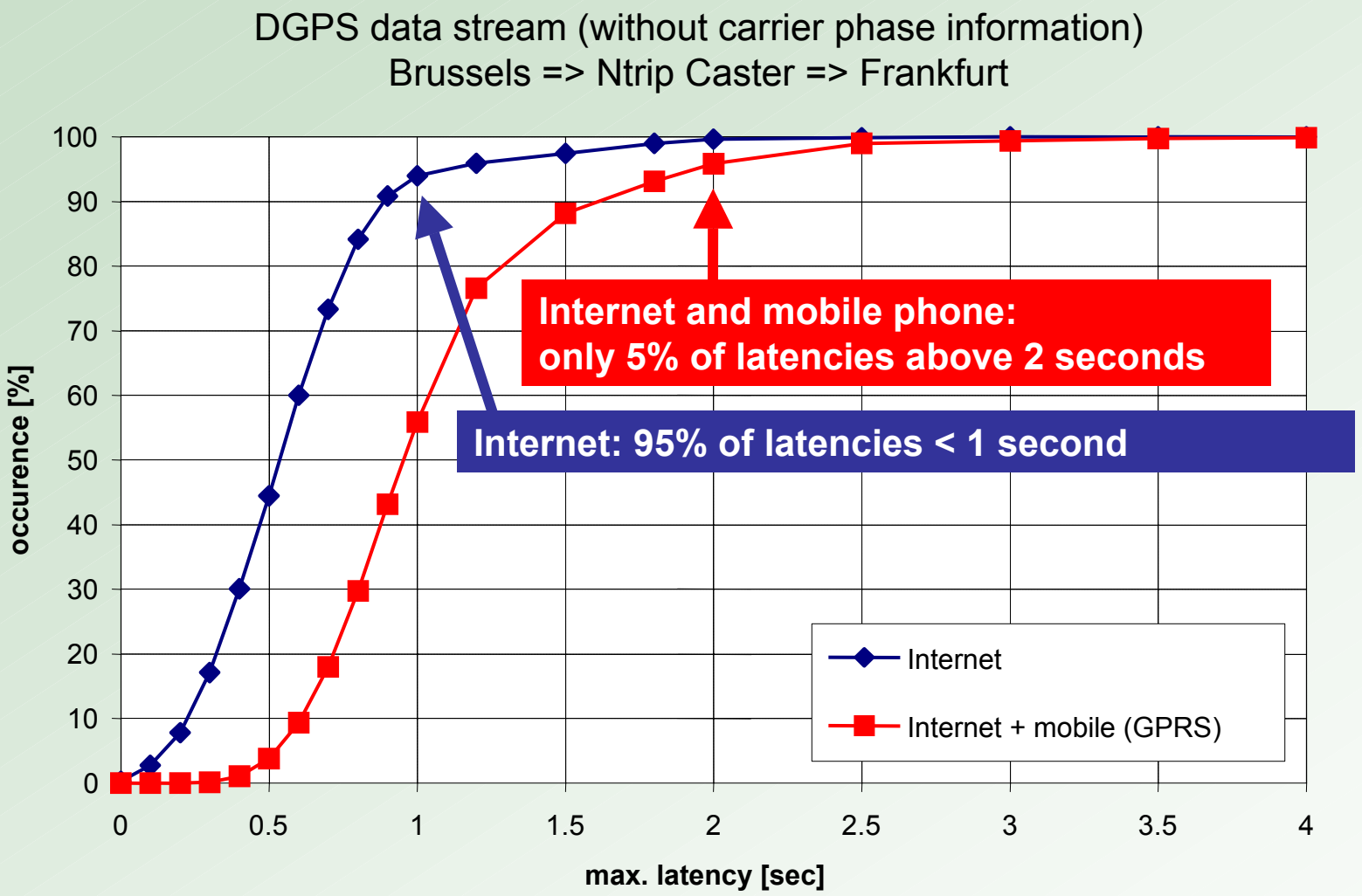
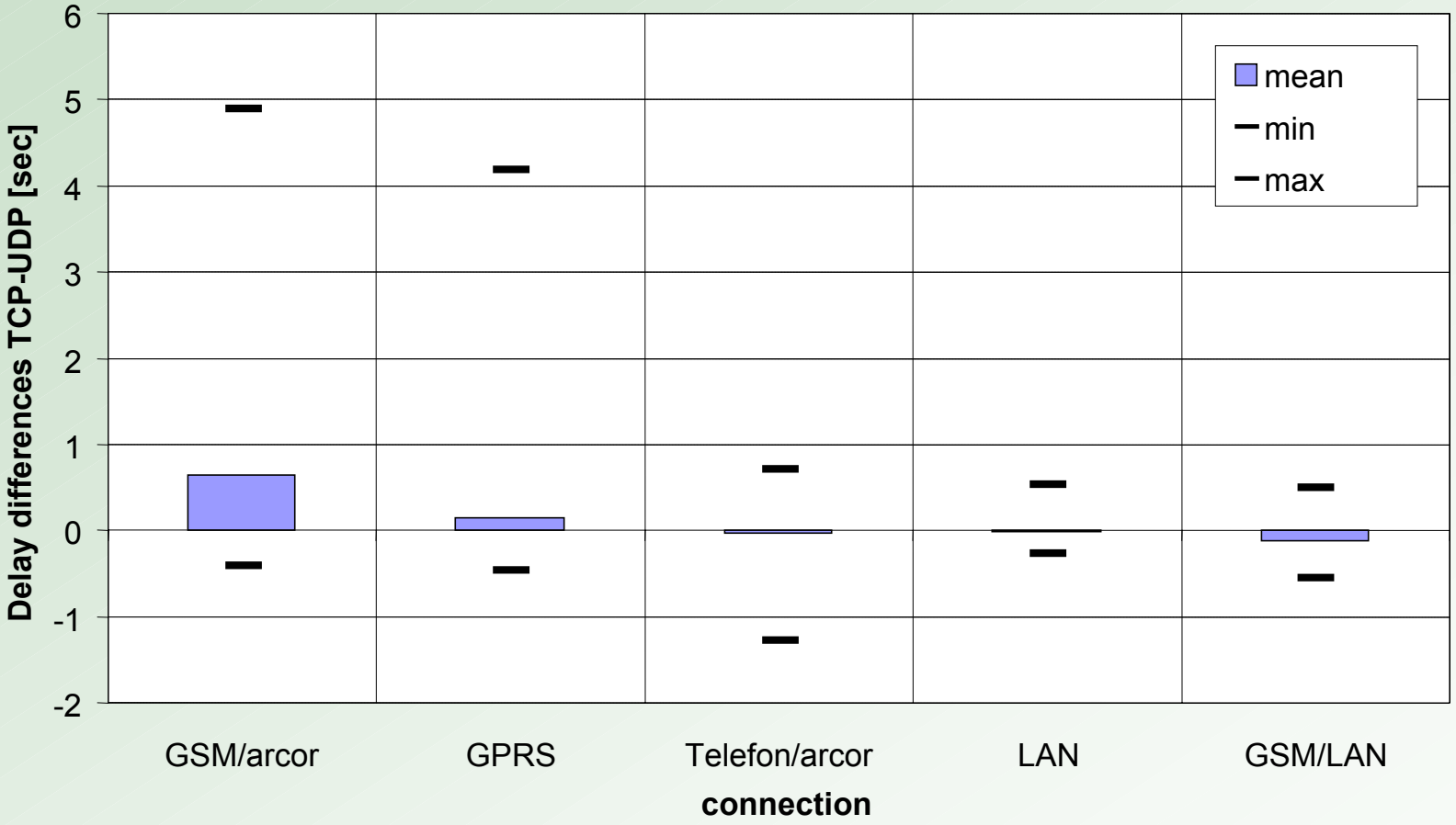
Latencies - RTCM corrections



TCP – UDP

- Runtime differences between TCP and UDP strongly depend on connection type and time (resp. bandwidth and traffic)
- Only with mobile phone connections significant differences



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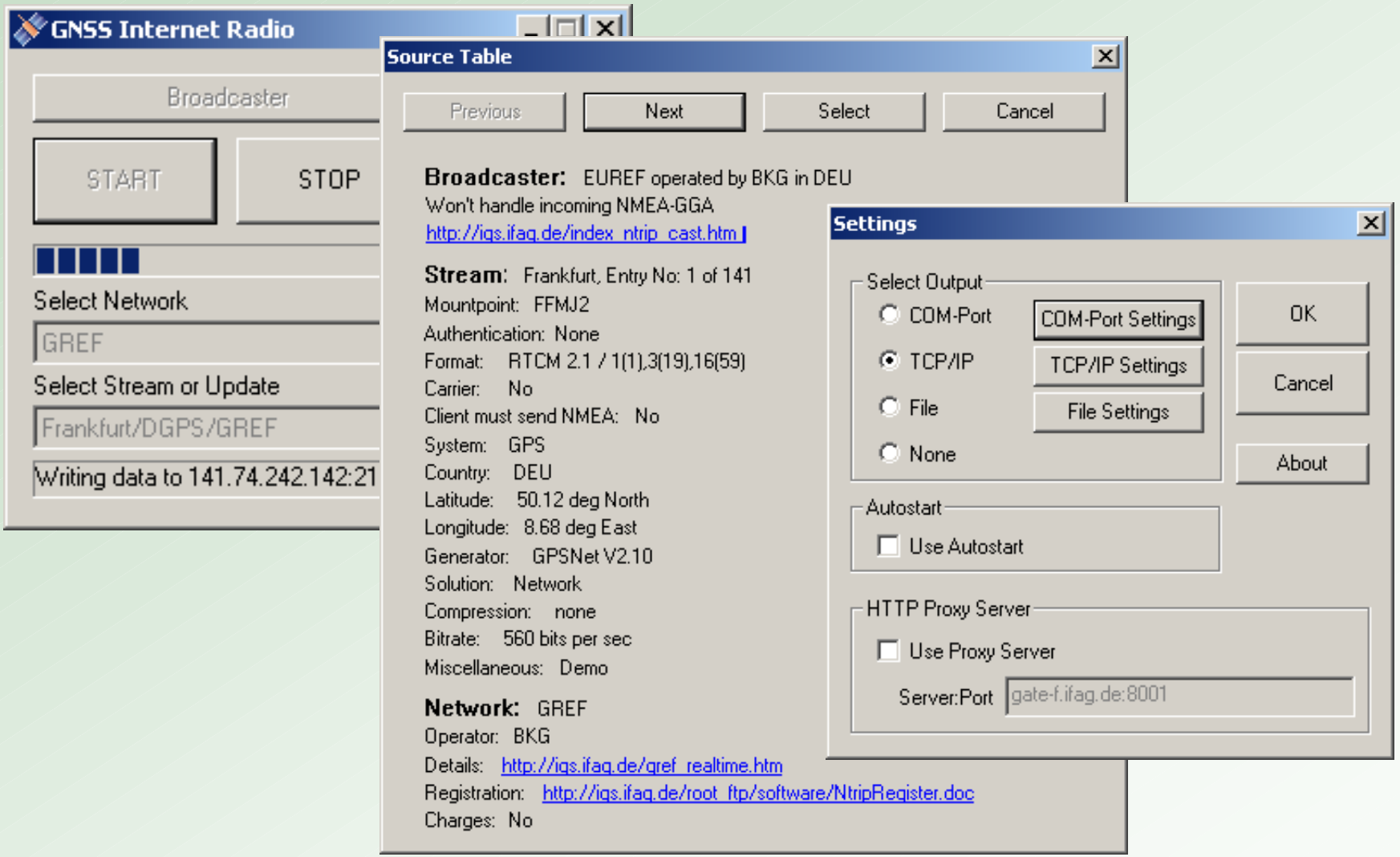
NTRIP Client: „GNSS Internet Radio“

available for Windows, Windows CE, Palm, LINUX



Mobile Data Access

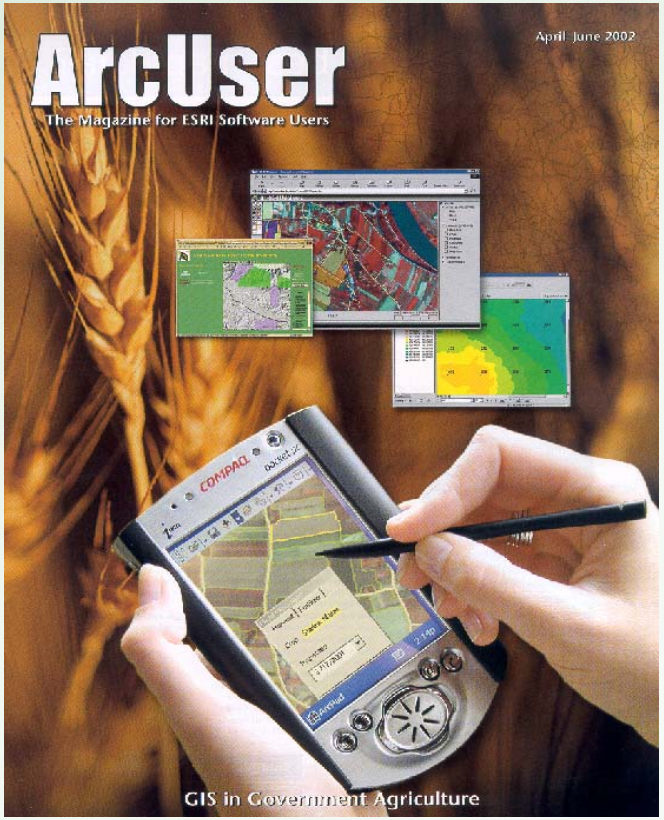
Compaq iPAQ Pocket PC
with „GNSS Internet Radio“

+

Nokia D211 GPRS modem

DGPS: 0.7 cent/min

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



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Other Broadcaster Implementations

Broadcasting Network

- Regional Broadcasters
- Distributing the Workload

<u>NtripCaster:</u>
EUREF: 129.217.182.51:80
BKG: 213.20.169.236:80

<u>Trimble-iGate:</u>
IGNE: 80.38.104.84:2101
Terrasat: 62.159.109.248:8080
Thüringen: 195.145.245.203:8040
Hessen: 141.90.2.81:8080
Swisstopo: www3.swisstopo.ch:8080
Trimble DK: Makalu.GPSnet.dk:9000

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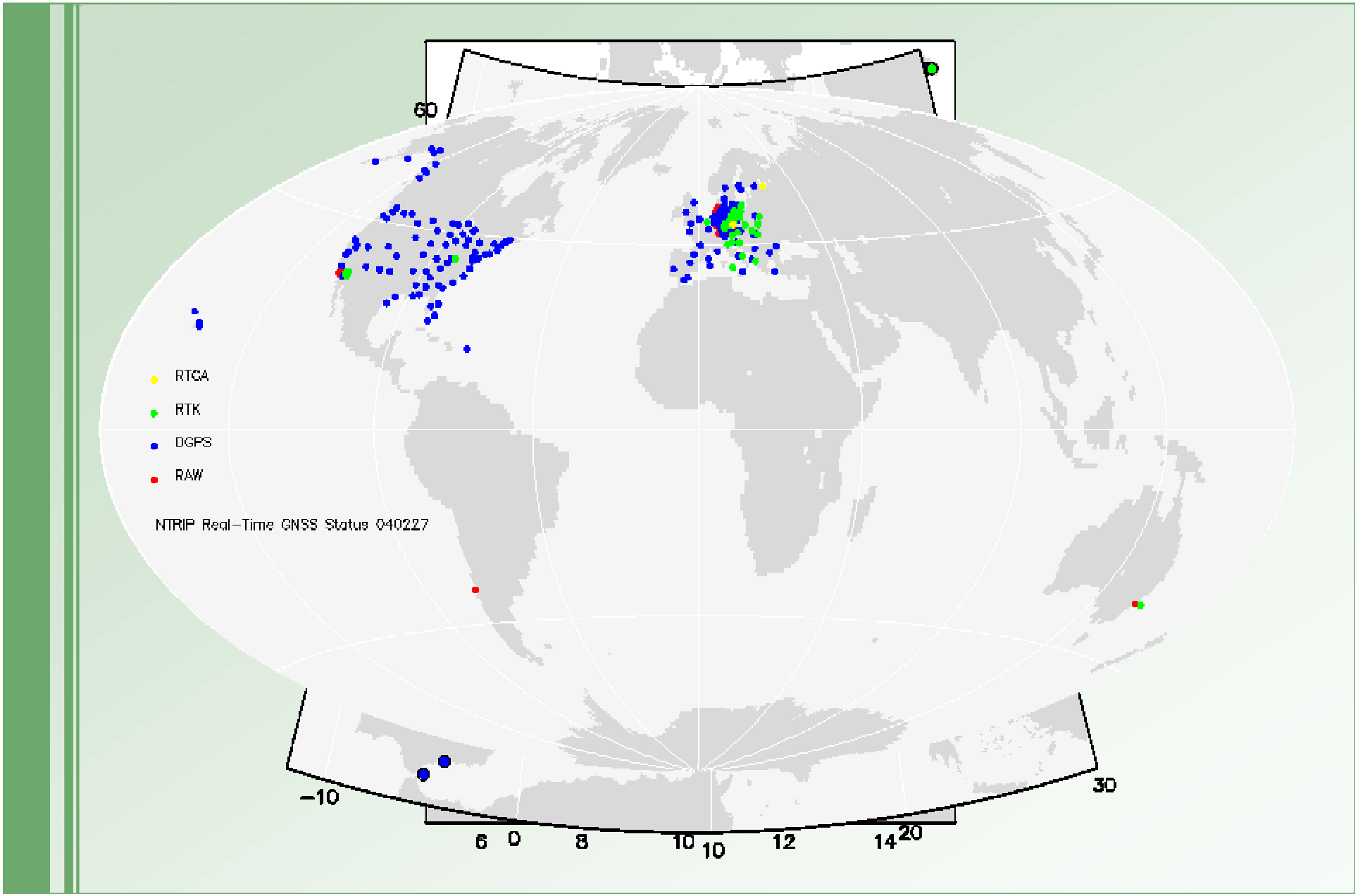
Available NTRIP Data Streams



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NTRIP - Standardization

- co-operation with receiver manufacturers
- Standardization process within RTCM SC-104
- Working Group on „Internet Protocol“
  Chair: Robert Snow, Thales
  WG Members from Leica, Trimble, Ashtech, Topcon, U.S. Coast Guard
- RTCM Paper 167-203/SC104-315
- new RTCM standard within the next few month

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Conclusion

- Streaming GNSS real-time data over Internet and cellular phone networks is feasible
- EUREF-IP Ntrip Broadcaster providing data for several month
- NtripCaster could handle about 300 data streams und up to 1500 user
- Today: more than 140 real-time data streams from 16 countries
- Latencies less than 1 second (2 seconds for mobile phone connections) sufficient for most applications
  like: real-time positioning, navigation, orbit determination
- No significant degradation of performance compared to usage of other transportation media

Information on the Web

EUREF Ntrip Broadcaster:	http://igs.ifag.de/ntrip_caster.htm
Ntrip Format:	http://igs.ifag.de/index_ntrip.htm
Download:	http://igs.ifag.de/ntrip_down.htm