



EUREF-IP:

From Pilot Project to Professional Service



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Overview

STATUS

-  EPN real-time stations
-  Data format and transport

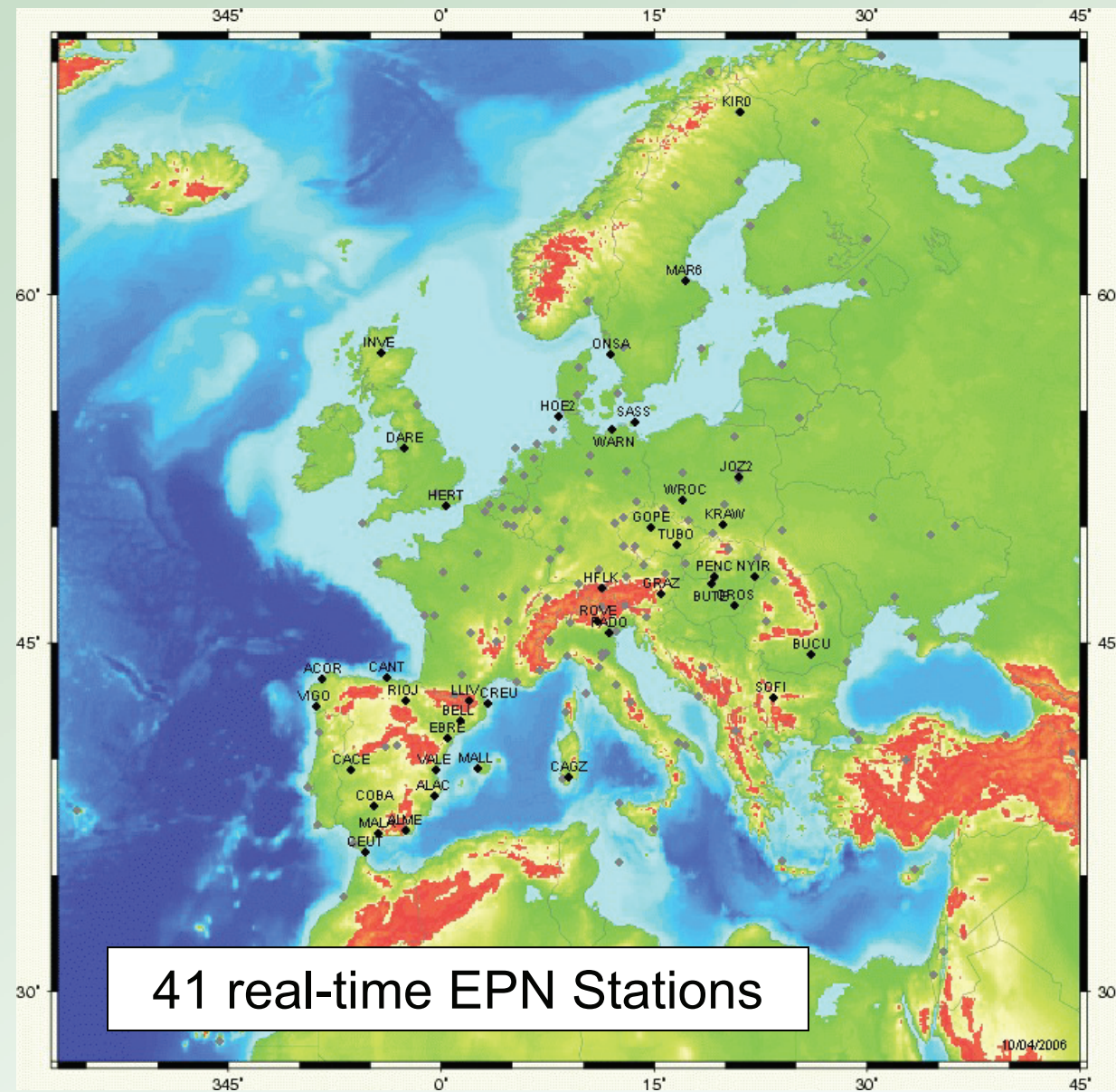
PERSPECTIVES

-  Upgrading of the network (stations, format, data flow)
-  Stream Control
-  Dissemination Policy
-  Products and Software
-  Summary, Recommendations



Status

EPN real-time stations



Data Formats

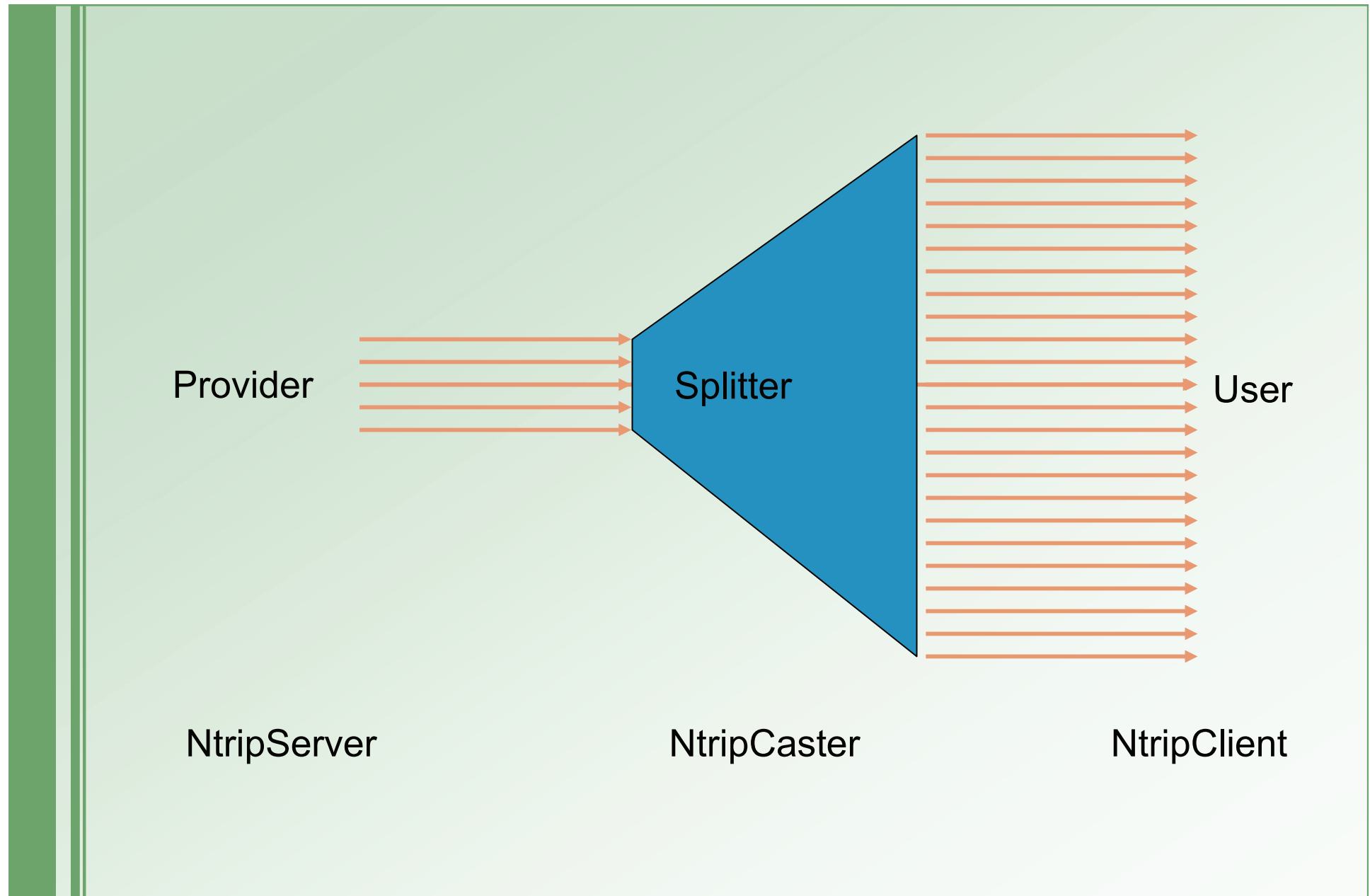
-  RTCM 2.0, DGPS corrections (9)
-  RTCM 2.x, RTK (27)
-  RAW data, vendor formats (10)
-  RTCM 3.0 (0)

Transport Protocol

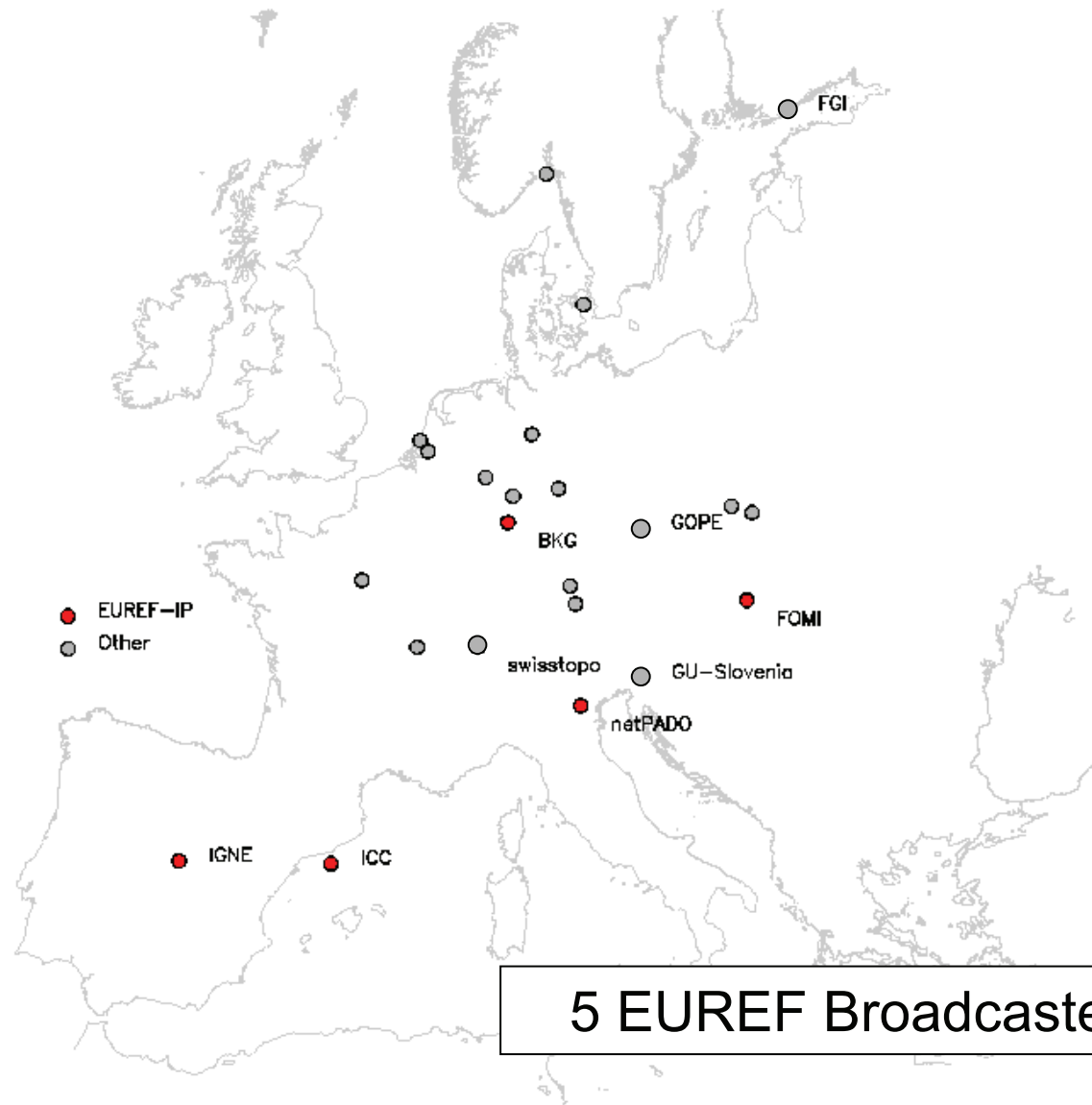
✓ Networked Transport of RTCM via Internet Protocol

-  NTRIP 1.0: RTCM SC-104 standard
-  Based on HTTP, port 80 and/or 2101
-  Distribution of any kind of GNSS data
-  Handles meta-data (sourcetable)
-  Supported by many devices
-  Mass-usage possible
-  NTRIP 2.0 under preparation

Ntrip Data Flow

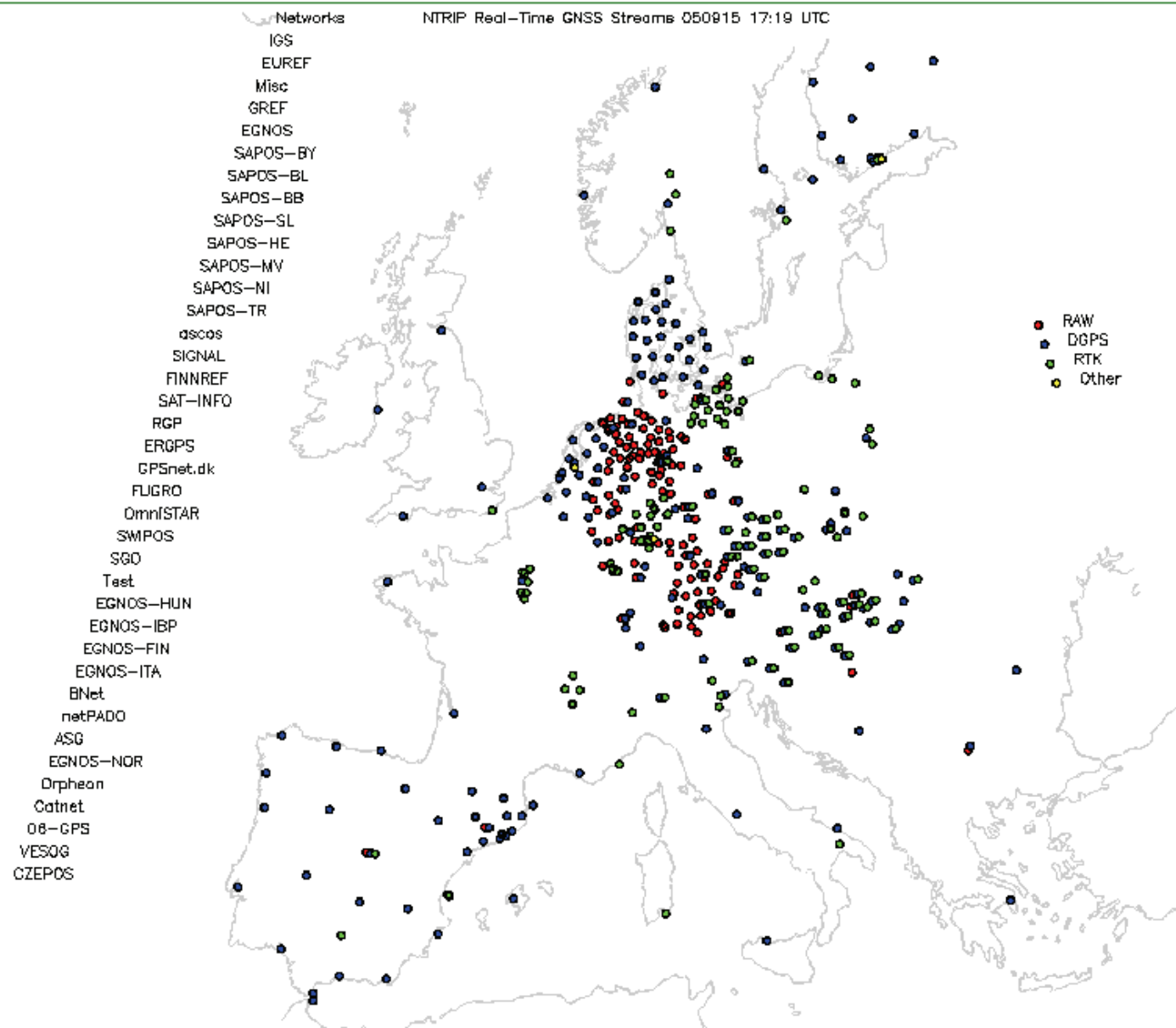


Ntrip Broadcasters





Ntrip Streams in Europe



Ntrip Software

Ntrip Client

- Windows: GNSS Internet Radio
- Windows CE & PocketPC 2003: GNSS Internet Radio
- Linux: Plain Example Program, [GNU GPL](#)
- Linux: Perl NtripClient, [GNU GPL](#)
- Palm OS: Demo Example Program

Ntrip Server

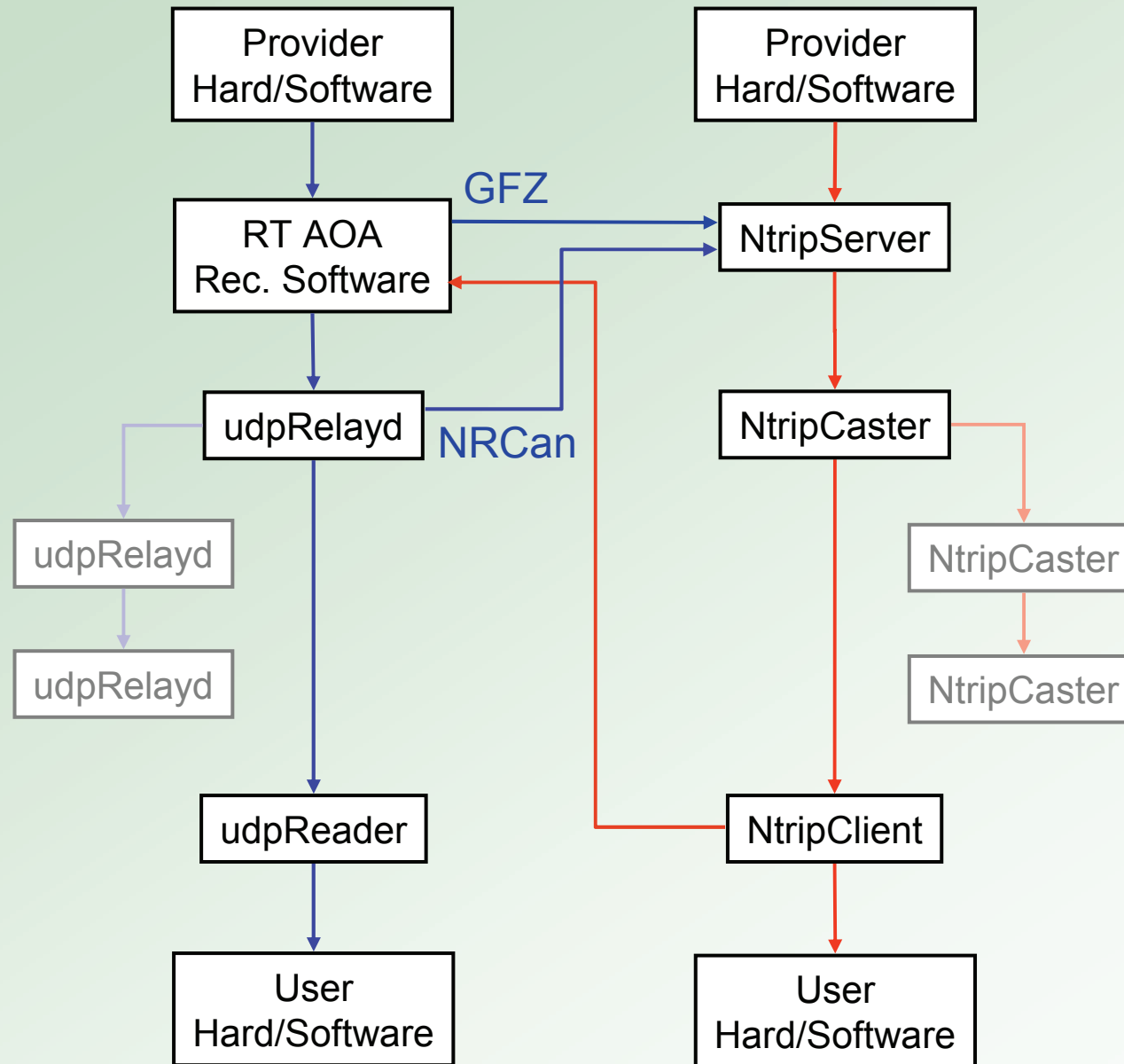
- Windows: Reading from Serial Port
- Windows: Command line version, reading from IP address/port
- Linux: Reading SISNeT, TCP/UDP Port, Serial Port, NtripCaster, [GNU GPL](#)
- Linux: Perl NtripServer, Reading from Standard Input, [GNU GPL](#)

Ntrip Decoder, Converter, etc

- Windows: GnssSurfer, Client & Server & RTCM 2.x Decoder
- Windows: RTCM 2.x DGPS/RTK Decoder, reading from TCP/IP Port
- Linux: Stand-alone RTCM 2.x RTK Decoder, reading from Std. Input, [GNU GPL](#)
- Linux: Multi-Stream Client and RTCM 2.x to RINEX Converter, [GNU GPL](#)
- Linux: Client and RTCM 3 to RINEX Converter, [GNU GPL](#)

Plus variety of commercial Ntrip supporting hard and software products

RTIGS - NTRIP Interface





Perspectives

Stations



Upgrade as many EPN stations to real-time as possible



Distribute all observables in common data formats

Priority:

- ✓ RTCM 3.0
- ✓ RTCM 2.x RTK
- ✓ vendor formats
- ✓ RTCM 2.x DGPS only additive in case of national interest



Network of Broadcasters

Broadcasters

European Broadcaster
for all EPN stations
with Backup

at RDC

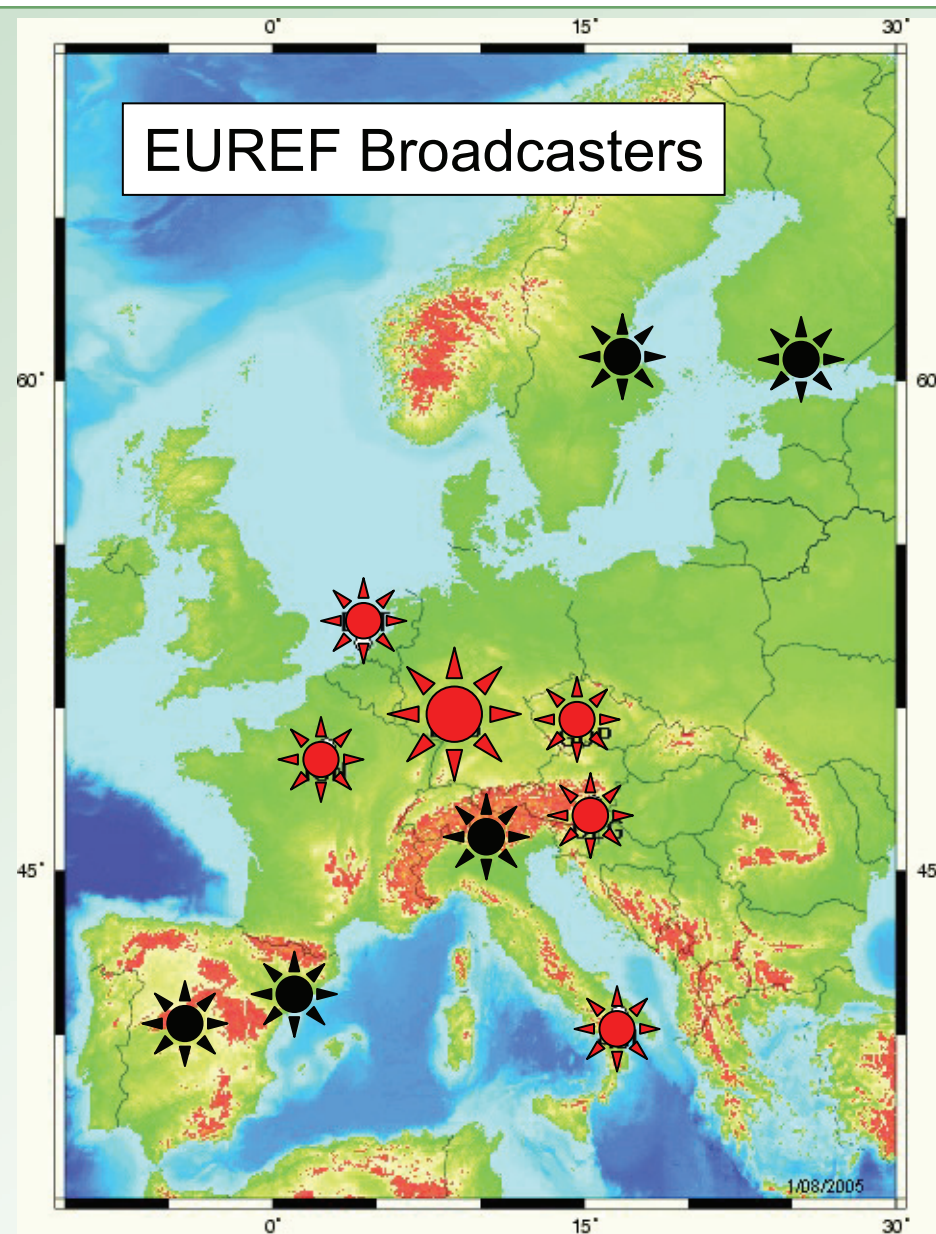


Additional Broadcasters
to share the workload and
to reduce latencies

at LDCs



at other institutions



Stream Control (1/3)



Caster Outage Monitoring

- ✓ Computer Breakdown
- ✓ Internet Problem
- ✓ Software Outages



Stream Outage Monitoring

- ✓ Problem at the station (hardware, software, Internet,...)



Stream Content Monitoring

- ✓ Data Format
- ✓ Consistency with souretable

=> Notification Service by email/SMS (NABUs)

NOTICE ADVISORY TO BROADCASTER USERS (NABU) 20063523

SUBJ: GNSS REAL-TIME DATA STREAM(S) FROM EUREF-IP NTRIP BROADCASTER
www.euref-ip.net UNAVAILABLE - UNTIL FURTHER NOTICE

1. NABU TYPE: UNAVUFN
NABU NUMBER: 20063523
NABU DTG: 060530 15H03 UTC
2. STREAM(S) AFFECTED: 1
CEUT0: CEUTA
START DTG: 060530 14H49 UTC
STOP: UFN
3. CONDITION: GNSS REAL-TIME DATA STREAM(S) FROM EUREF-IP
NTRIP BROADCASTER www.euref-ip.net UNAVAILABLE
UNTIL FURTHER NOTICE
4. POC: BKG AT +49 69 6333-253, euref-ip@bkg.bund.de
http://igs.bkg.bund.de/index_ntrip.htm
http://igs.bkg.bund.de/root_ftp/NTRIP

EUREF Stream

ZIMM0
WROCO
WARNO
VIGOO
TUBOO
SOFJO
SASSO
ROVED
PENCO
PADOO
ONSAO
MAR60
MALL0
LPAKO
KRAMO
KIR00
KARLO
JOZ20
HGE20
GOPEO
CEUTO
CANTO
CAGZO
CACEO
BUCUO
ALMEO

0H 1H 2H 3H 4H 5H 6H 7H 8H 9H 10H 11H 12H 13H 14H 15H 16H 17H

PADO0	0.07	%
MAR60	0.07	%
MALL0	0.07	%
KIR00	0.07	%
CANTO	0.07	%
CACEO	0.07	%
REYZO	0.00	%
INVE0	0.00	%
HFLK0	0.00	%
HERTO	0.00	%
GRAZO	0.00	%
DARE0	0.00	%
CREU0	0.00	%

Stream Control (3/3)



Stream Quality Monitoring
in near real-time
after generating RINEX files from data streams

- ✓ Number of observations
- ✓ Number of observed satellites
- ✓ ...
- ✓ Quality check by PPP => hourly coordinates

Dissemination Policy

-  Open Data Policy
-  No User Fee
-  User Registration recommended
-  Priority list in case of bandwidth limitations
 - ✓ Monitoring Issues
 - ✓ Stream Provider
 - ✓ Analysis Centres
 - ✓ Re-distributors (other Broadcasters)
 - ✓ Other Users

Products (proposal)



Already existing / Easy to implement

- ✓ Reliable observations
- ✓ Event notification service
- ✓ Station coordinates (near real-time, from PPP)



New EUREF products

- ? Real-time satellit clocks
- ? Real-time orbits

software
development/purchase
necessary



Special projects (only in case of national interest)

- ? Real-time coordinates (e.g. for geodynamic applications)
- ? DGPS/RTK data streams

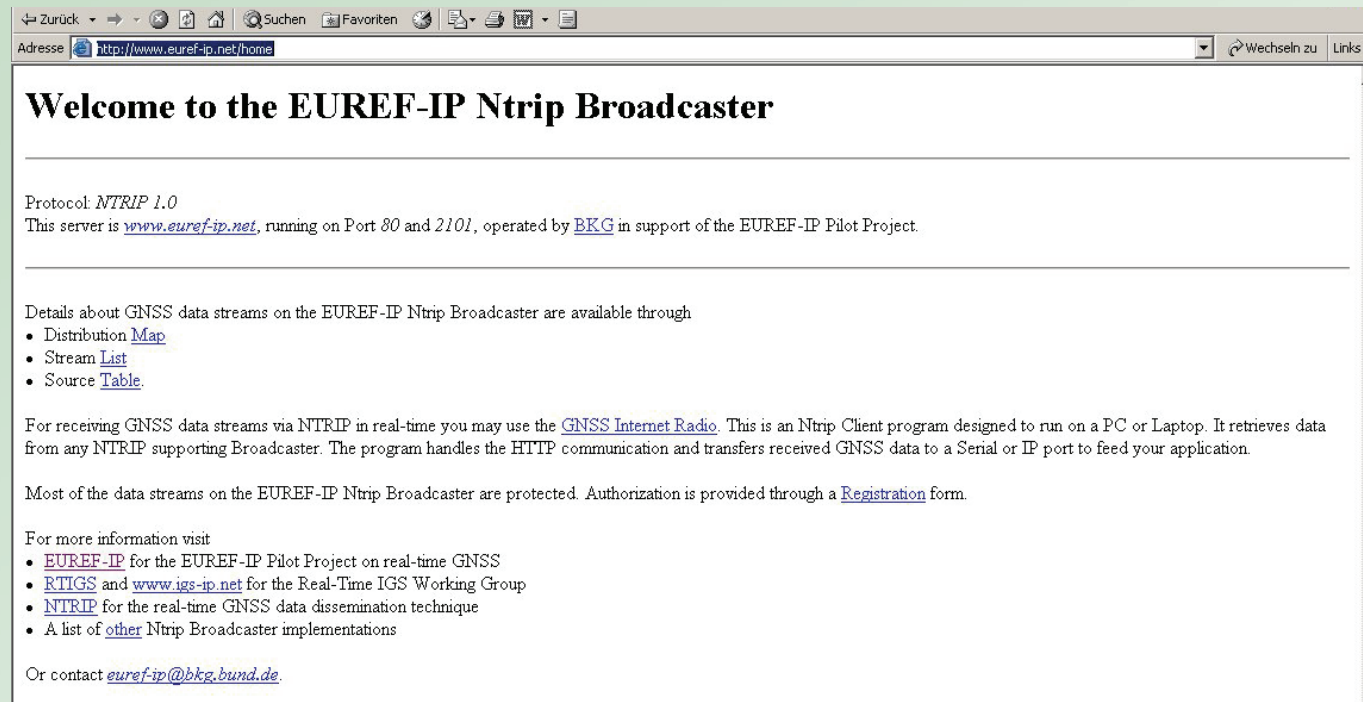


Summary

Recommendations

-  Upgrade as many EPN stations as possible to real-time
-  Generate high-rate data streams in addition to RINEX
-  RTCM 3.0 is recommended
-  Support open data policy
-  Operate Ntrip Broadcaster network
-  Monitor stream flow and content
-  Real-Time Working Group within TWG
-  Define EUREF real-time products and adequate product formats
-  Development of adequate real-time processing software

Thank you!



http://www.epncb.oma.be/_organisation/projects/euref_IP/index.html

<http://www.euref-ip.net/home>

http://igs.bkg.bund.de/index_ntrip.htm

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