

EUREF-IP:

From Pilot Project to Professional Service



EPN Real-time working group
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Topics



Network Structure

(Stations, Data Format, Transport Protocol, Broadcaster...)



Stream Control

(Outage Monitoring, Quality check)



Dissemination Policy



Products



Software



Guidelines



Documentation

Stations



Upgrade all EPN stations to real-time



Requirements for becoming an EPN real-time station:

- ✓ Long term commitment
- ✓ Continuous data stream
- ✓ Sufficient Internet Bandwidth

Data Formats



All observables together with quality information



High-rate data streams (1Hz)



GPS, GLONASS (& Galileo)



Common data formats



Priority, preferences

- ✓ RTCM 3.0
- ✓ RTCM 2.x, Message Types 18/19, w/ GLONASS
- ✓ RTCM 2.x, Message Types 18/19, w/o GLONASS
- ✓ RAW data, vendor formats
- ✓ RTCM 2.x, Message Type 1

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

Broadcasters

European Broadcaster
for all EPN stations
with Backup

at RDC

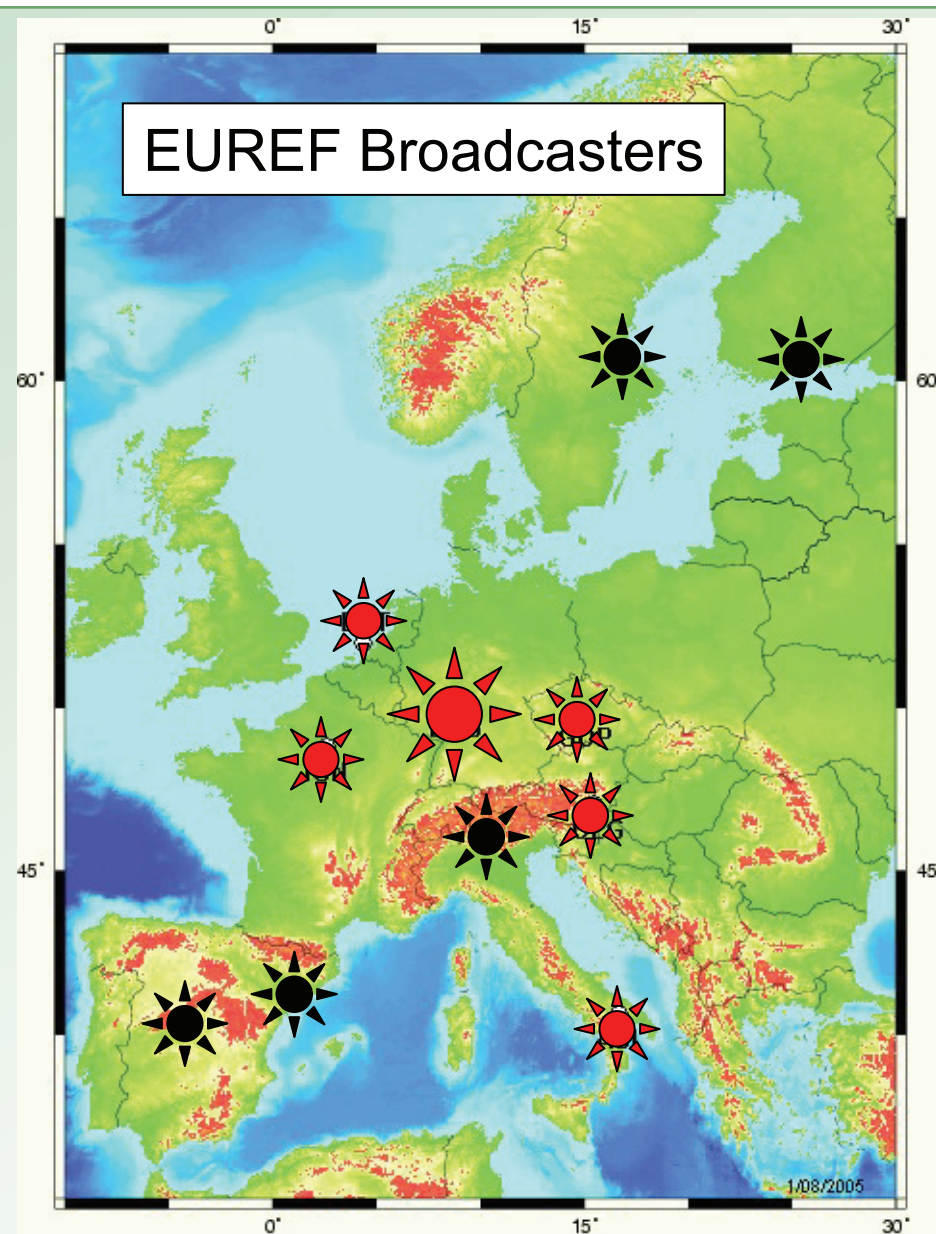


Additional Broadcasters
to share the workload and
to reduce latencies

at LDCs



at other institutions



On-Side Data Flow

-  No changes in existing RINEX data flow !
-  EPN stations should generate an additional NTRIP data stream, e.g. through
 - ✓ Second receiver port
 - ✓ Reference station receiver software
-  Sending only real-time data and produce RINEX files from the output of the Broadcaster (by TS, OC or DC) is possible but not recommended
Exception: High-rate data archiving

Outage Monitoring



Caster Outage Monitoring

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



Stream Outage Monitoring

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



Notification Service by email/SMS (NABUs)

Quality Check



Stream Content Monitoring (real-time)

- ✓ Data Format
- ✓ Consistency with souretable



Stream Quality Monitoring (near real-time)

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



Notification Service by email/SMS (NABUs)

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

official EPN real-time products



Reliable observations



Event notification service



Station coordinates (near real-time, from PPP)



Real-time satellite clocks



Real-time orbits?



Real-time coordinates (geodynamic applications) ?



DGPS/RTK data streams ?

Real-time Software

-  Software for transport, dissemination and monitoring is available
-  Access to real-time GNSS engine is a problem

Options:

-  Use (buy) a commercial software tool
 - ✓ Probably no source code available
 - ✓ Probably not all EUREF requirements fulfilled
-  New software development

=> Common effort (manpower and money)
Call for participation

Documentation



EUREF-IP website at EPN CB

- ✓ List and map of EPN real-time stations
- ✓ Detailed station information (links to site-logs)
- ✓ Station coordinates
- ✓ List of EUREF Broadcasters
- ✓ Information about registration procedures
- ✓ Detailed stream content information (link to sourcetables)
- ✓ List and link to EUREF real-time products



NTRIP technical website at BKG

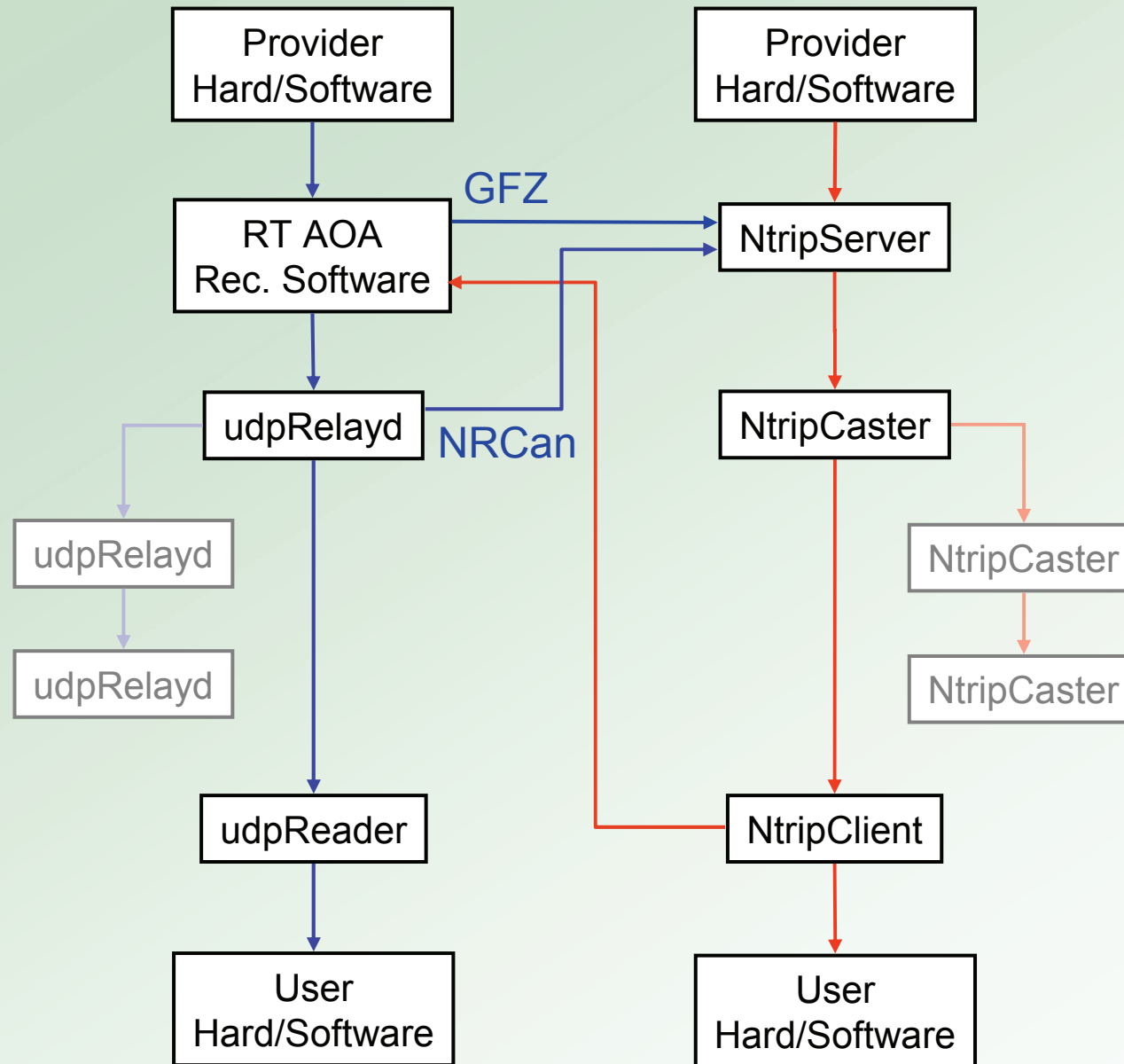
Guidelines

-  Guidelines for Stream Provider
-  Guidelines for Caster Operator
-  Monitoring issues ?
-  EPN real-time product generation

=> To be integrated in the existing guidelines

- ✓ Procedure for Becoming an EPN Station
- ✓ Guidelines for EPN Stations and Operational Centres
- ✓ Guidelines for EPN Data Centres **and EPN NtripCaster Operator**
- ✓ Guidelines for EPN Analysis Centres

RTIGS - NTRIP Interface



Summary

-  Upgrade all EPN stations to real-time
-  Generate high-rate data streams with all observables
-  Disseminate standard data formats via Internet (NTRIP)
-  Maintain a network of NTRIP Broadcasters
-  Monitor stream flow and content
-  Support open data policy
-  Inform EUREF community through websites and guidelines about real-time activities
-  Define EUREF real-time products and adequate product formats
-  Make decision on software development/purchase