



Federal Agency for
Cartography and Geodesy

Real-Time Tools Provided by BKG: Professional Ntrip Caster and BKG Ntrip Client (BNC)

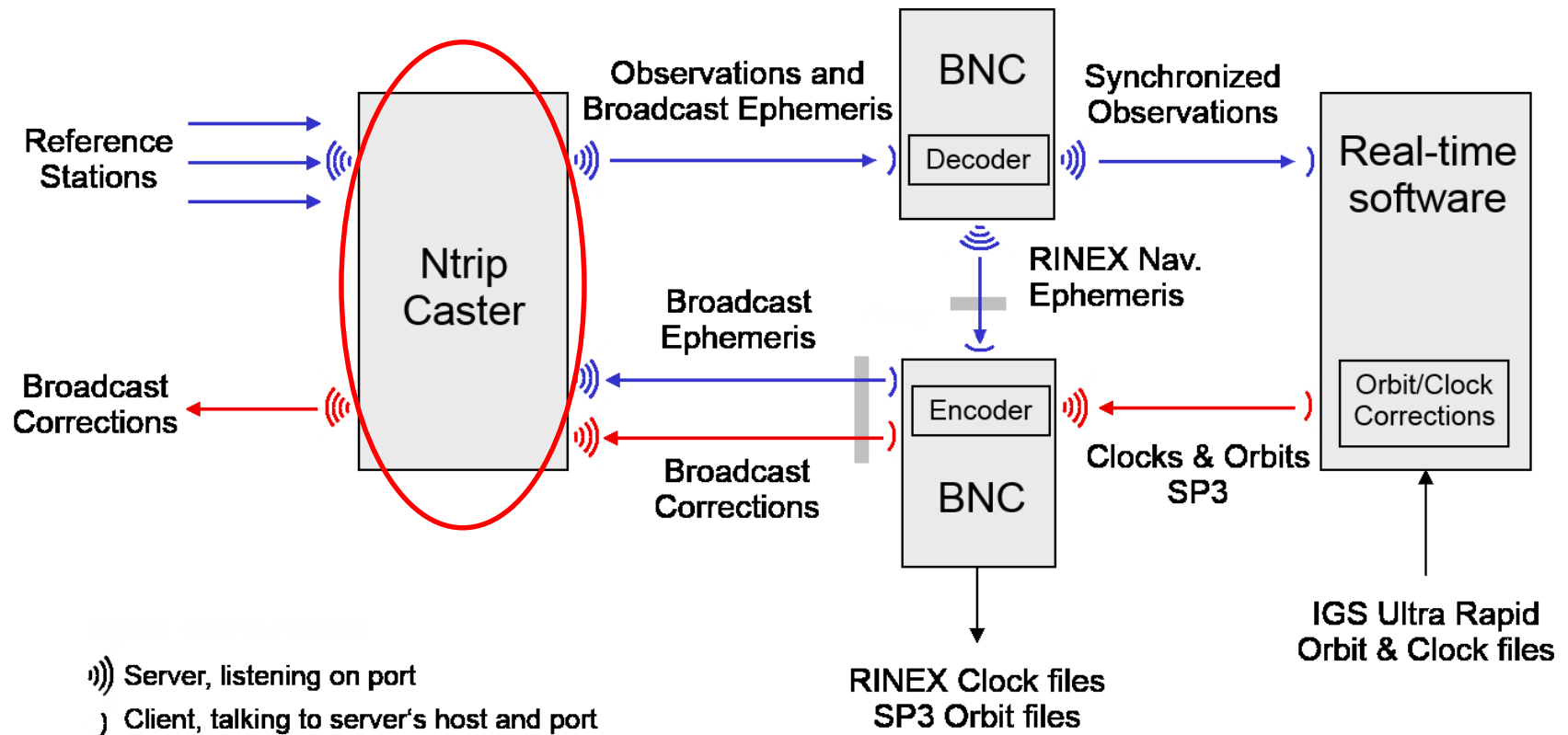
Wolfgang Söhne

Federal Agency for Cartography and Geodesy (BKG), Germany

Outline

- **Introduction/Motivation**
- **Ntrip**
- **Professional Ntrip Caster**
- **BKG Ntrip Client**
- **Summary**

GNSS Real-Time Processing *at BKG*



Ntrip

concept

- **NTRIP – Networked Transport of RTCM* via Internet Protocol, <http://igs.bkg.bund.de/ntrip>**
- **HTTP application layer on top of TCP/IP**
- **Data streaming begins with selective HTTP request**
- **Communication between Server, Caster and Client handled through HTTP port**
- **Major software components developed under “GNU General Public License”**
- **Open documentation**

*RTCM: Radio Technical Commission for Maritime Services (founded 1947)

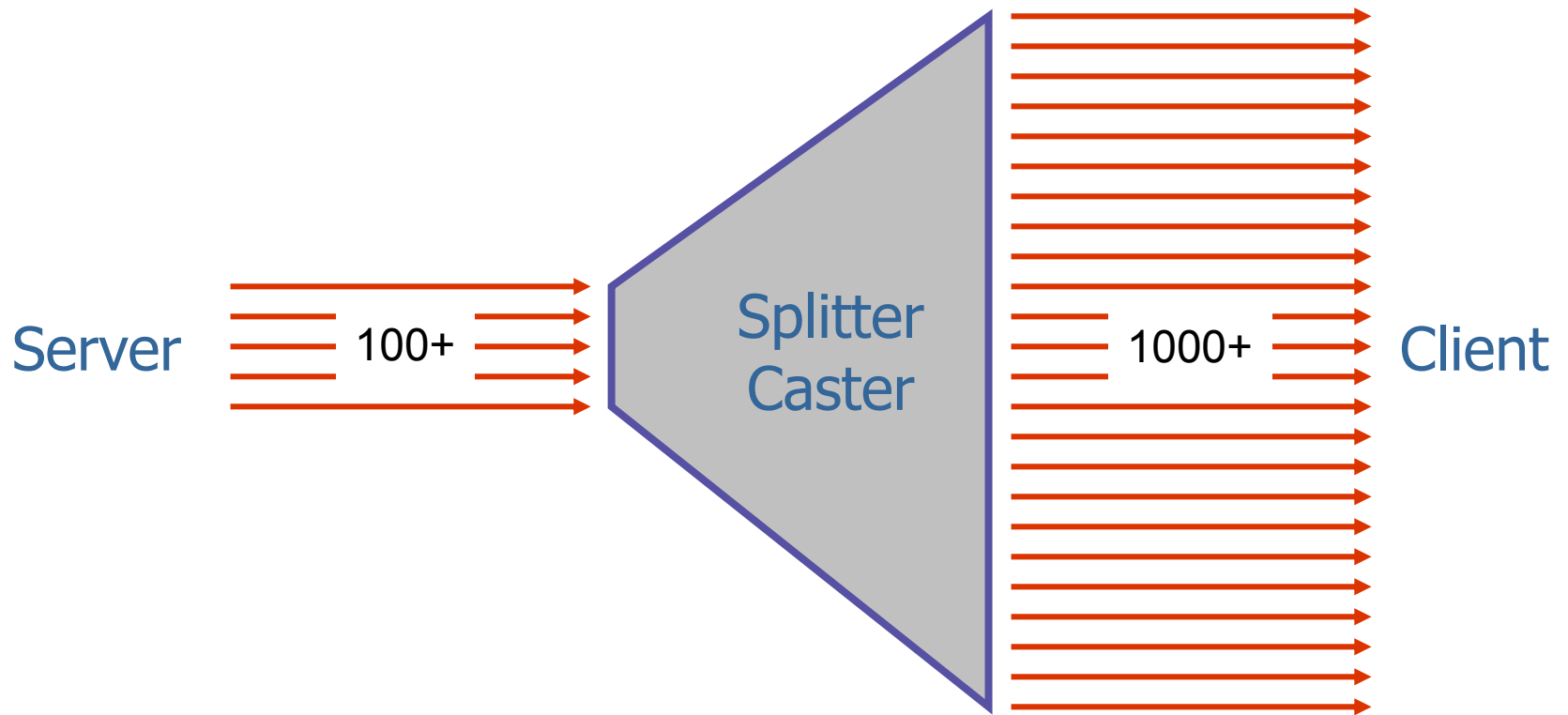
Ntrip

characteristics

- **Streaming protocol: distribution of any kind of GNSS data**
- **HTTP: easy to implement, usually not blocked by firewalls**
- **Security: stream providers and users are not in contact**
- **Mass usage: Disseminating hundreds of streams simultaneously for a few thousand users when applying modified Internet Radio broadcasting software**

Ntrip

characteristics



~5 kbit/s per GNSS Stream max.

Ntrip

history

- Developed by BKG and Informatikzentrum Dortmund
- Industry standard since 2004
- Standardized as Version 1 in RTCM Special Committee 104 “DGNSS”
- Version 2 completed 2009
 - Problems and bugs of version 1 fixed (improved HTTP compatibility)
 - Chunked transfer encoding added
 - Header records improved
 - Sourcetable filtering provided
 - Streaming protocol RTSP/RTP for UDP communication added
 - SSL/TLS included
 - Downward compatible to Ntrip version 1
 - .

Ntrip

server-caster communication

S
E
R
V
E
R

NTRIP-SOURCE /Mountpoint HTTP/1.1<CR><LF>
User-Agent: NTRIP ServerCMD/1.5<CR><LF>
Authorization: Basic aHVnb2JlbjpodWdvYmVuMTIz<CR><LF>
NTRIP-STR: <STR-String><CR><LF> (optional)
Upgrade: Ntrip/1.1 <CR><LF>
Connection: Upgrade <CR><LF>
<CR><LF>

C
A
S
T
E
R

S
E
R
V
E
R

HTTP/1.1 101 Switching Protocols<CR><LF>
Upgrade: Ntrip/2.0, HTTP/1.1<CR><LF>
Connection: Upgrade<CR><LF>
HTTP/1.1 200 OK<CR><LF>
<CR><LF>

C
A
S
T
E
R

SER
VER

GNSS Data

CAS
TER

Ntrip

client-caster communication

C GET /Mountpoint HTTP/1.1<CR><LF>
L User-Agent: NTRIP GNSSInternetRadio/2.0.10<CR><LF>
I Accept: */*<CR><LF>
E Upgrade: Ntrip/2.0<CR><LF>
N Connection: Upgrade<CR><LF>
T <CR><LF>

C
A
S
T
E
R

C
L
I
E
N
T

HTTP/1.1 101 Switching Protocols<CR><LF>
Upgrade: Ntrip/2.0, HTTP/1.1<CR><LF>
Connection: Upgrade<CR><LF>
HTTP/1.1 200 OK<CR><LF>
Server: NTRIP Caster 2.0.1<CR><LF>
Content-Type: gnss/data<CR><LF>
Date: 25/Jan/2005:17:41:48 UTC<CR><LF>
<CR><LF>
GNSS Data

C
A
S
T
E
R

Ntrip caster

installation

- Copy it somewhere into an empty directory
- run **bunzip2 ntripcaster-version.tar.bz2**
- run **tar xfv ntripcaster-version.tar** for un-compression
- Run **./configure**
 - if you do not want the server to be installed in `"/usr/local/ntripcaster"` specify the desired path with **./configure --prefix=<path>**
- Run **make**
- Run **make install**
- After that, the server files will be installed
 - binaries in **/usr/sbin** and **/usr/bin**
 - configuration files in **/etc/ntripcaster**
 - logs in **/var/log/ntripcaster**
 - html templates in **/usr/local/ntripcaster/templates**

Ntrip caster

installation

- **Configuration files** within the sub-directory **/conf**
 - for general administration
 - **ntripcaster.conf**
 - for Ntrip server and client authorization
 - **clientmounts.aut**
 - **sourcemounts.aut**
 - **groups.aut**
 - **users.aut**
 - to save meta-data
 - **sourcetable.dat**

Ntrip caster configuration

The image displays four screenshots of the 'Jens' File Editor' showing different configuration files for Ntrip casting. Each window has a menu bar (Datei, Bearbeiten, Ansicht, Einstellungen, Fenster) and a toolbar with icons for file operations.

- Jens' File Editor - [groups.aut]**: Shows configuration for admin groups and users.


```

13 #-----#
14 # Admin groups #
15 #-----#
16 FirstAdmin:weber
17 SecondAdmin:stuerze
18 NTRIPAdmin:ntrip
19 #
20 #-----#
21 # STREAM DOWNLOAD #
22 #-----#
23 sirgas:sirgasUser1,s
24 #
25 #-----#
26 # STREAM UPLOAD #
27 #-----#
28 upload:upload_user
29
30
      
```
- Jens' File Editor - [clientmounts.aut]**: Shows configuration for client mountpoints.


```

24 #-----#
25 # Admin mountpoints #
26 #-----#
27 /oper:FirstAdmin,Seco
28 /admin:NTRIPAdmin
29 #
30 #-----#
31 # Stream Download #
32 #-----#
33 /BRAZ0:sirgas
34 /BRFT0:sirgas
35 /CEEU0:sirgas
36 /CONZ0:sirgas
37 /ILHA0:sirgas
38 /NAUS0:sirgas
39 /POVE0:sirgas
40 /ROSA0:sirgas
41 /SALU0:sirgas
42 /SAV00:sirgas
43 /SJRP0:sirgas
44 /UFPR0:sirgas
45 /CLK91:sirgas
      
```
- Jens' File Editor - [sourcemounts.aut]**: Shows configuration for source mountpoints.


```

13 # there are no restr
14 # <GROUPi>: name of
15 #
16 #-----#
17 # Stream Upload #
18 #-----#
19 /BRAZ0:upload
20 /BRFT0:upload
21 /CEEU0:upload
22 /CONZ0:upload
23 /ILHA0:upload
24 /NAUS0:upload
25 /POVE0:upload
26 /ROSA0:upload
27 /SALU0:upload
28 /SAV00:upload
29 /SJRP0:upload
30 /UFPR0:upload
31 /CLK91:upload
32 /RTCM3EPH:upload
33
34
      
```
- Jens' File Editor - [users.aut]**: Shows user authentication configuration.


```

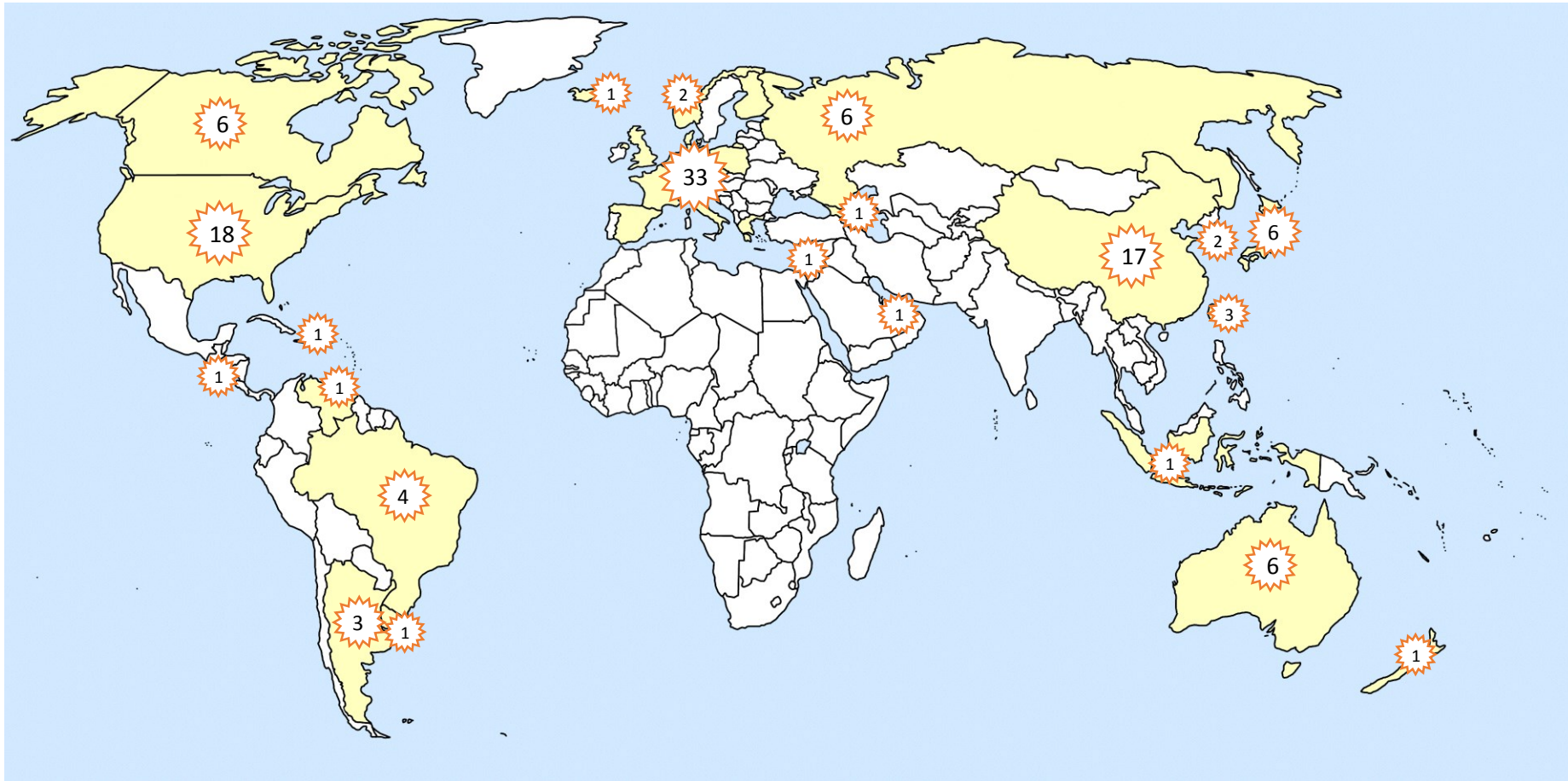
1 # User authentication file.
2 # Here you list all the users with their p
3 #
4 # Syntax: <USER>:<PASSWORD>
5 #
6 # <USER>: name of the user.
7 # <PASSWORD>: password of <USER>.
8 #
9 weber:georg
10 stuerze:andrea
11 ntrip:ntrip
12 sirgasUser1:pass1
13 sirgasUser2:pass2
14 sirgasUser3:pass3
15 upload_user:upload
16
17
18
      
```

Ntrip caster *configuration*

- **Home page**
 - http://NTRIP_CasterIP:port/home
- **Administrator web interface**
 - http://NTRIP_CasterIP:port/admin
 - password protected
- Sub-directory **/templates** contains templates for both

Professional NtripCaster

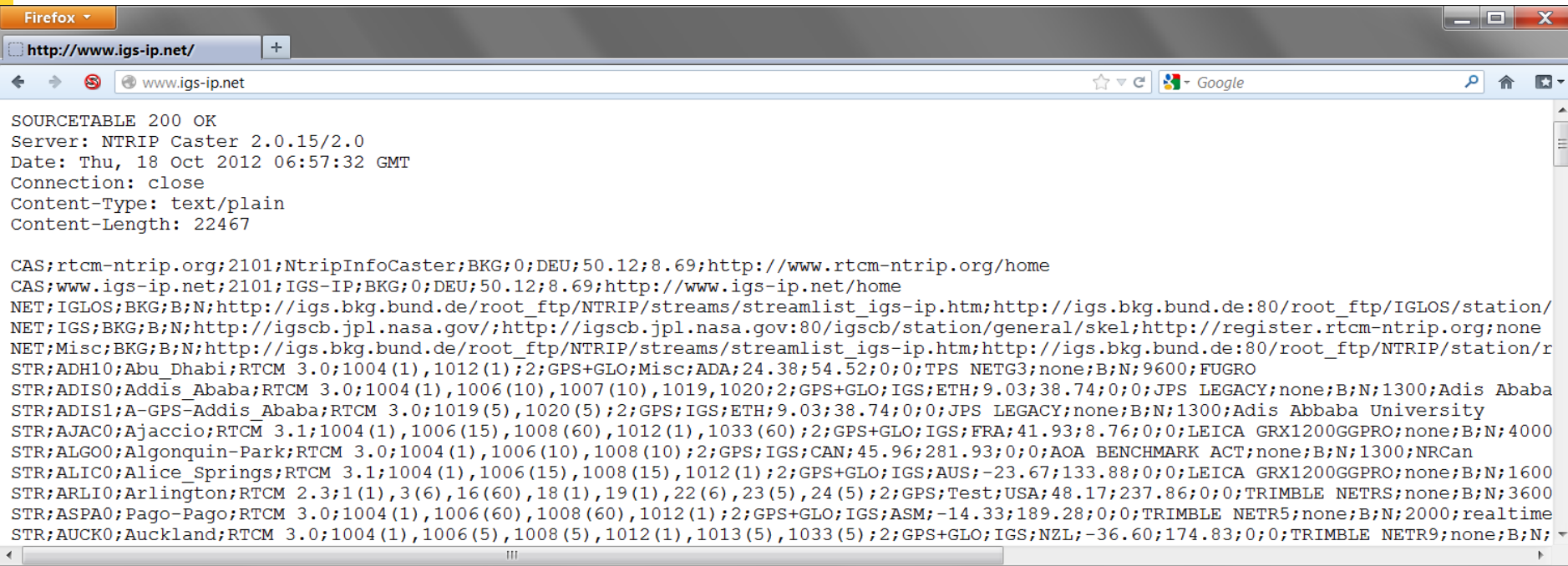
global distribution



Ntrip caster

source-table

- Ntrip caster source-table for meta-data handling
- Records
 - **CAS** record: caster entry
 - **NET** record: network entry
 - **STR** record: source entry



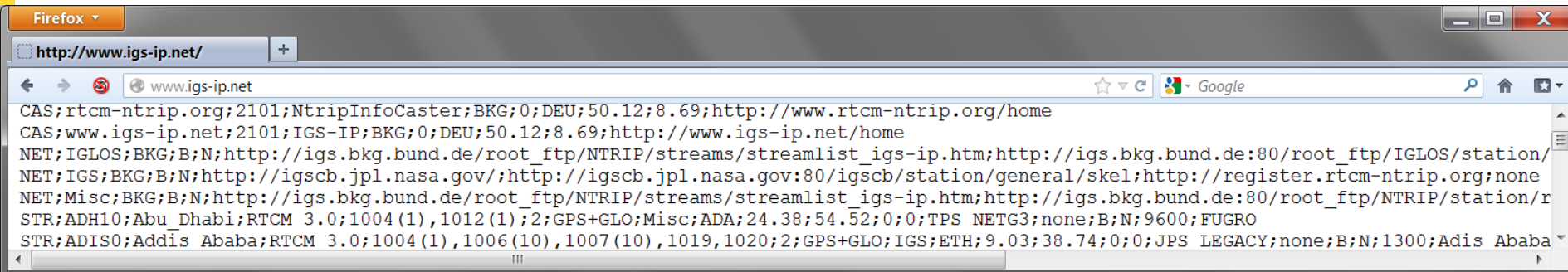
```
SOURCETABLE 200 OK
Server: NTRIP Caster 2.0.15/2.0
Date: Thu, 18 Oct 2012 06:57:32 GMT
Connection: close
Content-Type: text/plain
Content-Length: 22467

CAS;rtcm-ntrip.org;2101;NtripInfoCaster;BKG;0;DEU;50.12;8.69;http://www.rtcn-ntrip.org/home
CAS;www.igs-ip.net;2101;IGS-IP;BKG;0;DEU;50.12;8.69;http://www.igs-ip.net/home
NET;IGLOS;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/IGLOS/station/
NET;IGS;BKG;B;N;http://igscb.jpl.nasa.gov;http://igscb.jpl.nasa.gov:80/igscb/station/general/skel;http://register.rtcn-ntrip.org;none
NET;Misc;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/NTRIP/station/r
STR;ADH10;Abu_Dhabi;RTCM 3.0;1004(1),1012(1);2;GPS+GLO;Misc;ADA;24.38;54.52;0;0;TPS NETG3;none;B;N;9600;FUGRO
STR;ADIS0;Addis_Ababa;RTCM 3.0;1004(1),1006(10),1007(10),1019,1020;2;GPS+GLO;IGS;ETH;9.03;38.74;0;0;JPS LEGACY;none;B;N;1300;Adis Ababa
STR;ADIS1;A-GPS-Addis_Ababa;RTCM 3.0;1019(5),1020(5);2;GPS;IGS;ETH;9.03;38.74;0;0;JPS LEGACY;none;B;N;1300;Adis Abbaba University
STR;AJACO;Ajaccio;RTCM 3.1;1004(1),1006(15),1008(60),1012(1),1033(60);2;GPS+GLO;IGS;FRA;41.93;8.76;0;0;LEICA GRX1200GGPRO;none;B;N;4000
STR;ALGO0;Algonquin-Park;RTCM 3.0;1004(1),1006(10),1008(10);2;GPS;IGS;CAN;45.96;281.93;0;0;AOA BENCHMARK ACT;none;B;N;1300;NRCan
STR;ALIC0;Alice_Springs;RTCM 3.1;1004(1),1006(15),1008(15),1012(1);2;GPS+GLO;IGS;AUS;-23.67;133.88;0;0;LEICA GRX1200GGPRO;none;B;N;1600
STR;ARLI0;Arlington;RTCM 2.3;1(1),3(6),16(60),18(1),19(1),22(6),23(5),24(5);2;GPS;Test;USA;48.17;237.86;0;0;TRIMBLE NETRS;none;B;N;3600
STR;ASPA0;Pago-Pago;RTCM 3.0;1004(1),1006(60),1008(60),1012(1);2;GPS+GLO;IGS;ASM;-14.33;189.28;0;0;TRIMBLE NETR5;none;B;N;2000;realtime
STR;AUCK0;Auckland;RTCM 3.0;1004(1),1006(5),1008(5),1012(1),1013(5),1033(5);2;GPS+GLO;IGS;NZL;-36.60;174.83;0;0;TRIMBLE NETR9;none;B;N;
```

Ntrip caster

source-table

- Ntrip caster source-table for meta-data handling
- Records
 - CAS record



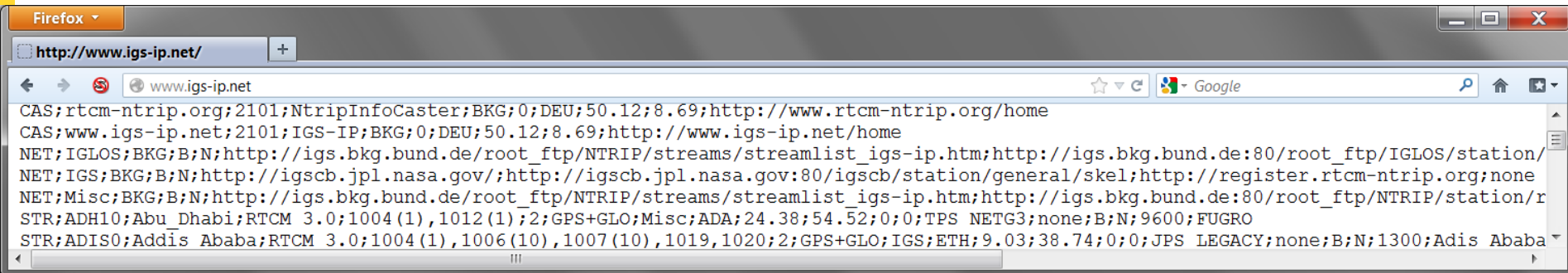
```
CAS;rtcm-ntrip.org;2101;NtripInfoCaster;BKG;0;DEU;50.12;8.69;http://www.rtcn-ntrip.org/home
CAS;www.igs-ip.net;2101;IGS-IP;BKG;0;DEU;50.12;8.69;http://www.igs-ip.net/home
NET;IGLOS;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/IGLOS/station/
NET;IGS;BKG;B;N;http://igsb.jpl.nasa.gov/;http://igsb.jpl.nasa.gov:80/igsb/station/general/skel;http://register.rtcn-ntrip.org;none
NET;Misc;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/NTRIP/station/r
STR;ADH10;Abu Dhabi;RTCM 3.0;1004(1),1012(1);2;GPS+GLO;Misc;ADA;24.38;54.52;0;0;TPS NETG3;none;B;N;9600;FUGRO
STR;ADIS0;Addis Ababa;RTCM 3.0;1004(1),1006(10),1007(10),1019,1020;2;GPS+GLO;IGS;ETH;9.03;38.74;0;0;JPS LEGACY;none;B;N;1300;Addis Ababa
```

- caster host; port
- caster name; operator; NMEA support; 3 char country ID
- latitude; longitude of caster location
- Backup caster IP and host

Ntrip caster

source-table

- Ntrip caster source-table for meta-data handling
- Records
 - **NET** record



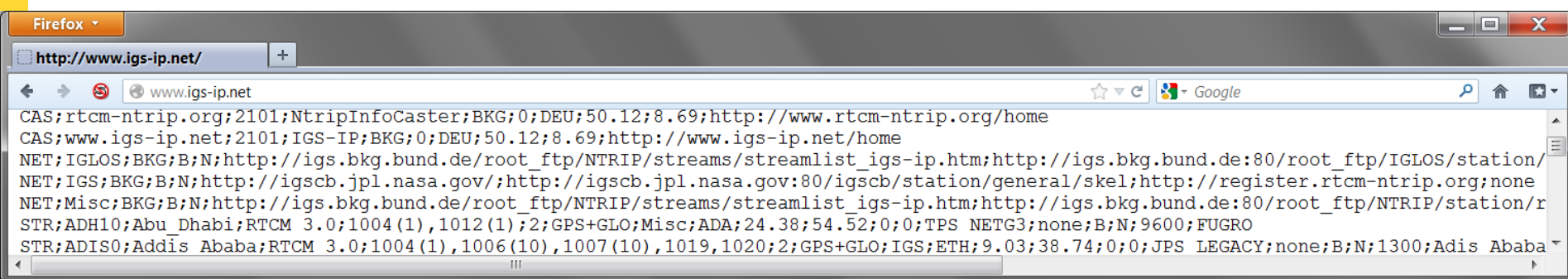
```
CAS;rtcm-ntrip.org;2101;NtripInfoCaster;BKG;0;DEU;50.12;8.69;http://www.rtcn-ntrip.org/home
CAS;www.igs-ip.net;2101;IGS-IP;BKG;0;DEU;50.12;8.69;http://www.igs-ip.net/home
NET;IGLOS;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/IGLOS/station/
NET;IGS;BKG;B;N;http://igsch.jpl.nasa.gov/;http://igsch.jpl.nasa.gov:80/igsch/station/general/skel;http://register.rtcn-ntrip.org;none
NET;Misc;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/NTRIP/station/r
STR;ADH10;Abu_Dhabi;RTCM 3.0;1004(1),1012(1);2;GPS+GLO;Misc;ADA;24.38;54.52;0;0;TPS NETG3;none;B;N;9600;FUGRO
STR;ADIS0;Addis Ababa;RTCM 3.0;1004(1),1006(10),1007(10),1019,1020;2;GPS+GLO;IGS;ETH;9.03;38.74;0;0;JPS LEGACY;none;B;N;1300;Addis Ababa
```

- network identifier
- network operator; authentication (None, Basic, Digest); fee (Yes, No)
- Web pages (network, streams, registration, etc.)
- miscellaneous information

Ntrip caster

source-table

- Ntrip caster source-table for meta-data handling
- Records
 - **STR** record



```
CAS;rtcm-ntrip.org;2101;NtripInfoCaster;BKG;0;DEU;50.12;8.69;http://www.rtcn-ntrip.org/home
CAS;www.igs-ip.net;2101;IGS-IP;BKG;0;DEU;50.12;8.69;http://www.igs-ip.net/home
NET;IGLOS;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/IGLOS/station/
NET;IGS;BKG;B;N;http://igscb.jpl.nasa.gov/;http://igscb.jpl.nasa.gov:80/igscb/station/general/skel;http://register.rtcn-ntrip.org;none
NET;Misc;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de:80/root_ftp/NTRIP/station/r
STR;ADH10;Abu_Dhabi;RTCM 3.0;1004(1),1012(1);2;GPS+GLO;Misc;ADA;24.38;54.52;0;0;TPS NETG3;none;B;N;9600;FUGRO
STR;ADIS0;Addis_Ababa;RTCM 3.0;1004(1),1006(10),1007(10),1019,1020;2;GPS+GLO;IGS;ETH;9.03;38.74;0;0;JPS LEGACY;none;B;N;1300;Adis_Ababa
```

- “Mountpoint”; Identifier (Name of the city next to source location)
- Format; Format details
- Carrier; GNSS; network; 3 char country ID; Latitude; longitude; NMEA support solution (0 = reference station, 1 = network)
- Generator (hardware, software, receiver)
- miscellaneous information

Browser window showing the GNSS Data Center website. The address bar displays <https://igs.bkg.bund.de/ntrip/chksourcetable>. The page title is "GNSS Data Center".

The website header includes the GDC logo (GNSS DATA CENTER) and a navigation menu with links: Home, About Us, Data & Products, Real-Time, and Links. There are also icons for a shopping cart, a mobile phone, a globe, and an XML file, along with a "Project Filter: ALL" dropdown.

The main content area features the title "Sourcetable Validation Service" and a description: "This service checks a Ntrip sourcetable referring to the format described at <http://software.rtcn-ntrip.org/>." Below this, there is a form with the label "Enter address here" and a text input field. A security question is also present: "Security question: 4 less than ninethynine is:" followed by a text input field and a "Submit" button.

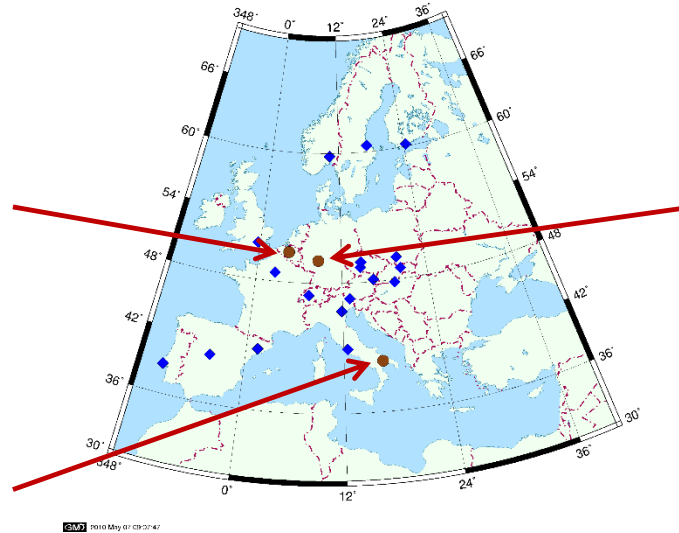
The footer contains links: <impressum> <sitemap> <contact>

Ntrip caster

example: EUREF

Regional Broadcaster: ROB
 Link: <http://www.euref-ip.be>
 Located: Royal Observatory of Belgium

Regional Broadcaster: ASI
 Link: <http://192.106.234.7:2101/>
 Located: ASI/CGS Centro di Geodesia Spaziale



Regional Broadcaster: BKG
 Link: <http://www.euref-ip.net>
 Located: external provider

Blue diamonds: Local, national or other (e.g., IGS) Ntrip Broadcaster supporting EUREF activities
Red dots: EPN Regional Broadcaster (see http://www.epncb.oma.be/networkdata/data_access/real_time/broadcasters.php for a complete list of Ntrip Broadcasters)

Guidelines

- ◆ “EPN Stations and Operational Centres”
 (http://www.epncb.oma.be/_documentation/guidelines/guidelines_station_operationalcentre.pdf)
- ◆ “EPN Data Centres & EPN Broadcasters”
 (http://www.epncb.oma.be/_documentation/guidelines/guidelines_data_centres.pdf)

Ntrip caster

example: EUREF

← → ↻

http://www.epncb.oma.be/_networkdata/data_access/real_time/status.php

EUREF Permanent GNSS Ne...

Datei Bearbeiten Ansicht Favoriten Extras ?

Vorgeschlagene Sites ▾

EPN CB HOME

EUREF PERMANENT NETWORK

ROB *****
GNSS RESEARCH GROUP

EUREF

ORGANISATION
About | Components | Working groups | Management | Contributors | Collaborations | Site map

NETWORK & DATA
Station list | Maps | Tracking status | Data access | Proposed stations | Station log submission | Station picture submission

PRODUCTS & SERVICES
Data analysis | Daily/weekly positions | Positions & velocities | Tropospheric delays | ETRF/ITRF transformation | Position time series | Satellite orbit & clock correction streams

DOCUMENTATION
Formats | Guidelines | Equipment & calibration | Papers | FAQ

NEWS, EVENTS & LINKS
News | Mails | Calendar | Workshops | FTP server | Web history | Links

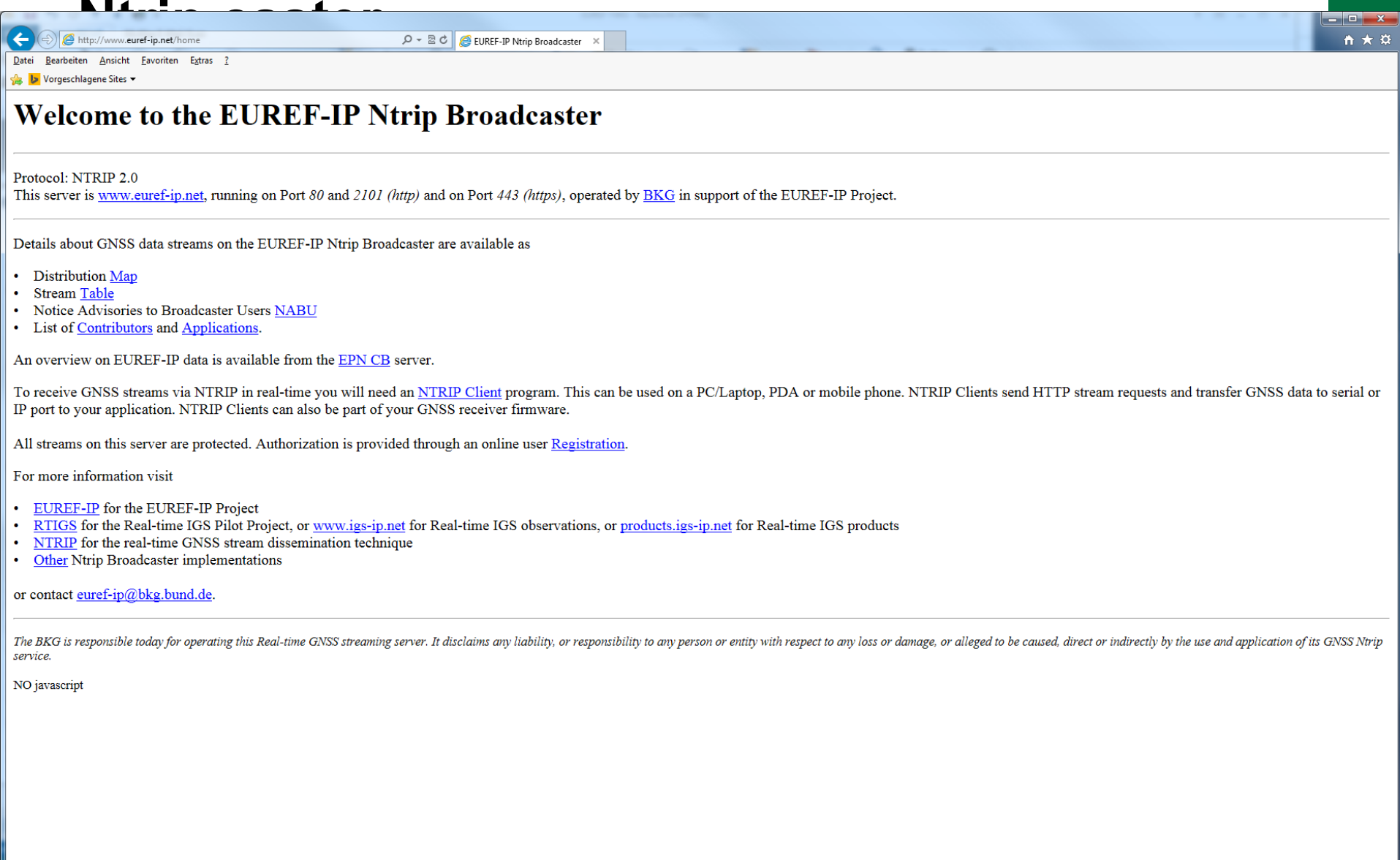
NETWORK & DATA > DATA ACCESS > REAL-TIME > PRODUCTS & DATA STREAMS

REAL-TIME PRODUCTS

Mountpoint	ASI (status: 2016-01-28 07:55 UTC)	BKG (status: 2016-01-28 07:55 UTC)	ROB (status: 2016-01-28 07:55 UTC)
EUREF01	RTCM 3.0 - BKG	RTCM 3.0 - EUREF filter combination	RTCM 3.0 - EUREF filter combination
EUREF02	RTCM 3.0 - BKG	RTCM 3.0 - EUREF filter combination	RTCM 3.0 - EUREF filter combination
RTCM3EPH	RTCM 3 - products.igs-ip.net:2101/RTCM3EPH(1)	RTCM 3.0 - products.igs-ip.net/RTCM3EPH(1)	RTCM 3.0 - products.igs-ip.net/RTCM3EPH(1)

REAL-TIME DATA STREAMS

Mountpoint	ASI (status: 2016-01-28 07:55 UTC)	BKG (status: 2016-01-28 07:55 UTC)	ROB (status: 2016-01-28 07:55 UTC)
ACOR0	RTCM 3.1- erguson-ip.ign.es:2101/ACOR0(1)	RTCM 3.1- erguson-ip.ign.es:2101/ACOR0(1)	RTCM 3.1- erguson-ip.ign.es:2101/ACOR0(1)
AJACO	Last received on 2015-11-27 14:55 UTC	Last received on 2015-11-27 14:55 UTC	Last received on 2015-11-27 14:55 UTC
ALACO	RTCM 3.1- erguson-ip.ign.es:2101/ALACO(1)	RTCM 3.1- erguson-ip.ign.es:2101/ALACO(1)	RTCM 3.1- erguson-ip.ign.es:2101/ALACO(1)
ALBA0	RTCM 3.1- erguson-ip.ign.es:2101/ALBA0(1)	RTCM 3.1- erguson-ip.ign.es:2101/ALBA0(1)	RTCM 3.1- erguson-ip.ign.es:2101/ALBA0(1)
ALME0	RTCM 2.3- erguson-ip.ign.es:2101/ALME0(1)	RTCM 2.3- erguson-ip.ign.es:2101/ALME0(1)	RTCM 2.3- erguson-ip.ign.es:2101/ALME0(1)
AUT10	Last received on 2016-01-13 11:35 UTC	Last received on 2016-01-13 11:35 UTC	Last received on 2016-01-13 11:35 UTC
BCLN0	RTCM 3.1- erguson-ip.ign.es:2101/BCLN0(1)	RTCM 3.1- erguson-ip.ign.es:2101/BCLN0(1)	RTCM 3.1- erguson-ip.ign.es:2101/BCLN0(1)
BELF0	RTCM 3.1- www.euref-ip.net:2101/BELF0(1)	RTCM 3.1- OSNI	RTCM 3.1- www.euref-ip.net:2101/BELF0(1)
BELL0	RTCM 3.0- www.euref-ip.net:2101/BELL0(1)	RTCM 3.0- ICGC	RTCM 3.0- www.euref-ip.net:2101/BELL0(1)
BOGI0	Last received on 2015-03-12 12:15 UTC	RTCM 3.0- IGIC	RTCM 3.0- www.euref-ip.net:2101/BOGI0(1)
BOR10	RTCM 2.3- www.euref-ip.net:2101/BOR10(1)	RTCM 2.3- SRCPAS	RTCM 2.3- www.euref-ip.net:2101/BOR10(1)
BORJ1	RTCM 3.0- www.euref-ip.net:2101/BORJ1(1)	RTCM 3.1- BKG	RTCM 3.1- www.euref-ip.net:2101/BORJ1(1)
BORR0	RTCM 3.0- icverva.icv.qva.es:2101/RTBO1(1)	RTCM 3.0- IGE	RTCM 3.0- icverva.icv.qva.es:2101/RTBO1(1)
BRMF0		RTCM 3.1- rgp-ip.ign.fr:2101/BRMF(1)	RTCM 3.1- rgp-ip.ign.fr:2101/BRMF(1)
BRST0	RTCM 3.0- rgp-ip.ign.fr:2101/BRST1(1)	RTCM 3.1- www.igs-ip.net:2101/BRST0(2)	RTCM 3.1- rgp-ip.ign.fr:2101/BRST1(1)
BRUX0	Last received on 2015-03-12 09:45 UTC	RTCM 3.1- www.igs-ip.net:2101/BRUX0(2)	RTCM 3.1- ROB
BRUX1			RAW- ROB
BRUX7			RTCM 3.2- mgex.igs-ip.net:2101/BRUX7(1)
BSCN0	RTCM 3.1- rgp-ip.ign.fr:2101/BSCN1(1)	RTCM 3.1- rgp-ip.ign.fr:2101/BSCN1(1)	RTCM 3.1- rgp-ip.ign.fr:2101/BSCN1(1)



http://www.euref-ip.net/admin?mode=sourcetable EUREF-IP Admin Interface

home | statistics | sourcetable | listeners | sources | admins | settings

Sourcetable

- CAS;192.106.234.17;2101;NTRIPcaster/2.0.21;ASI - eGeos;0;ITA;40.65;16.07;0.0.0.0;0;http://euref-ip.asi.it
- CAS;rtcm-ntrip.org;2101;NtripInfoCaster;BKG;0;DEU;50.12;8.69;0.0.0.0;0;http://www.rtcm-ntrip.org/home
- CAS;www.euref-ip.be;2101;ROBcaster;ROB;0;BEL;50.48;4.21;0.0.0.0;0;http://www.gnss.be/
- CAS;www.euref-ip.net;2101;EUREF-IP;BKG;0;DEU;50.12;8.69;0.0.0.0;0;http://www.euref-ip.net/home
- NET;EUREF;EUREF;B;N;https://igs.bkg.bund.de/root_ftip/NTRIP/streams/streamlist_euref-ip.htm;https://igs.bkg.bund.de:443/root_ftip/EUREF/station/mxskl/;http://register.rtcm-ntrip.org;none
- NET;IGS;IGS;B;N;https://igs.bkg.bund.de/root_ftip/NTRIP/streams/streamlist_euref-ip.htm;https://igs.bkg.bund.de:443/root_ftip/IGS/station/mxskl/;http://register.rtcm-ntrip.org;none
- NET;MISC;BKG;B;N;https://igs.bkg.bund.de/root_ftip/NTRIP/streams/streamlist_euref-ip.htm;https://igs.bkg.bund.de:443/root_ftip/MISC/station/mxskl/;http://register.rtcm-ntrip.org;none
- STR;ACOR0;Coruna;RTCM 3.1;1004(1),1006(30),1008(30),1019(120),1033(30);2;GPS;EUREF;ESP;43.36;351.60;0;0;LEICA GRX1200PRO;none;B;N;3000;erngss-ip.ign.es:2101/ACOR0(1)
- STR;AJACO0;Ajaccio;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1013(10),1019,1020,1033(10),1045,1230(10);2;GPS+GLO+GAL;IGS;FRA;41.93;8.76;0;0;LEICA GR25;none;B;N;4000;www.igs-ip.net:2101/AJACO(2)
- STR;ALACO0;Alicante;RTCM 3.1;1004(1),1006(15),1008(15),1012(1),1013(30),1019,1020,1045,1033(15),1230(15);2;GPS+GLO+GAL;EUREF;ESP;38.34;359.52;0;0;LEICA GR25;none;B;N;5000;erngss-ip.ign.es:2101/ALACO(1)
- STR;ALBA0;Albacete;RTCM 3.1;1004(1),1006(15),1008(15),1012(1),1013(60),1019,1020,1033(15),1230(15);2;GPS+GLO;EUREF;ESP;38.98;358.14;0;0;LEICA GR10;none;B;N;5000;erngss-ip.ign.es:2101/ALBA0(1)
- STR;ALME0;Almeria;RTCM 3.0;1004(1),1006(10),1007(10),1013(10);2;GPS;EUREF;ESP;36.85;357.54;0;0;TRIMBLE NETRS;none;B;N;4000;erngss-ip.ign.es:2101/ALME0(1)
- STR;AUT10;Thessaloniki;RTCM 3.0;1004(1),1006(10),1008(10);2;GPS;EUREF;GRC;40.57;23.00;0;0;LEICA GRX1200PRO;none;B;N;1500;DGS
- STR;BCLN0;Barcelona;RTCM 3.1;1004(1),1006(15),1008(15),1012(1),1013(60),1019(120),1020(120),1033(15),1230(15);2;GPS+GLO;EUREF;ESP;41.41;2.00;0;0;LEICA GR10;none;B;N;3000;erngss-ip.ign.es:2101/BCLN0(1)
- STR;BELL0;Bellmunt de Segarra;RTCM 3.0;1004(1),1005(5),1008(5),1012(1);2;GPS+GLO;EUREF;ESP;41.58;1.40;0;0;LEICA GR50;none;B;N;6000;ICGC
- STR;BOCH0;Bochum;RTCM 2.1;1(1),3(60),14(60),16(60),18(1),19(1);2;GPS;MISC;DEU;50.45;7.27;0;0;LEICA SR9500;none;B;N;4000;FH Bochum
- STR;BUGO0;Borowa Gora;RTCM 3.0;1004(1),1006(10),1008(10),1012(1);2;GPS+GLO;IGS;POL;52.48;21.04;0;0;JAVAD TRE_G3T DELTA;none;B;N;4000;IGIK
- STR;BOR10;Borowiec;RTCM 2.3;1(1),3(10),18(1),19(1),22(10);2;GPS;IGS;POL;52.28;17.07;0;0;TRIMBLE NETR9;none;B;N;2400;SRCPAS
- STR;BORJ1;Borkum;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1019,1020,1033(10);2;GPS+GLO;EUREF;DEU;53.58;6.67;0;0;JAVAD TRE_3 DELTA;none;B;N;2400;BKG
- STR;BORR0;Borriana;RTCM 3.0;1004(1),1006(10),1008(10),1012(1),1013(10),1019(1),1020(1),1033(10),1230(10);2;GPS+GLO;EUREF;ESP;39.91;359.91;0;0;TRIMBLE NETR9;none;B;N;6000;IGE
- STR;BRMF0;Bron;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1013(10),1019,1020,1033(10),1230(00);2;GPS+GLO;EUREF;FRA;45.72;4.93;0;0;LEICA GR25;none;B;N;2400;rgp-ip.ign.fr:2101/BRMF(1)
- STR;BRST0;Brest;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1013(10),1019(30),1020(30),1033(10);2;GPS+GLO;IGS;FRA;48.38;-04.49;0;0;TRIMBLE NETR9;none;B;N;2000;www.igs-ip.net:2101/BRST0(2)
- STR;BRUX0;Brussels;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1019,1020,1033(10);2;GPS+GLO;IGS;BEL;50.47;4.21;0;0;SEPT POLARX4TR;none;B;N;1300;www.igs-ip.net:2101/BRUX0(2)
- STR;BSCN0;Besancon;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1013(10),1019,1020,1033(10),1230(10);2;GPS+GLO;EUREF;FRA;47.24;5.99;0;0;LEICA GR25;none;B;N;2000;rgp-ip.ign.fr:2101/BSCN1(1)
- STR;BUCU0;Bucharest;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1019(120),1020(30),1033(10);2;GPS+GLO;IGS;ROU;44.46;26.12;0;0;LEICA GRX1200GGPRO;none;B;N;2800;TU Bucharest
- STR;BUTE0;Budapest;RTCM 3.1;1004(1),1006(15),1008(15),1012(1),1013(60),1019,1020,1033(15),1230(15);2;GPS+GLO;EUREF;HUN;47.48;19.06;0;0;LEICA GR25;none;B;N;3000;BUTE
- STR;BZRG0;Bolzano;RTCM 2.3;1(1),3(15),18(1),19(1),22(15),23(15),24(15);2;GPS+GLO;IGS;ITA;46.47;11.56;0;0;LEICA GRX1200+GNSS;none;B;N;3600;www.igs-ip.net:2101/BZRG0(2)
- STR;CACE0;Caceres;RTCM 3.1;1004(1),1006(10),1008(10),1012(1),1013(10),1019(120),1020(120),1033(10),1230(10);2;GPS+GLO;EUREF;ESP;39.48;353.66;0;0;TRIMBLE NETR9;none;B;N;5000;erngss-ip.ign.es:2101/CACE0(1)
- STR;CAG10;Cagliari;RTCM 3.1;1004(1),1006(1),1008(1),1012(1),1019,1020;2;GPS+GLO;EUREF;ITA;39.23;9.11;0;0;TPS NET-G5;none;B;N;3000;ASI
- STR;CANT0;Cantabria;RTCM 3.1;1004(1),1006(15),1008(15),1012(1),1013(30),1019,1020,1033(15),1045,1230(15);2;GPS+GLO+GAL;EUREF;ESP;43.47;356.20;0;0;LEICA GR10;none;B;N;5000;erngss-ip.ign.es:2101/CANT0(1)
- STR;CARG0;Cartagena;RTCM 3.1;1004(1),1006(15),1008(15),1012(1),1013(60),1019(120),1020(120),1033(15),1045,1230(15);2;GPS+GLO+GAL;EUREF;ESP;37.60;359.02;0;0;LEICA GR25;none;B;N;5000;erngss-ip.ign.es:2101/CARG0(1)
- STR;CASC0;Cascais;RTCM 3.1;1004(1),1006(60),1008(60),1012(1),1013(60),1033(60);2;GPS+GLO;EUREF;PRT;38.69;350.58;0;0;LEICA GRX1200GGPRO;none;B;N;3000;193.137.94.71:2101/CASC0(1)

http://www.euref-ip.net/admin?mode=sources EUREF-IP Admin Interface

home | statistics | sourcetable | listeners | sources | admins | settings

Listing sources

Mountpoint	Id	Host	Source Agent	Time of connect	IP	Clients	KBytes read	KBytes written	Client connections	Connected for
/MOP20	1	147.175.19.177	NTRIP BKG Caster/2.0.27 (direct access)	05/May/2017:13:32:49	147.175.19.177	7	164205	1128342	157	5 days, 22 hours, 45 minutes and 17 seconds
/TUWI0	3	128.130.69.198	NTRIP BKG Caster/2.0.27 (direct access)	05/May/2017:13:32:49	128.130.69.198	5	160631	782463	93	5 days, 22 hours, 45 minutes and 17 seconds
/MEDI0	12	192.106.234.17	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	192.106.234.17	2	154387	313314	130	5 days, 22 hours, 45 minutes and 17 seconds
/UCAG0	14	192.106.234.17	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	192.106.234.17	4	166047	562928	134	5 days, 22 hours, 45 minutes and 17 seconds
/PASA0	26	82.130.196.2	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	82.130.196.2	3	411383	1574670	116	5 days, 22 hours, 45 minutes and 17 seconds
/GOP60	28	88.86.123.92	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	88.86.123.92	0	171308	79662	420	5 days, 22 hours, 45 minutes and 17 seconds
/IGNE0	42	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	3	170363	517137	89	5 days, 22 hours, 45 minutes and 17 seconds
/LEON0	44	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	8	173971	1395937	162	5 days, 22 hours, 45 minutes and 17 seconds
/MALA0	45	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	9	169465	1418766	3220	5 days, 22 hours, 45 minutes and 17 seconds
/MALL0	46	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	11	166461	1896875	3211	5 days, 22 hours, 45 minutes and 17 seconds
/MELI0	47	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	6	165976	1027863	247	5 days, 22 hours, 45 minutes and 17 seconds
/RIO10	48	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	5	175810	883997	142	5 days, 22 hours, 45 minutes and 17 seconds
/SONS0	50	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	8	174679	1401493	165	5 days, 22 hours, 45 minutes and 17 seconds
/TERU0	52	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	7	166732	1172649	164	5 days, 22 hours, 45 minutes and 17 seconds
/ZARA0	55	193.144.251.13	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	193.144.251.13	9	171403	1370024	471	5 days, 22 hours, 45 minutes and 17 seconds
/BRUX0	62	78.46.41.8	NTRIP BKG Caster/2.0.27 (relay)	05/May/2017:13:32:49	78.46.41.8	6	183562	1108742	263	5 days, 22 hours, 45 minutes and 17 seconds

http://www.euref-ip.net/admin?mode=listeners EUREF-IP Admin Interface

home | statistics | sourcetable | listeners | sources | admins | settings

Connected Listeners

- [Host: 195.250.148.89] [IP: 195.250.148.89] [User: zd74] [Mountpoint /RTCM3EPH] [Id: 123] [Connected for: 5 days, 22 hours, 46 minutes and 9 seconds] [Bytes written: 542967719] [Errors: 0] [User agent: NTRIP rtes_simple/1.0] [Type: http client]
- [Host: 141.74.33.13] [IP: 141.74.33.13] [User: bkg] [Mountpoint /ONSA0] [Id: 139] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 185695652] [Errors: 0] [User agent: NTRIP BNC/2.12.3 (LINUX)] [Type: http client]
- [Host: 212.18.21.156] [IP: 212.18.21.156] [User: tvn-de-1] [Mountpoint /GRAZ3] [Id: 290] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 183818636] [Errors: 0] [User agent: NTRIP Trimble NtripClient] [Type: http client]
- [Host: 212.18.21.156] [IP: 212.18.21.156] [User: tvn-de-1] [Mountpoint /BUTE0] [Id: 294] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 183358183] [Errors: 0] [User agent: NTRIP Trimble NtripClient] [Type: http client]
- [Host: 212.18.21.156] [IP: 212.18.21.156] [User: tvn-de-1] [Mountpoint /MAR60] [Id: 295] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 169281746] [Errors: 0] [User agent: NTRIP Trimble NtripClient] [Type: http client]
- [Host: 212.18.21.156] [IP: 212.18.21.156] [User: tvn-de-1] [Mountpoint /PENC0] [Id: 297] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 151762371] [Errors: 0] [User agent: NTRIP Trimble NtripClient] [Type: http client]
- [Host: 212.18.21.156] [IP: 212.18.21.156] [User: tvn-de-1] [Mountpoint /ONSA0] [Id: 358] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 185695352] [Errors: 0] [User agent: NTRIP Trimble NtripClient] [Type: http client]
- [Host: 94.198.134.87] [IP: 94.198.134.87] [User: ded9090] [Mountpoint /MELI0] [Id: 438] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 169976658] [Errors: 0] [User agent: NTRIP SPP] [Type: http client]
- [Host: 94.198.134.87] [IP: 94.198.134.87] [User: alex591] [Mountpoint /ONSA0] [Id: 443] [Connected for: 5 days, 22 hours, 46 minutes and 8 seconds] [Bytes written: 185695352] [Errors: 0] [User agent: NTRIP SPP] [Type: http client]
- [Host: 147.175.19.177] [IP: 147.175.19.177] [User: kgza] [Mountpoint /PENC0] [Id: 455] [Connected for: 5 days, 22 hours, 46 minutes and 7 seconds] [Bytes written: 151762371] [Errors: 0] [User agent: NTRIP Trimble NtripClient] [Type: http client]
- [Host: 194.199.172.227] [IP: 194.199.172.227] [User: regina2] [Mountpoint /BRUX0] [Id: 460] [Connected for: 5 days, 22 hours, 46 minutes and 7 seconds] [Bytes written: 187986271] [Errors: 0] [User agent: NTRIP Caster/2.0.15] [Type: puller]
- [Host: 194.199.172.227] [IP: 194.199.172.227] [User: regina2] [Mountpoint /NYA20] [Id: 465] [Connected for: 5 days, 22 hours, 46 minutes and 7 seconds] [Bytes written: 601405555] [Errors: 0] [User agent: NTRIP Caster/2.0.15] [Type: puller]
- [Host: 194.199.172.227] [IP: 194.199.172.227] [User: regina2] [Mountpoint /MATE0] [Id: 466] [Connected for: 5 days, 22 hours, 46 minutes and 7 seconds] [Bytes written: 148015026] [Errors: 0] [User agent: NTRIP Caster/2.0.15] [Type: puller]
- [Host: 147.175.19.177] [IP: 147.175.19.177] [User: kgza] [Mountpoint /TUWI0] [Id: 504] [Connected for: 5 days, 22 hours, 46 minutes and 7 seconds] [Bytes written: 164502373] [Errors: 0] [User agent: NTRIP Trimble NtripClient] [Type: http client]
- [Host: 94.198.134.87] [IP: 94.198.134.87] [User: spp] [Mountpoint /MATE0] [Id: 509] [Connected for: 5 days, 22 hours, 46 minutes and 7 seconds] [Bytes written: 148015026] [Errors: 0] [User agent: NTRIP SPP] [Type: http client]
- [Host: 139.17.3.112] [IP: 139.17.3.112] [User: Gseis] [Mountpoint /YEBE0] [Id: 555] [Connected for: 5 days, 22 hours, 46 minutes and 5 seconds] [Bytes written: 288257927] [Errors: 0] [User agent: NTRIP ntrips/2.0.22672] [Type: http client]
- [Host: 139.17.3.112] [IP: 139.17.3.112] [User: Gseis] [Mountpoint /WROC0] [Id: 557] [Connected for: 5 days, 22 hours, 46 minutes and 5 seconds] [Bytes written: 187241837] [Errors: 0] [User agent: NTRIP ntrips/2.0.22672] [Type: http client]
- [Host: 139.17.3.112] [IP: 139.17.3.112] [User: Gseis] [Mountpoint /ONSA0] [Id: 571] [Connected for: 5 days, 22 hours, 46 minutes and 5 seconds] [Bytes written: 185694752] [Errors: 0] [User agent: NTRIP ntrips/2.0.22672] [Type: http client]
- [Host: 139.17.3.112] [IP: 139.17.3.112] [User: Gseis] [Mountpoint /MATE0] [Id: 573] [Connected for: 5 days, 22 hours, 46 minutes and 5 seconds] [Bytes written: 148014626] [Errors: 0] [User agent: NTRIP ntrips/2.0.22672] [Type: http client]
- [Host: 139.17.3.112] [IP: 139.17.3.112] [User: Gseis] [Mountpoint /MAR60] [Id: 575] [Connected for: 5 days, 22 hours, 46 minutes and 5 seconds] [Bytes written: 169280720] [Errors: 0] [User agent: NTRIP

The screenshot shows a web browser window with the address bar displaying `http://www.euref-ip.net/admin?mode=stats`. The browser's menu bar includes 'Datei', 'Bearbeiten', 'Ansicht', 'Favoriten', 'Extras', and '?'. Below the menu bar is a search bar and a tab labeled 'EUREF-IP Admin Interface'. The main content area features a navigation bar with links: [home](#), [statistics](#), [sourcetable](#), [listeners](#), [sources](#), [admins](#), and [settings](#). The 'statistics' link is highlighted. Below the navigation bar, the page title 'Statistics' is displayed. The main content area contains the following text: 'Following info is server total:', 'NtripCaster 2.0.27 server running on www.euref-ip.net default port 80, uptime: 5 days, 22 hours, 46 minutes and 57 seconds', 'Admins (0):', 'Sources (139):', 'Listeners (1228):', 'Displaying server statistics since last resync at: 05/May/2017:13:32:45', 'Total KBytes read: 28423086', 'Total KBytes written: 240525708', 'Number of source connects: 4376', 'Number of client connects: 110917', 'Average listener time: 1 hours, 33 minutes', 'Average listener transfer: 2168 KBytes', 'Average source connect time: 4 hours, 34 minutes', 'Average source transfer: 6495 KBytes', and 'End of statistics'.

Following info is server total:

NtripCaster 2.0.27 server running on www.euref-ip.net default port 80, uptime: 5 days, 22 hours, 46 minutes and 57 seconds

Admins (0):

Sources (139):

Listeners (1228):

Displaying server statistics since last resync at: 05/May/2017:13:32:45

Total KBytes read: 28423086

Total KBytes written: 240525708

Number of source connects: 4376

Number of client connects: 110917

Average listener time: 1 hours, 33 minutes

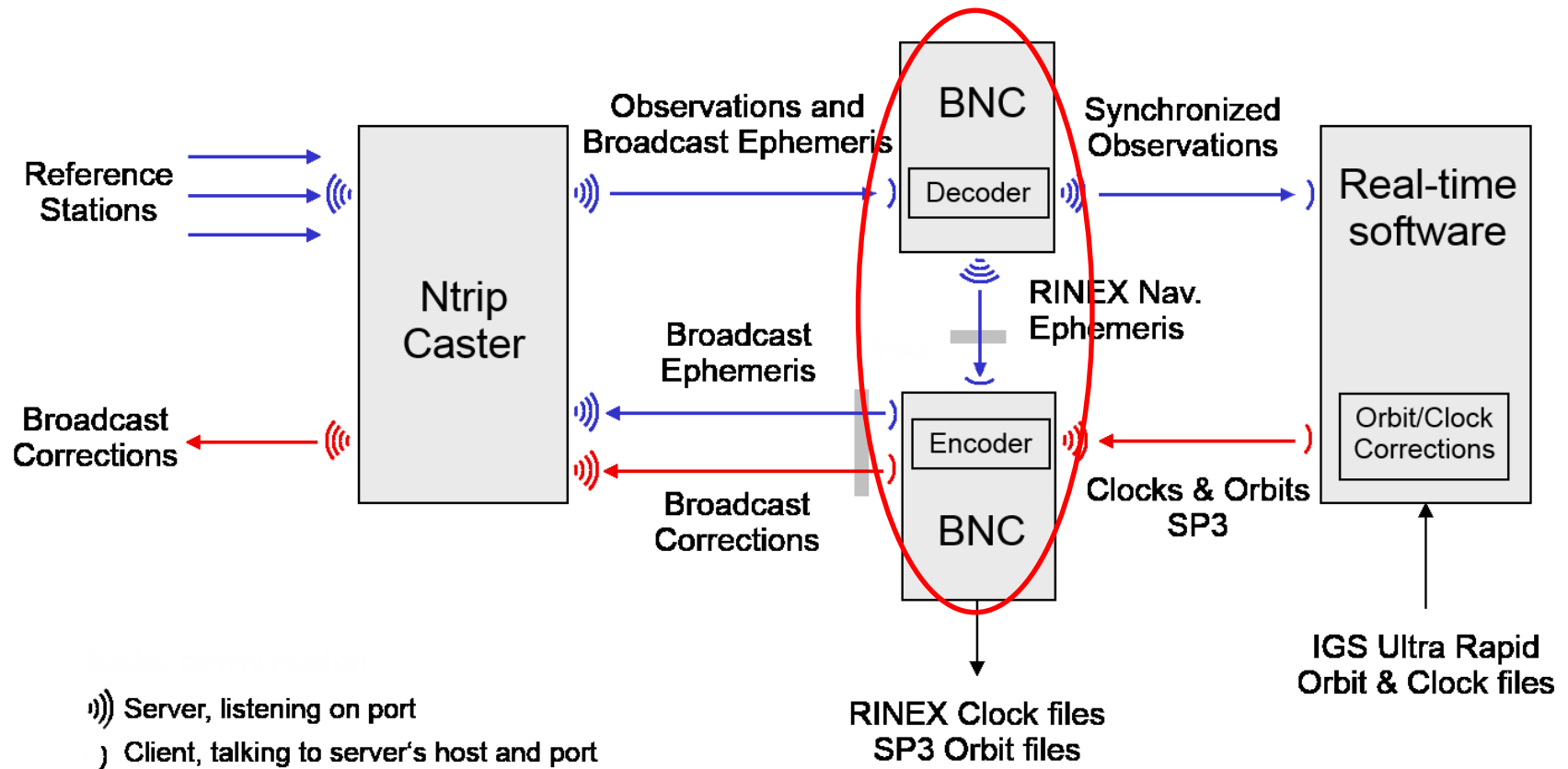
Average listener transfer: 2168 KBytes

Average source connect time: 4 hours, 34 minutes

Average source transfer: 6495 KBytes

End of statistics

GNSS Real-Time Processing at BKG



BKG Ntrip Client

motivation

- **Provide Open Source tool for real-time GNSS**
- **Push development and usage of RTCM standards**
 - Ntrip
 - RTCM v2/v3
 - State Space Representation (SSR) messages
 - Multiple Signal Messages (MSM)
- **Provide tool which allows others to concentrate on development of real-time GNSS engines**
 - Decoding, synchronization before engine
 - Encoding, conversion after engine

BKG Ntrip Client

technical stuff

- BNC source consists of more than 50.000 lines of code
- Approximately 90 % is C++, 10 % standard C
- BNC uses a few third-party pieces of software
- RTCM decoders/encoders and a matrix algebra library
- Qt library is used for
 - GUI
 - networking
 - threads
 - containers, streams, etc.
- BNC intended to be useable on different platforms
- Can be used
 - in graphics (interactive) mode
 - in 'no window' mode
 - with command line configuration

BKG Ntrip Client

history

- **BNC 1.0 (12/2005)**
 - **Decoding, synchronization before real-time GNSS processing engine**
 - **Encoding, conversion after real-time GNSS processing engine**
- **BNC 1.3 (5/2007)**
 - **Source code published**
- **BNC 1.4 (7/2007)**
 - **RINEXv3 output**
- **BNC 1.6 (12/2008)**
 - **Offline mode**
 - **Re-configuration on-the-fly**
 - **Support of Ntrip v2**

BKG Ntrip Client

history

- **BNC 2.0 (2/2010)**
 - **Real-time PPP option**
- **BNC 2.4 (12/2010)**
 - **Drafted RTCMv3 Multiple Signal Messages**
 - **Drafted Galileo ephemeris messages**
- **BNC 2.5 (2/2011)**
 - **Include Galileo in SPP**
 - **SP3 and Clock RINEX output**
 - **PPP in post-processing mode**
 - **Combination of orbit & clock correction streams**
 - **Corrections for antenna eccentricities**

BKG Ntrip Client

history

- **BNC 2.6 (5/2012)**
 - **RINEX editing, concatenation and quality check**
- **BNC 2.9 (7/2013)**
 - **QC multipath and SNR plots for GLONASS and Galileo**
- **BNC 2.10 (12/2013)**
 - **Transformation of corrections from global to regional datums**
- **BNC 2.11 (9/2014)**
 - **'Append files' option for RINEX observation files**

BKG Ntrip Client

key features

- **BNC 2.12 (2014 - now)**
 - **Modification of PPP module**
necessary with respect to additional constellations and new signals
on different frequencies
multiple PPP solutions with one BNC command, individual
configuration for each mount-point
 - **Rx2 <-> Rx3 conversion**
 - **SINEX TRO output**
 - **Quality control checking feature for Rx3**
 - Observation statistics
 - Multipath analysis sky plots
 - Signal-to-noise ration sky plots
 - PDOP plots
 - Satellite availability and elevation plots
 - Man/machine readable ASCII output format

Precise Point Positioning - Plots.

PPP Plot Mountpoint Audio response

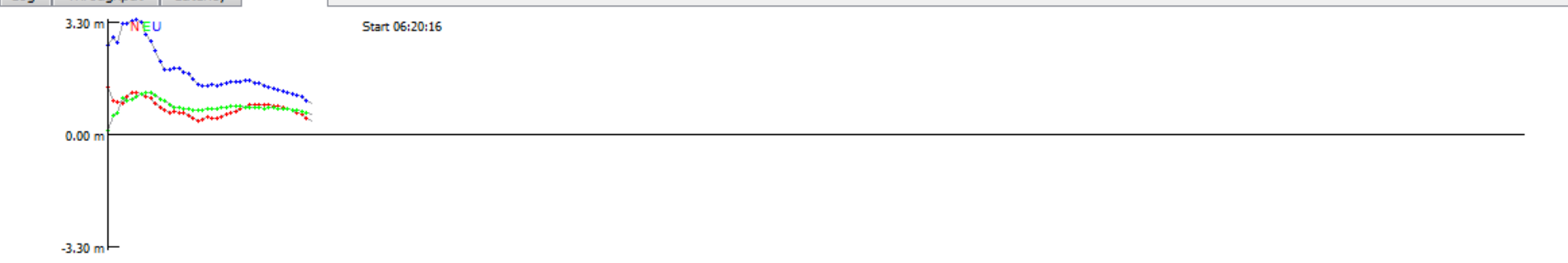
Track map OSM ☐ Google ☐

Dot-properties Size Color

Post-processing speed

Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3.0	50.08967	8.66458	no	2	11.079 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3.2	50.08967	8.66458	no	2	108.12 kB
3	www.igs-ip.net:2101/FFMJ1	RTCM_3.1	50.09	8.66	no	2	37.48 kB

Log Throughput Latency PPP Plot



Precise Point Positioning - Input and Output.

Data source	Real-Time Streams	RINEX Obs file	
Corrections stream	CLK11	RINEX Nav file	
Corrections file		ANTEX file	D:/soehne/Realtime/Programme/BNC212.3/Input/igs08.atx
Coordinates file	D:/soehne/Realtime/Programme/BNC212.3/Input/AP	Version 3 filenames	
Logfile directory	D:/soehne/Realtime/Programme/BNC212.3/Output	NMEA directory	
SNX TRO directory	D:/soehne/Realtime/Programme/BNC212.3/Output	SNX TRO interval	1 hour
		SNX TRO sampling	0 sec
		SNX TRO AC	
		SNX TRO solution	

Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3.0	50.08967	8.66458	no	2	17.919 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3.2	50.08967	8.66458	no	2	162.23 kB
3	www.igs-ip.net:2101/FFMJ1	RTCM_3.1	50.09	8.66	no	2	58.894 kB

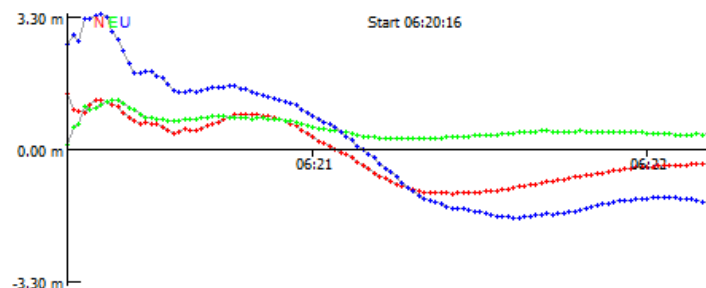


Precise Point Positioning - Processed Stations.

	Station	Sigma N	Sigma E	Sigma H	Noise N	Noise E	Noise H	Tropo Sigma	Tropo Noise	NMEA Port
1	FFMJ1	100.0	100.0	100.0	100.0	100.0	100.0	0.1	3e-6	0

Add Station Delete Station

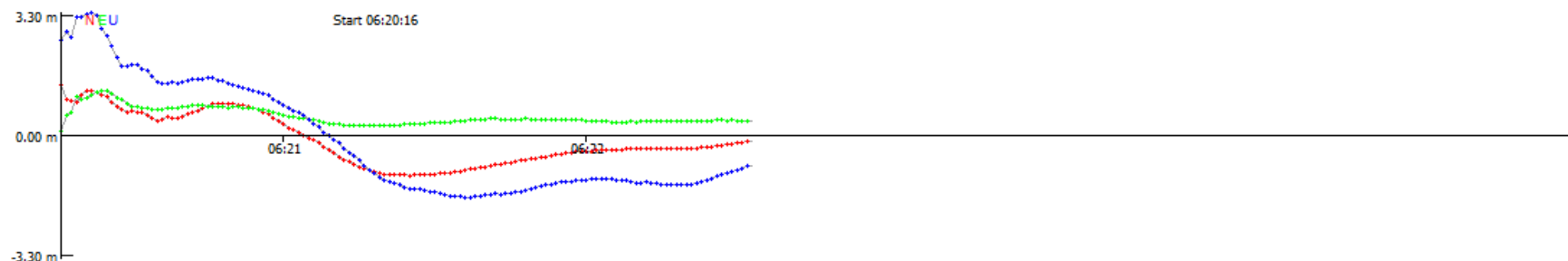
Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3.0	50.08967	8.66458	no	2	20.96 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3.2	50.08967	8.66458	no	2	183.83 kB
3	www.igs-ip.net:2101/FFMJ1	RTCM_3.1	50.09	8.66	no	2	66.199 kB



Precise Point Positioning - Options.

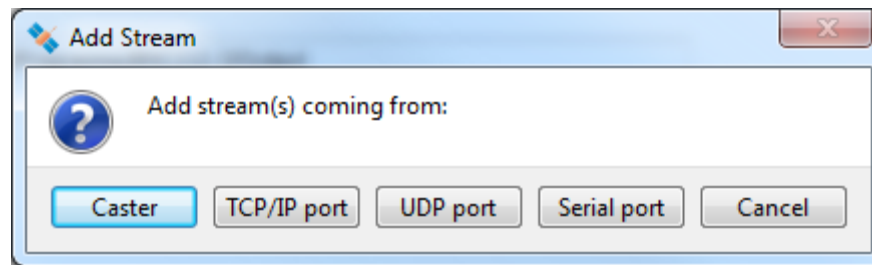
GPS LCs	P3&L3	Sigma C1	2.0	Sigma L1	0.01
GLONASS LCs	L3	Max Res C1	4.0	Max Res L1	0.03
Galileo LCs	no	Ele Wgt Code	☐	Ele Wgt Phase	☐
BDS LCs	no	Min # of Obs	4	Min Elevation	0 deg
Wait for clock corr.	0 sec	Seeding (sec)	0		

Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3.0	50.08967	8.66458	no	2	23.08 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3.2	50.08967	8.66458	no	2	205.485 kB
3	www.igs-ip.net:2101/FFMJ1	RTCM_3.1	50.09	8.66	no	2	74.849 kB



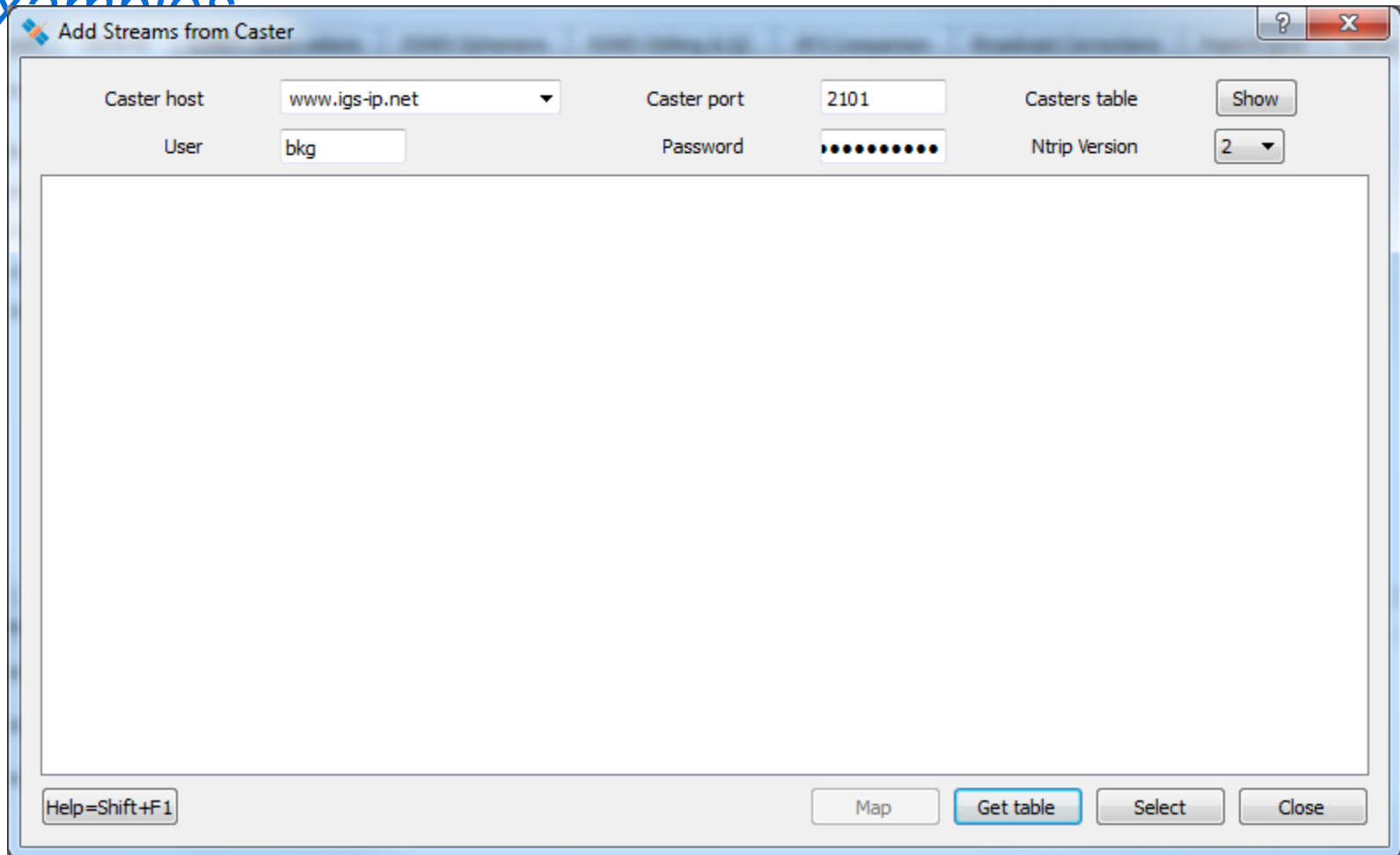
BKG Ntrip Client

examples



BKG Ntrip Client

examples



BKG Ntrip Client

Add Streams from Caster

Caster host

www.igs-ip.net

Caster port

2101

Casters table

Show

User

bkg

Password

.....

Ntrip Version

2

	mountpoint	identifier	format	format-details	carrier	system	network	country	lat	long	nmea	solution	generator	compress
1	ABMF0	Les-Abymes	RTCM 3.1	1004(1),1006(10),1008(10),1012...	2	GPS+GLO	IGS	GLP	16.27	-61.52	no	0	LEICA GR25	none
2	ADIS0	Addis_Ababa	RTCM 3.0	1004(1),1006(10),1007(10),1012...	2	GPS+GLO	IGS	ETH	9.03	38.74	no	0	JPS LEGACY	none
3	ADIS1	A-GPS-Add...	RTCM 3.0	1019(5),1020(5)	2	GPS+GLO	IGS	ETH	9.03	38.74	no	0	JPS LEGACY	none
4	AGGO00AR...	Aggo	RTCM 3.2	1004(1),1006(10),1008(10),1012...	2	GPS+GLO	IGS	ARG	-34.8...	-58.1...	no	0	SEPT POLARX4TR	none
5	AJAC0	Ajaccio	RTCM 3.1	1004(1),1006(10),1008(10),1012...	2	GPS+GLO	IGS	FRA	41.93	8.76	no	0	LEICA GR25	none
6	ALBH0	Albert-Head	RTCM 3.0	1004(1),1006(10),1008(10)	2	GPS	IGS	CAN	48.39	236.51	no	0	TPS NET-G3A	none
7	ALGO0	Algonquin-...	RTCM 3.0	1004(1),1006(10),1008(10)	2	GPS	IGS	CAN	45.96	281.93	no	0	JAVAD TRE_G3TH D...	none
8	ALIC5	Alice_Springs	RTCM 3.2	1006(15),1008(15),1019(60),102...	2	GPS+GL...	IGS	AUS	-23.67	133.88	no	0	LEICA GR25	none
9	ARL10	Arlington	RTCM 3.1	1004(1),1005(5),1007(5),1012(1...	2	GPS+GLO	MISC	USA	48.17	237.86	no	0	TRIMBLE NETR9	none
10	ASCG1	Ascension I...	RTCM 3.1	1004(1),1006(10),1008(10),1012...	2	GPS+GLO	IGS	SHN	-7.91	-14.33	no	0	TRIMBLE NETR9	none
11	AUCK0	Auckland	RTCM 3.0	1004(1),1006(10),1008(10),1012...	2	GPS+GLO	IGS	NZL	-36.60	174.83	no	0	TRIMBLE NETR9	none
12	AZU10	Azusa	RTCM 3.1	1004(1),1005(5),1007(5),1033(5...	2	GPS	IGS	USA	34.13	242.10	no	0	TRIMBLE NETRS	none
13	BIK00	Bishkek	RTCM 3.2	1006(10),1007(10),1008(10),101...	2	GPS+GL...	IGS	KGZ	42.88	74.58	no	1	JAVAD TRE_G3TH D...	none
14	BNDY0	Bundaberg	RTCM 3.0	1004(1),1006(10),1008(10),1012...	2	GPS+GLO	MISC	AUS	-24.91	152.32	no	0	TRIMBLE NETRS	none
15	BOGI0	Borowa_Gora	RTCM 3.0	1004(1),1006(10),1008(10),1012...	2	GPS+GLO	IGS	POL	52.48	21.04	no	0	JAVAD TRE_G3T DE...	none
16	BRA70	Brazilia	RTCM 3.2	1006(1),1008(10),1010(15),1020...	2	GPS+GL...	IGS	BRA	15.05	47.88	no	0	TRIMBLE NETR9	none

Help=Shift+F1

Map

Get table

Select

Close

General settings for logfile, file handling, configuration on-the-fly, auto-start, and raw file output.

Logfile (full path)

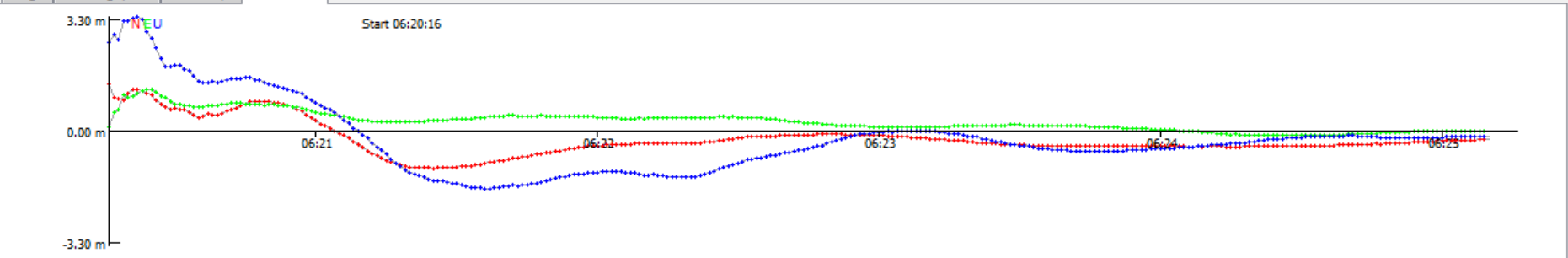
Append files ☒

Reread configuration

Auto start ☐

Raw output file (full path)

Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3.0	50.08967	8.66458	no	2	42.803 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3.2	50.08967	8.66458	no	2	378.67 kB
3	www.igs-ip.net:2101/BOG10	RTCM_3.0	52.48	21.04	no	2	0 byte(s)
4	www.igs-ip.net:2101/FFMJ1	RTCM_3.1	50.09	8.66	no	2	138.547 kB



RINEX file editing, concatenation and quality check.

Action ▼

Input files (full path) ... Obs ... Nav

Output file (full path) ... Obs ... Nav

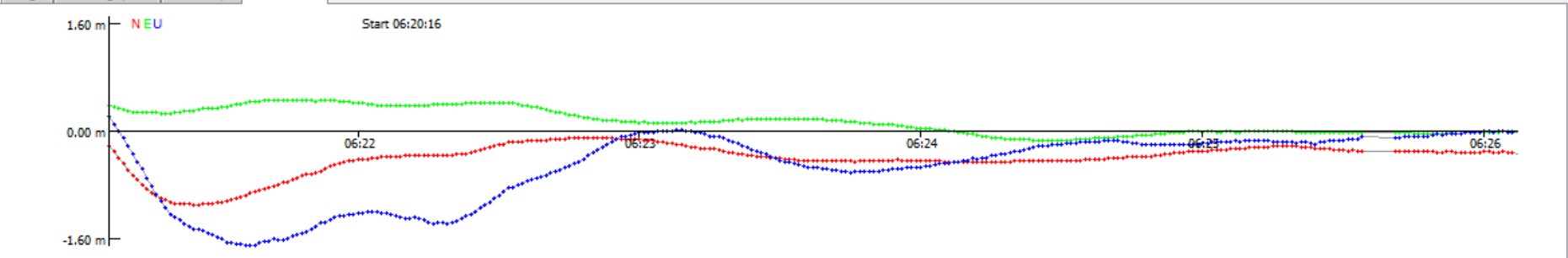
Logfile ... Summary only ☐

Plots for signals ...

Directory for plots ...

Set Edit Options

Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3.0	50.08967	8.66458	no	2	48.603 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3.2	50.08967	8.66458	no	2	438.18 kB
3	www.igs-ip.net:2101/BOG10	RTCM_3.0	52.48	21.04	no	2	0 byte(s)
4	www.igs-ip.net:2101/FFMJ1	RTCM_3.1	50.09	8.66	no	2	163.51 kB

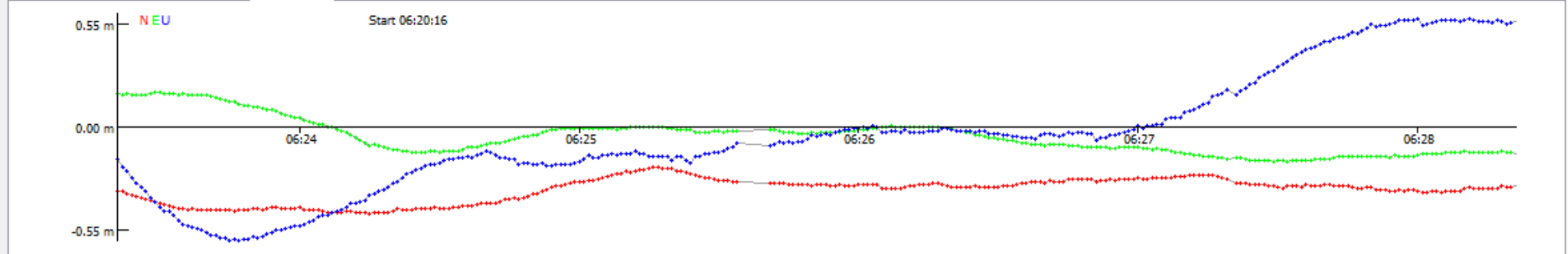


Mountpoint	AC Name	Weight
1 CLK11	BKG	1.0
2 CLK91	CNES	1.0

Combine Broadcast Correction streams.

Method Filter
 Maximal residuum Single-Epoch
 Sampling 10 sec
 Use GLONASS ☐

Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3.0	50.08967	8.66458	no	2	65.929 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3.2	50.08967	8.66458	no	2	584.255 kB
3	www.igs-ip.net:2101/BOG10	RTCM_3.0	52.48	21.04	no	2	0 byte(s)
4	www.igs-ip.net:2101/FFMJ1	RTCM_3.1	50.09	8.66	no	2	221.023 kB



BKG Ntrip Client (BNC) Version 2.12.3

FileHelp

SP3 ComparisonBroadcast CorrectionsFeed EngineSerial OutputOutagesMiscellaneousPPP (1)PPP (2)PPP (3)PPP (4)Combine CorrectionsUpload CorrectionsUpload Ephemeris

Precise Point Positioning - Input and Output.

Data sourceReal-Time Streams

Corrections streamCLK11

Corrections file

Coordinates fileD:/soehne/Realtime/Programme/BNC212.3/Input/AP

Logfile directoryD:/soehne/Realtime/Programme/BNC212.3/Output

SNX TRO directoryD:/soehne/Realtime/Programme/BNC212.3/Output

RINEX Obs file

RINEX Nav file

ANTEX fileD:/soehne/Realtime/Programme/BNC212.3/Input/igs08.atx

Version 3 filenames

NMEA directory

SNX TRO interval1 hour

SNX TRO sampling0 sec

SNX TRO AC

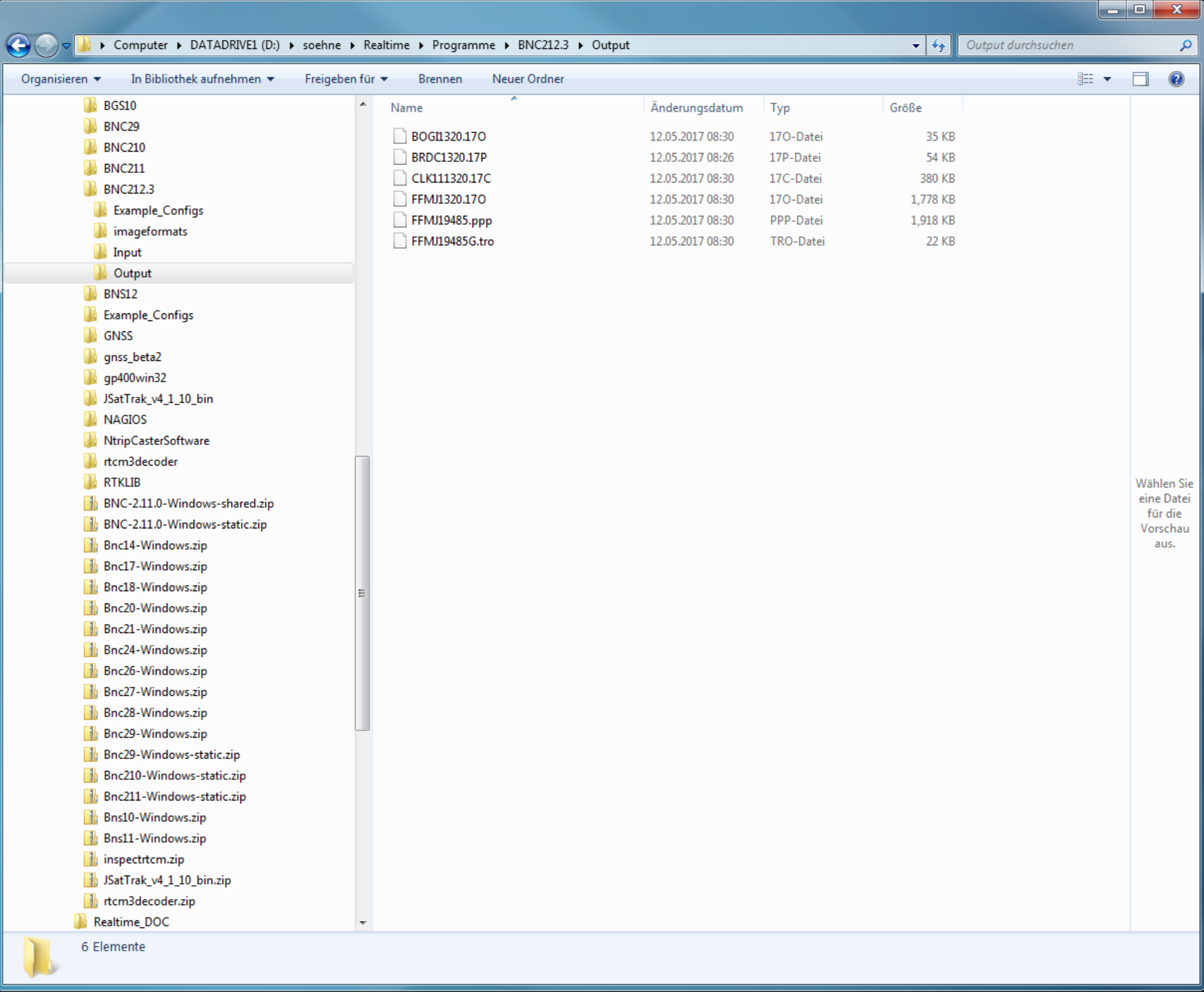
SNX TRO solution

	Streams: resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	products.igs-ip.net:2101/CLK11	RTCM_3,0	50.08967	8.66458	no	2	72.796 kB
2	products.igs-ip.net:2101/RTCM3EPH	RTCM_3,2	50.08967	8.66458	no	2	643.765 kB
3	www.igs-ip.net:2101/BOG10	RTCM_3,0	52.48	21.04	no	2	0 byte(s)
4	www.igs-ip.net:2101/FFMJ1	RTCM_3,1	50.09	8.66	no	2	244.902 kB

LogThroughputLatencyPPP Plot

17-05-12 06:28:58 FFMJ1: Received message type 1004
17-05-12 06:28:58 FFMJ1: Antenna descriptor LEIAR25.R4 LEIT
17-05-12 06:28:58 FFMJ1: ARP (ITRF) X 4053456.2025 m
17-05-12 06:28:58 FFMJ1: ARP (ITRF) Y 617729.4333 m
17-05-12 06:28:58 FFMJ1: ARP (ITRF) Z 4869395.5355 m
17-05-12 06:28:58 FFMJ1: Antenna height above marker 0.0450 m
17-05-12 06:28:58 2017-05-12_06:29:15.000 FFMJ1 X = 4053456.4145 Y = 617729.6857 Z = 4869395.9914 NEU: -0.3799 -0.2454 +0.5444 TRP: +2.3451 +0.1574
17-05-12 06:28:59 FFMJ1: Received message type 1012
17-05-12 06:28:59 FFMJ1: Received message type 1004
17-05-12 06:28:59 2017-05-12_06:29:16.000 FFMJ1 X = 4053456.4250 Y = 617729.6891 Z = 4869396.0032 NEU: -0.3807 -0.2436 +0.5603 TRP: +2.3451 +0.1574
17-05-12 06:29:00 FFMJ1: Received message type 1012
17-05-12 06:29:00 FFMJ1: Received message type 1004
17-05-12 06:29:00 2017-05-12_06:29:17.000 FFMJ1 X = 4053456.4269 Y = 617729.6903 Z = 4869396.0079 NEU: -0.3793 -0.2428 +0.5653 TRP: +2.3451 +0.1573

Add StreamDelete StreamMapStartStopHelp?=Shift+F1



Summary Ntrip

- Ntrip is a worldwide accepted and used standard for real-time GNSS data and products
- Current professional Ntrip caster version 2.0.26
 - Resolving firewall issues for relay caster
- To Do: Increasing the rate to > 1 Hz
- References
 - <http://igs.bkg.bund.de/ntrip>
 - https://igs.bkg.bund.de/root_ftp/NTRIP/documentation/ntripcaster-manual.pdf

Summary BNC

- **To Do: introduce new clock combination taking phase biases into account**
- **To Do: Update all transformation parameters to ITRF2014 etc.**
- **Download**
 - **BNC executables from BKG web page**
<http://igs.bkg.bund.de/ntrip/download>
 - **svn co** <http://software.rtcn-ntrip.org/svn/trunk/BNC>
- **References**
 - **G. Weber, L. Mervart, A. Stürze, A. Rülke, D. Stöcker – BKG Ntrip Client (BNC) Version 2.12, Mitteilungen des Bundesamtes für Kartographie und Geodäsie, Band 49, 2016, ISBN 978-3-86482-083-0 (in english)**
 - **Online BNC Help function**



Thank you for your attention !

Contact:

Bundesamt für Kartographie und Geodäsie
Referat G2
Richard-Strauss-Allee 11
60598 Frankfurt

Contact person:
Wolfgang Söhne
wolfgang.soehne@bkg.bund.de
www.bkg.bund.de
Tel. +49 (0) 69 6333-263