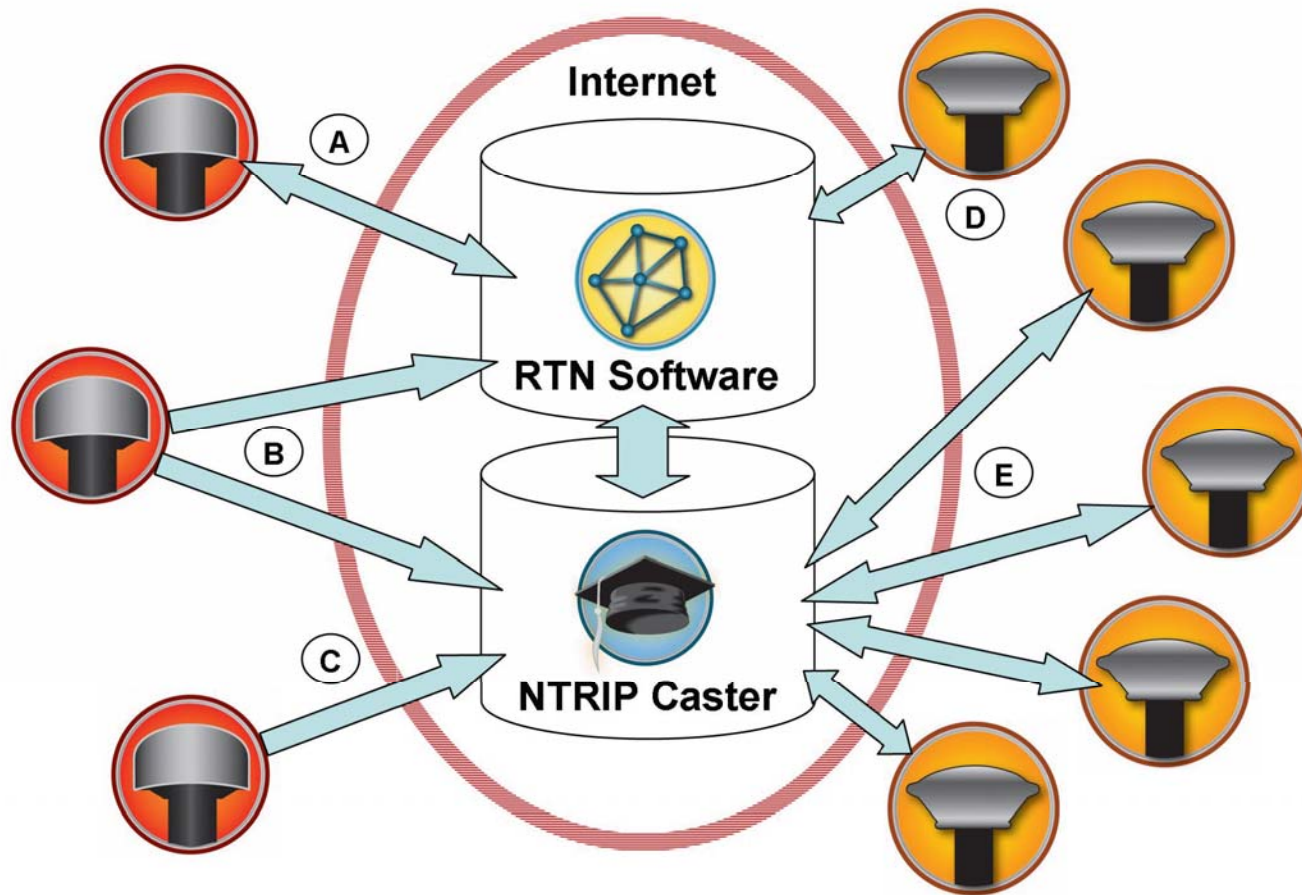


**Networked  
Transport  
of RTCM  
via Internet  
Protocol**

# NTRIP Background – History, Development & BKG



# NTRIP Background – History, Development & BKG



RTCM

The Radio Technical Commission for Maritime Services

Networked Transport of RTCM via Internet Protocol

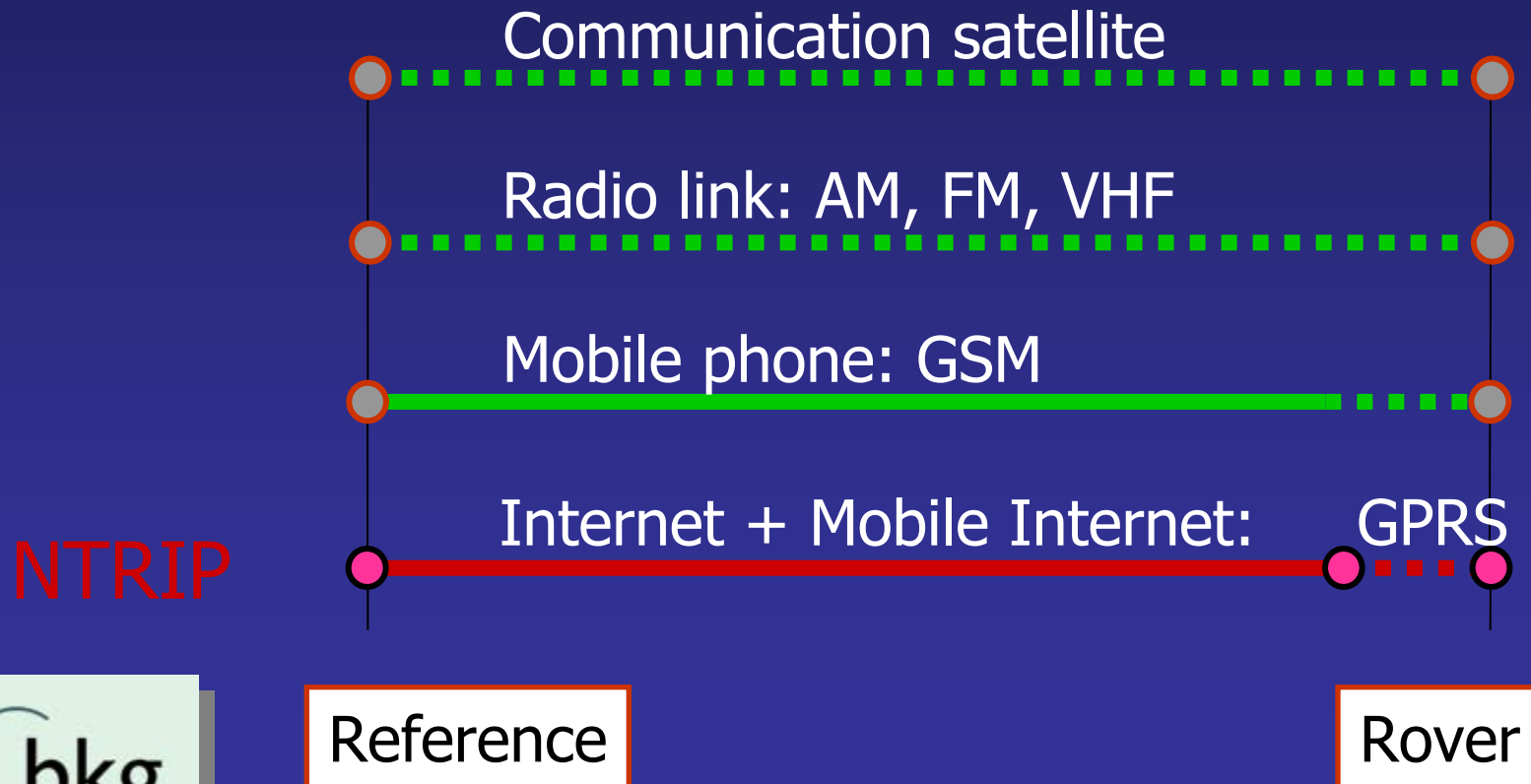


Bundesamt für Kartographie und Geodäsie

# NTRIP Background – History, Development & BKG

## Motivation:

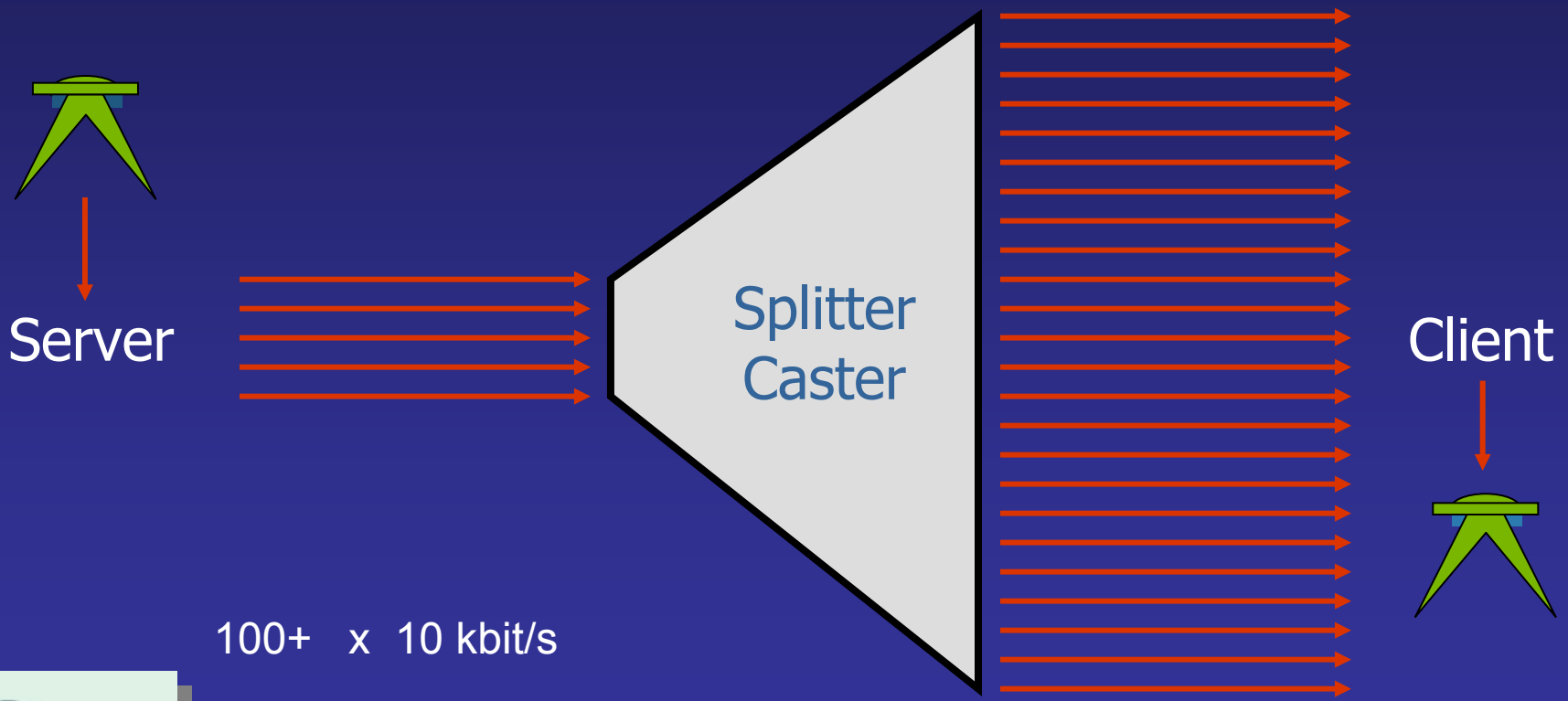
- Use Internet to transport GNSS corrections



# NTRIP Background – History, Development & BKG

## Motivation:

- Mass usage



100+ x 10 kbit/s

1000+ x 10 kbit/s

# NTRIP Background – History, Development & BKG

## Motivation:

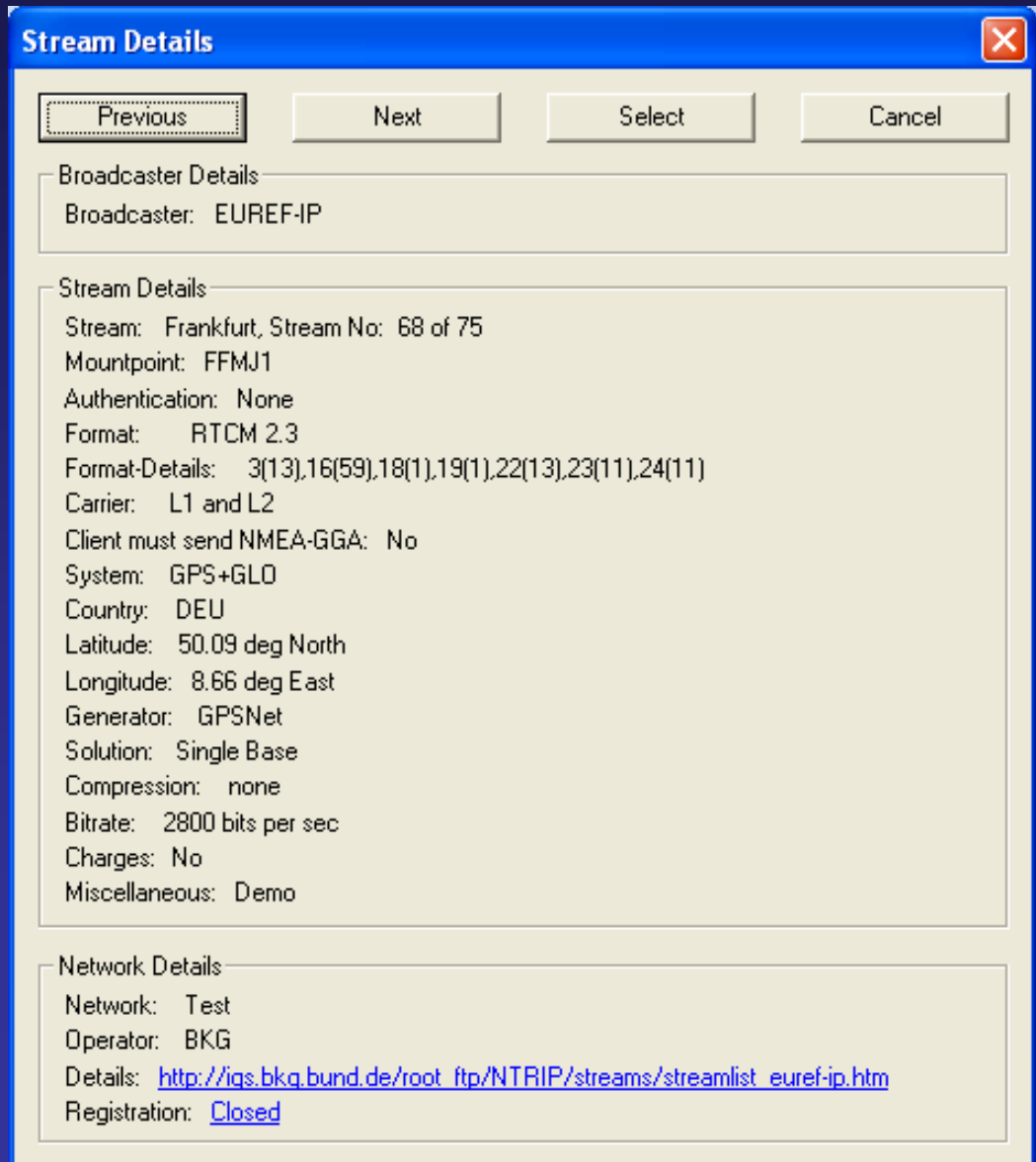
- Make GNSS corrections accessible to a wider user range
  - GSM, GPRS, EDGE, UMTS, ...
- RTCM - Standard
  - any NTRIP - capable hardware - and software can be used



# NTRIP Background – History, Development & BKG

## Motivation:

- Metadata



The screenshot shows a 'Stream Details' dialog box with a blue title bar and a close button. It contains four buttons at the top: 'Previous' (highlighted with a dashed border), 'Next', 'Select', and 'Cancel'. The dialog is divided into three sections: 'Broadcaster Details', 'Stream Details', and 'Network Details'. The 'Broadcaster Details' section shows 'Broadcaster: EUREF-IP'. The 'Stream Details' section lists: 'Stream: Frankfurt, Stream No: 68 of 75', 'Mountpoint: FFMJ1', 'Authentication: None', 'Format: RTCM 2.3', 'Format-Details: 3(13),16(59),18(1),19(1),22(13),23(11),24(11)', 'Carrier: L1 and L2', 'Client must send NMEA-GGA: No', 'System: GPS+GLO', 'Country: DEU', 'Latitude: 50.09 deg North', 'Longitude: 8.66 deg East', 'Generator: GPSNet', 'Solution: Single Base', 'Compression: none', 'Bitrate: 2800 bits per sec', 'Charges: No', and 'Miscellaneous: Demo'. The 'Network Details' section shows: 'Network: Test', 'Operator: BKG', 'Details: [http://igs.bkg.bund.de/root\\_ftp/NTRIP/streams/streamlist\\_euref-ip.htm](http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_euref-ip.htm)', and 'Registration: [Closed](#)'.

**Stream Details**

Previous Next Select Cancel

**Broadcaster Details**  
Broadcaster: EUREF-IP

**Stream Details**  
Stream: Frankfurt, Stream No: 68 of 75  
Mountpoint: FFMJ1  
Authentication: None  
Format: RTCM 2.3  
Format-Details: 3(13),16(59),18(1),19(1),22(13),23(11),24(11)  
Carrier: L1 and L2  
Client must send NMEA-GGA: No  
System: GPS+GLO  
Country: DEU  
Latitude: 50.09 deg North  
Longitude: 8.66 deg East  
Generator: GPSNet  
Solution: Single Base  
Compression: none  
Bitrate: 2800 bits per sec  
Charges: No  
Miscellaneous: Demo

**Network Details**  
Network: Test  
Operator: BKG  
Details: [http://igs.bkg.bund.de/root\\_ftp/NTRIP/streams/streamlist\\_euref-ip.htm](http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_euref-ip.htm)  
Registration: [Closed](#)



# NTRIP Background – History, Development & BKG

## History – Scientific Community:

### **IGS-IP** (Start: May 2006)

- BKG operates [www.igs-ip.net](http://www.igs-ip.net) (ports 80, 2101)
- cooperate with RTIGS Working Group
- offer world-wide data streams via NTRIP
- following Open Data Policy
- support RTCM 2.x, RTCM 3 and RTIGS data formats
- Strategic Planning Meeting 8-9 Dec 2006



# NTRIP Background – History, Development & BKG

RTCM Paper 234-2004/SC104-PR



## **NEWS** from the Radio Technical Commission for Maritime Services (RTCM)

November 29, 2004

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### The Radio Technical Commission for Maritime Services (RTCM) Publishes New Standard for Networked Transfer of RTCM via Internet Protocol (Ntrip)

*Summary:* RTCM Special Committee 104 has completed a new standard which defines a protocol for streaming differential correction data or other kinds of Global Navigation Satellite System (GNSS) data to stationary or mobile users over the Internet. Titled “Networked Transport of RTCM via Internet Protocol (Ntrip)” the standard is named for the widely used RTCM data format, but it can also be used for other data formats. Designated as Version 1.0, (Paper 200-2004/SC104-STD), the standard is available from RTCM at its secure online publication store. Visit [www.rtcn.org](http://www.rtcn.org) and click on “Publications.”

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# NTRIP Background – History, Development & BKG



## Radio Technical Commission for Maritime Services:

- Non-profit organisation
- ~ 100 members
- Develops industry standards for marine and land-based applications
- SC-104: Differential GNSS data formats → RTCM 2.x and RTCM 3.0 data formats

# NTRIP Background – History, Development & BKG

## History – Scientific Community:



- **EUREF Symposium 2002**
  - set up and maintain a differential GNSS infrastructure based on selected EPN stations through the Internet
  - upgrade respective EPN stations
  - enable real-time data stream dissemination
  - Broadcaster: [www.euref-ip.net](http://www.euref-ip.net) (ports 80, 2101)
- **EUREF Symposium 2005**
  - Stream also carrier phase data

# NTRIP Background – History, Development & BKG

## History – Scientific Community:



### **EUREF – IP**

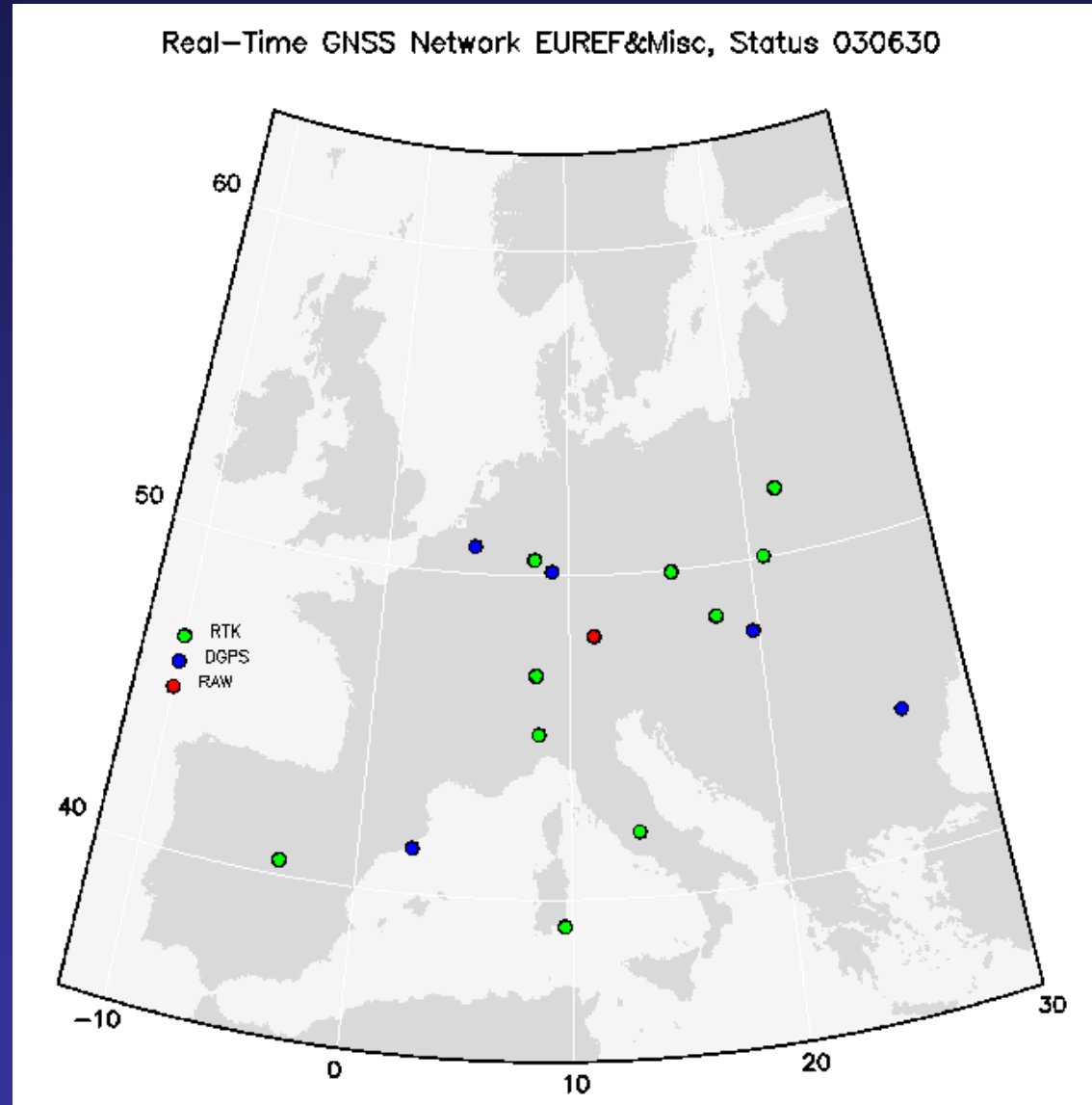
(Start: 2002)

- Real-time access to reference frame
- Disseminate real-time data from EPN stations
- Develop NTRIP software tools (GPL)
- Run network of NTRIP casters
- Promote NTRIP technology
- Enable generation of EUREF real-time products
- Support scientific community in generating real-time products:
  - Orbits & clocks
  - Atmospheric parameters, disaster monitoring, ...

# NTRIP Background – History, Development & BKG

NTRIP Streams  
Europe:

June 2003

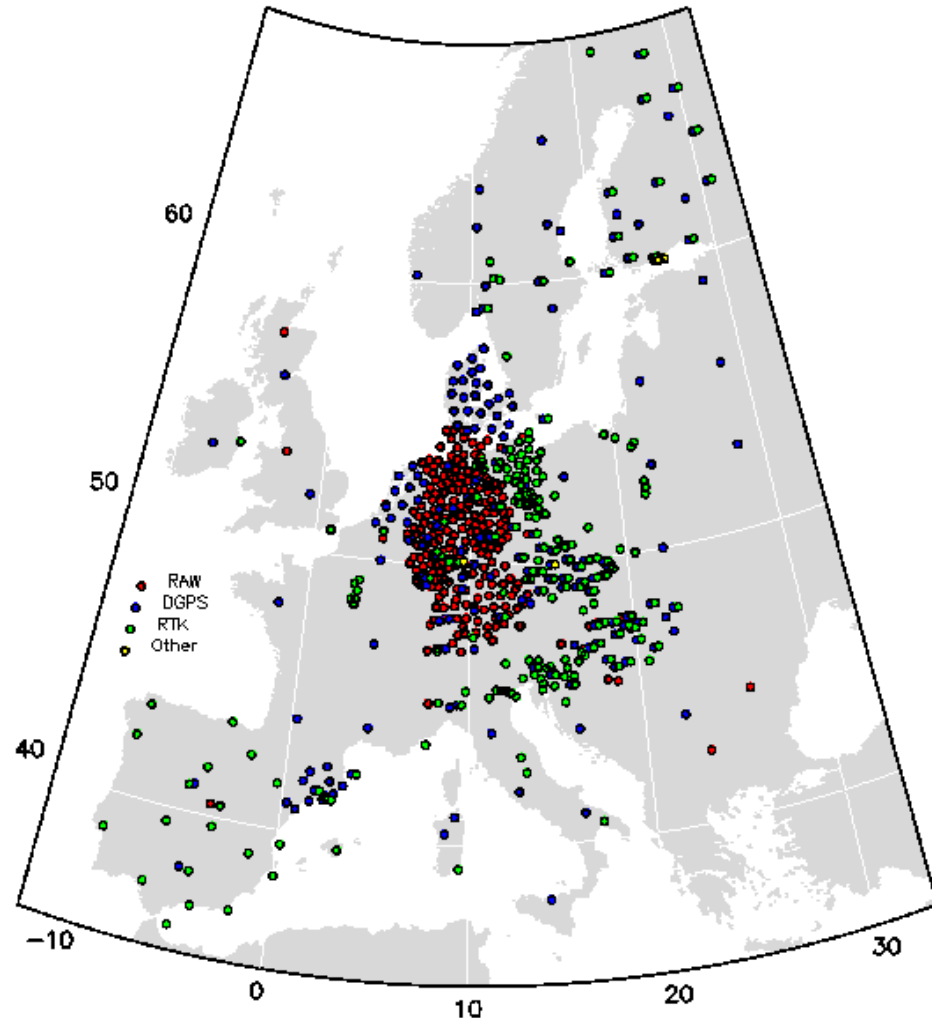


# NTRIP Background – History, Development & BKG

NTRIP Streams  
Europe:

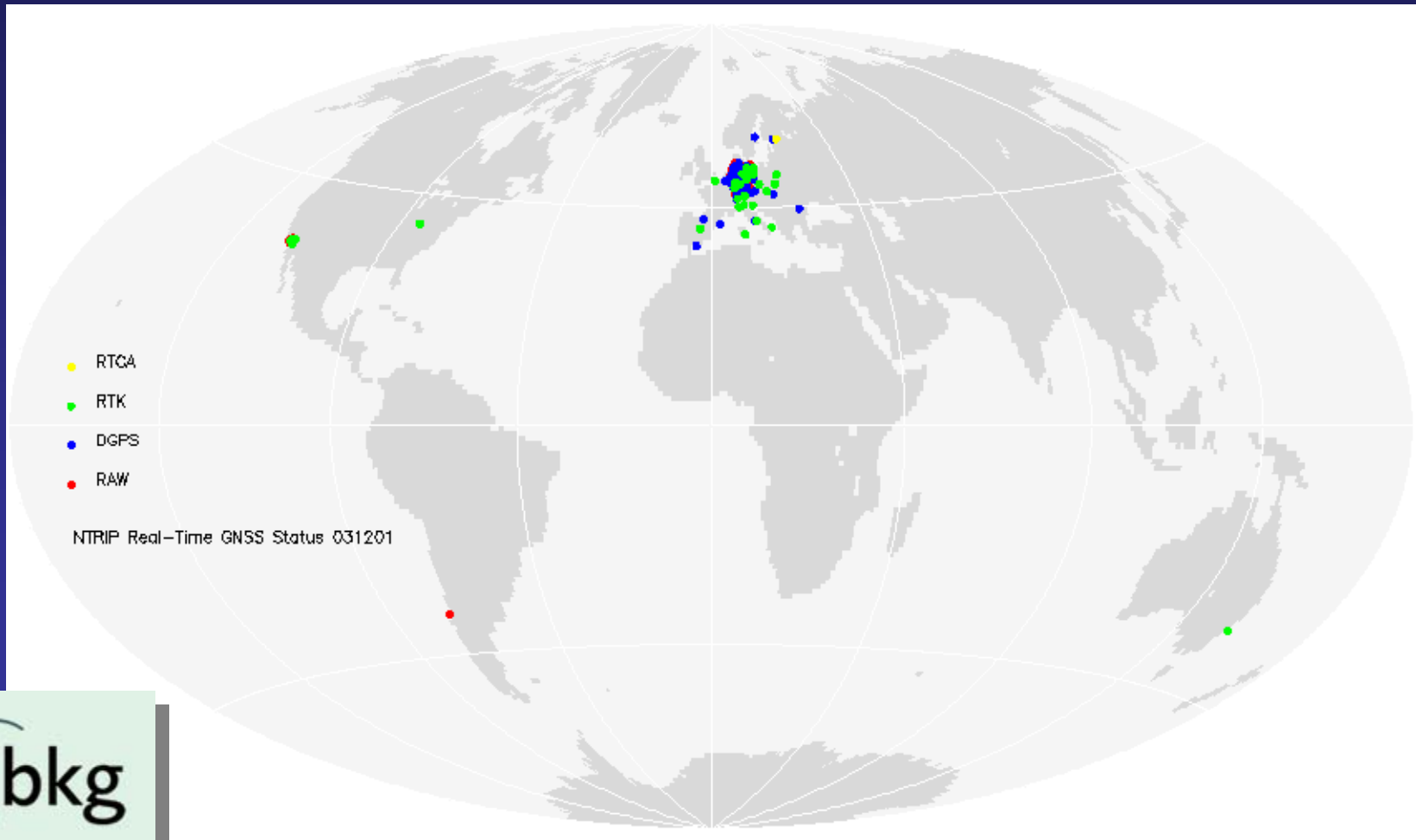
October 2006

Ntrip Real-Time GNSS Networks All-Europe, Status 061031



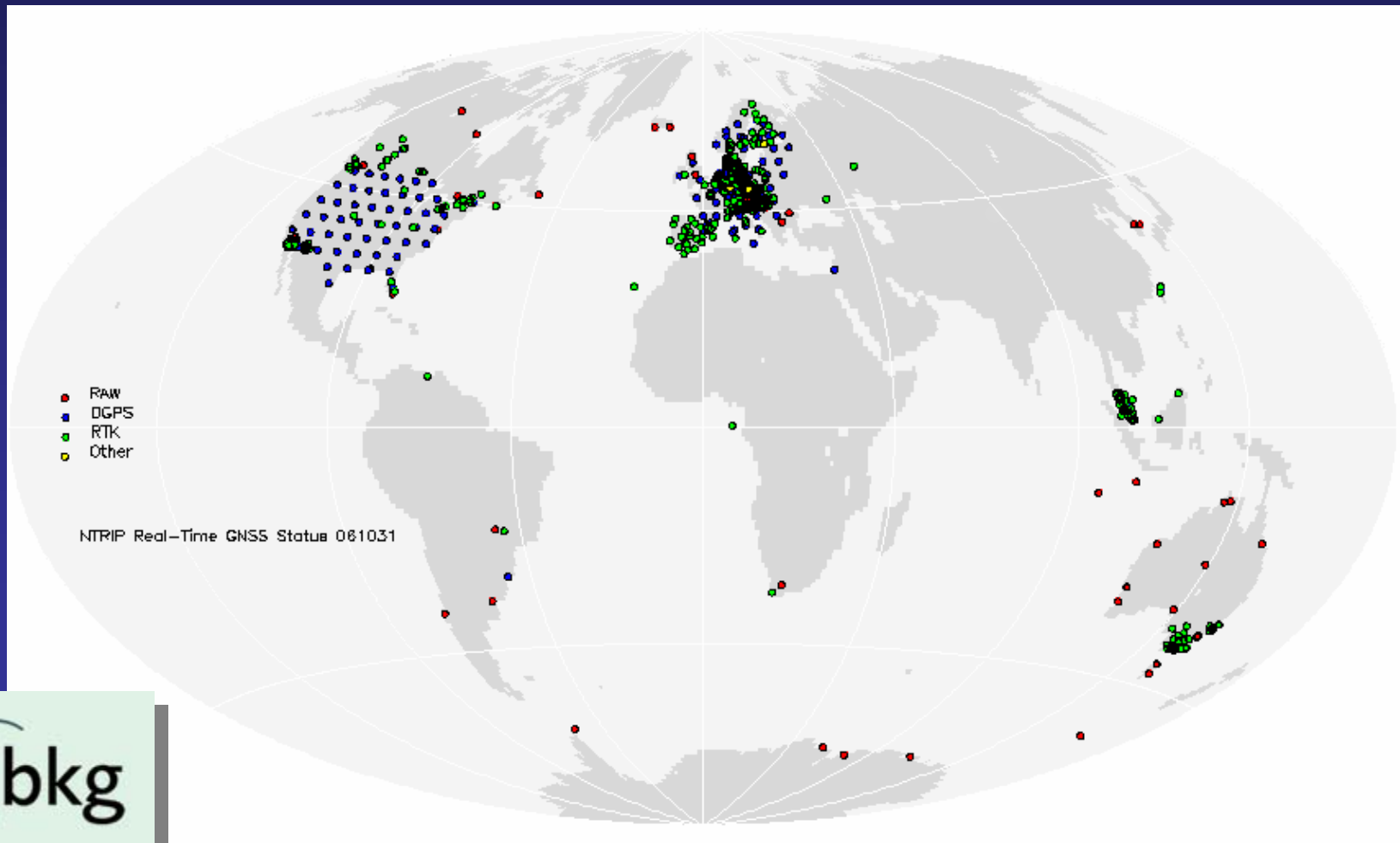
# NTRIP Background – History, Development & BKG

## World-wide NTRIP Streams: December 2003



# NTRIP Background – History, Development & BKG

## World-wide NTRIP Streams: October 2006





# NTRIP Background – History, Development & BKG

## Formats

### RTCM-SC104

- Versions – 2.0, 2.1, 2.2, 3.0
- Type 1 Fixed GPS corrections (1 sec)
- Type 3 GPS reference station parameters (10)
- Type 16 GPS special message (30,60)
- Type 18 RTK uncorrected carrier phases (1)
- Type 19 RTK uncorrected pseudoranges (1)
- Type 22 Extended station parameters (15)
- Type 59 Proprietary messages (1)

### Raw

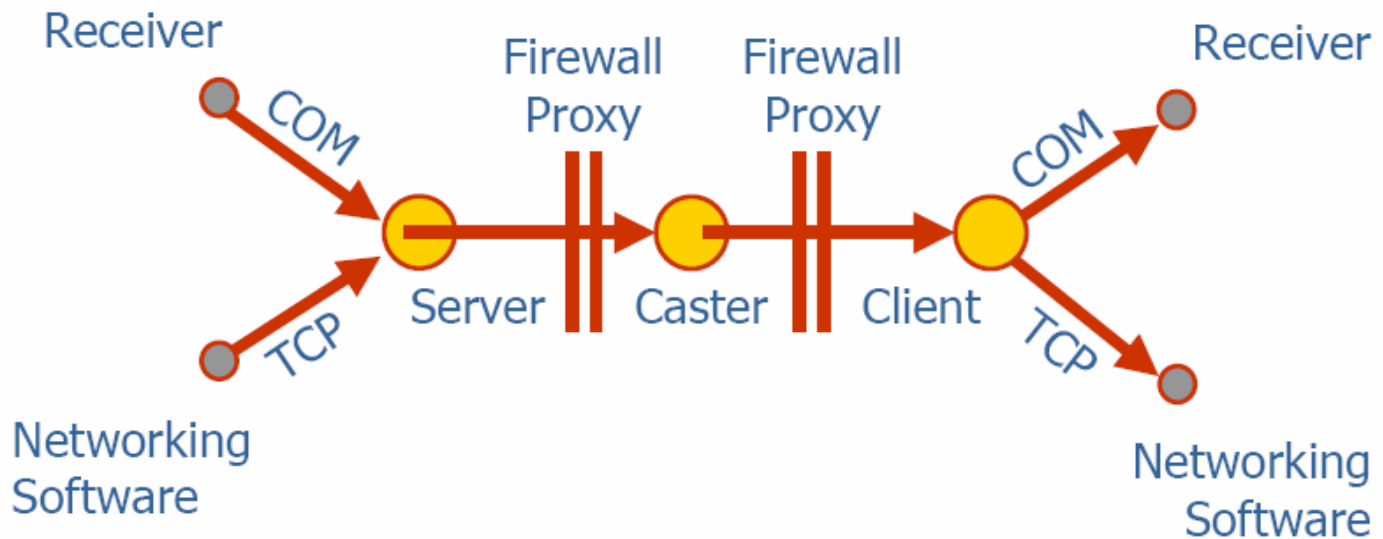
- Topcon/Javad Compact (1)
- Ashtech MBEN (5) / PBEN (5) / SNAV
- Thales ASCII
- SP3 ASCII
- Trimble RT17, concise
- Leica LB2
- RINEX
- BINEX

# NTRIP Background – History, Development & BKG

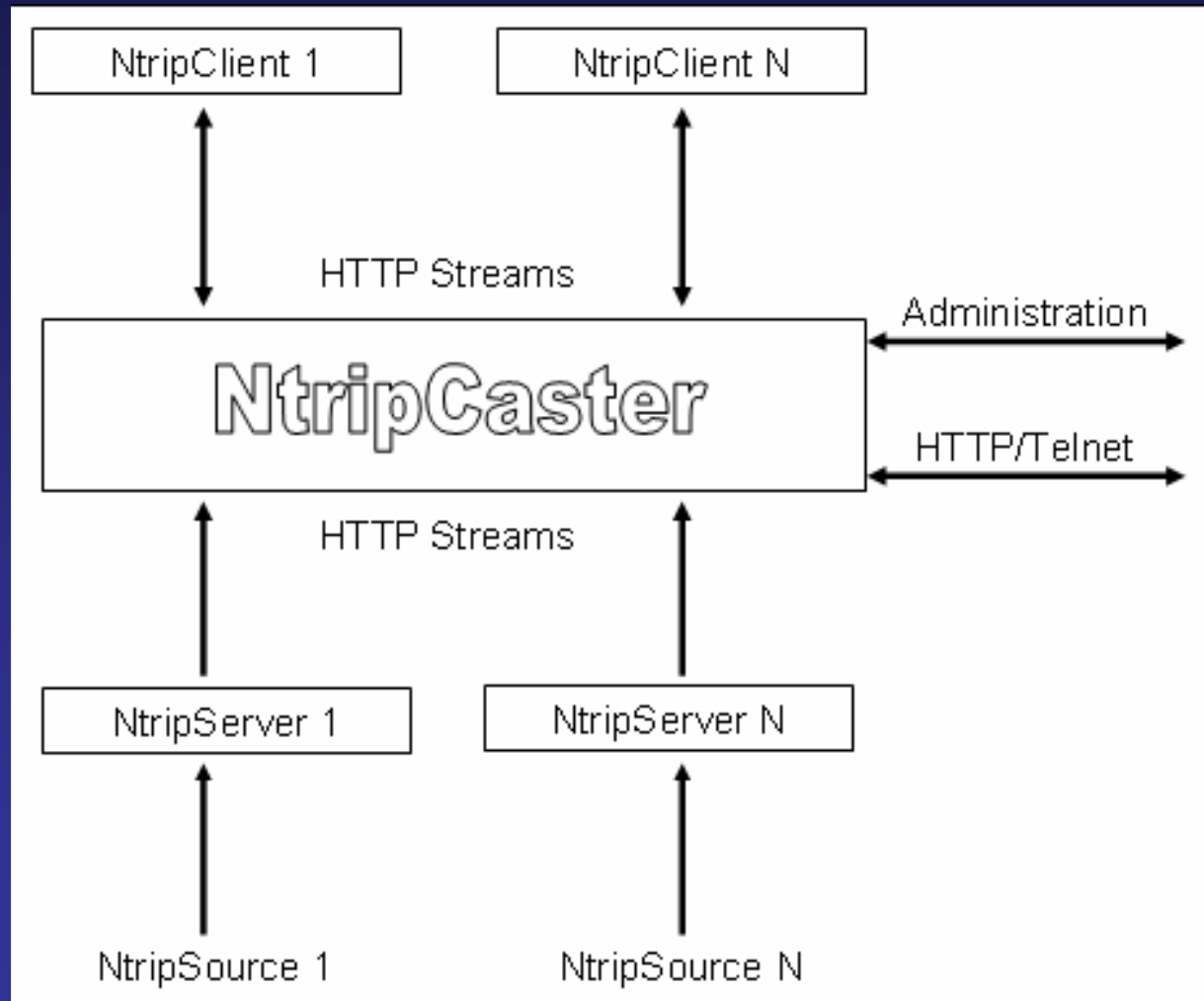
RTCM PAPER 166-2003/SC104-314



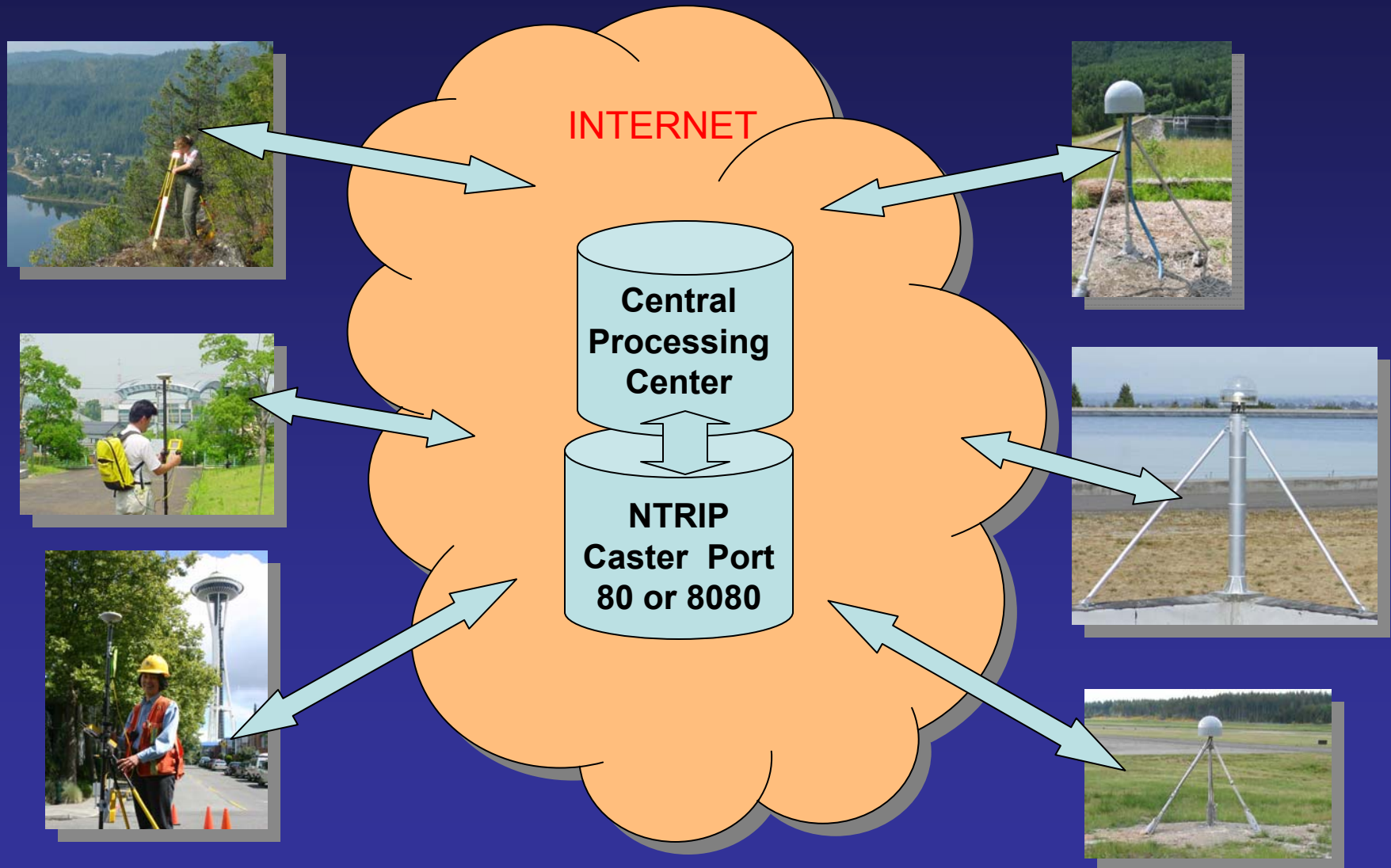
## Internet Transport Configuration



# NTRIP Background – History, Development & BKG



# NTRIP Background – History, Development & BKG



# NTRIP Background – History, Development & BKG

## NTRIP – network Transportation of RTCM via Internet Protocol

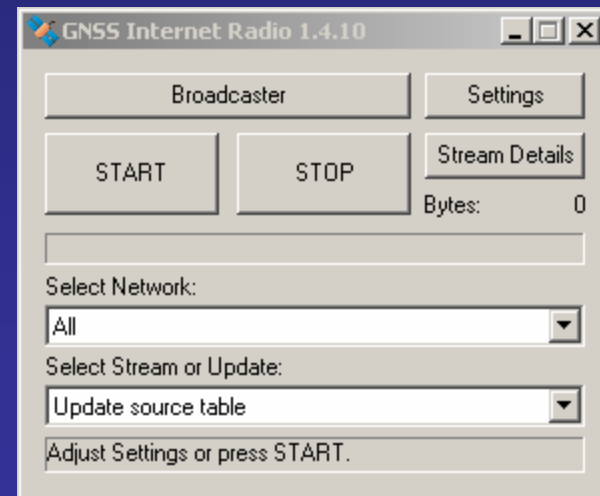
Server – what sends data to a caster (CORS or RTN Software)

Caster – the ‘exchange’ for incoming and outgoing data

Client – application(s) used to get user data from the caster

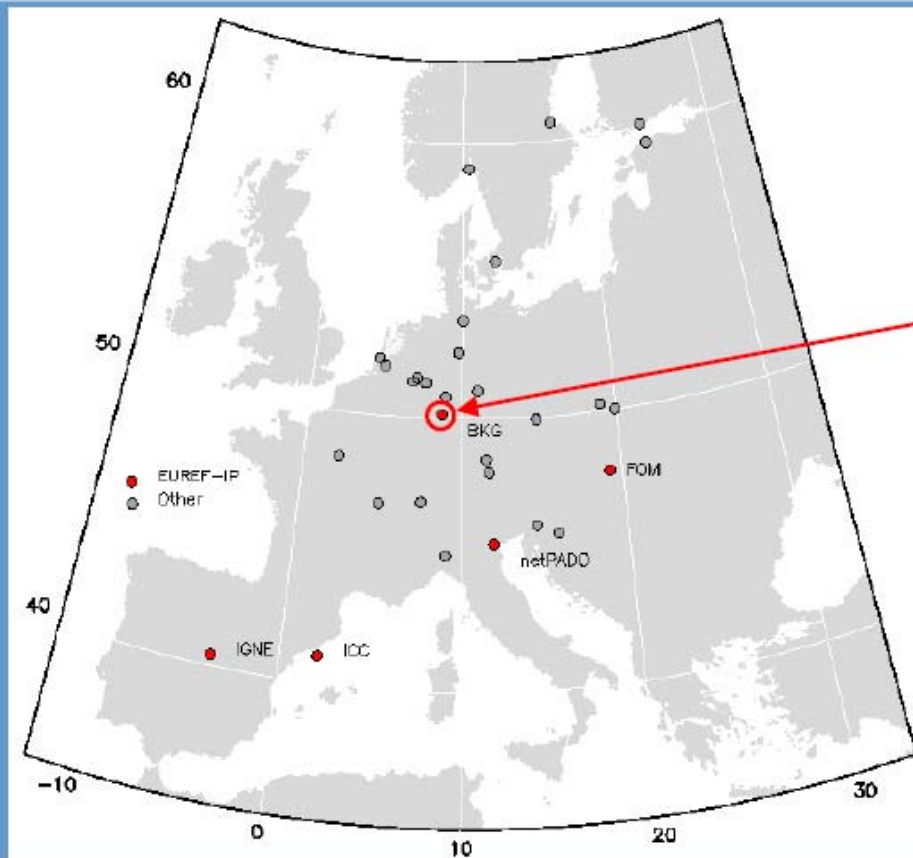
Download a free client for testing, training  
(and correction relaying) from:

[http://igs.bkg.bund.de/ntrip/ntrip\\_down.htm](http://igs.bkg.bund.de/ntrip/ntrip_down.htm)



# NTRIP Background – History, Development & BKG

## NtripCasters in Europe



EUREF-IP  
[www.euref-ip.net](http://www.euref-ip.net)

- 17 networks
- 180 data streams
- 27 EPN stations
- 488 registered users

(14/Jan/2006)

## **Stream Sharing – Beyond RTN**

- **Tectonic Plate Studies**
- **Geodetic Monitoring Agencies / Services / Programs**
- **National CORS Program**
- **National / World Ionospheric & Tropospheric Modeling**
- **National / World Timing Modeling / Studies**
- **National Positioning Initiatives (e.g. NDGPS, HaNDGPS)**
- **International Positioning Initiatives (IGS – PPP)**
- **Augmentation Systems (WAAS, AGPS)**

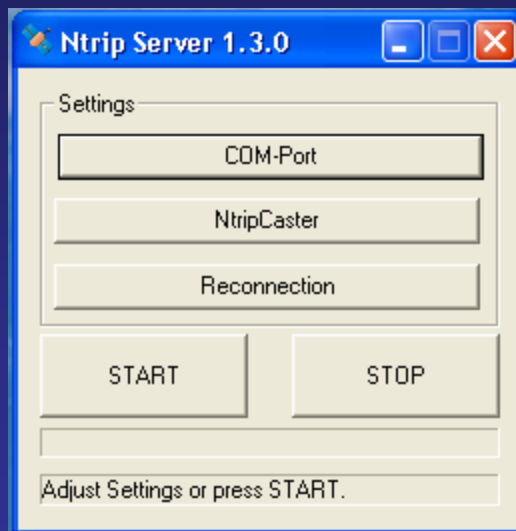
# BKG NTRIP Client Downloads



<i>Ntrip Client</i>	<i>Software</i>	<i>KB</i>
<b><u>Windows Client</u></b>	GNSS Internet Radio, Vers. 1.4.10	EXE ~680
<b><u>Linux Client</u></b>	Plain Example NtripClient Program, Vers. 1.14 GNU General Public License Provided by Dirk Stoecker, Euronik	ZIP ~7
<b><u>Linux Perl Client</u></b>	Perl NtripClient Program for Linux, Vers. 0.6 GNU General Public License	ZIP ~15
<b><u>Windows CE Client</u></b>	GNSS Internet Radio, Vers. 1.0.0 WinCE, PocketPC 2002/3, Intel PXA Processor	EXE ~700
<b><u>Windows CE Client</u></b> via FTP or HTTP	GNSS Internet Radio, Vers. 1.0.0 WinCE, PocketPC 2002/3, Intel PXA Processor	CAB ~70
<b><u>Windows CE Client</u></b>		
<b><u>Palm OS Client</u></b>	Demo NtripClient Program, Vers. 1.2.1 Provided by Guenther Thalmann	ZIP ~50

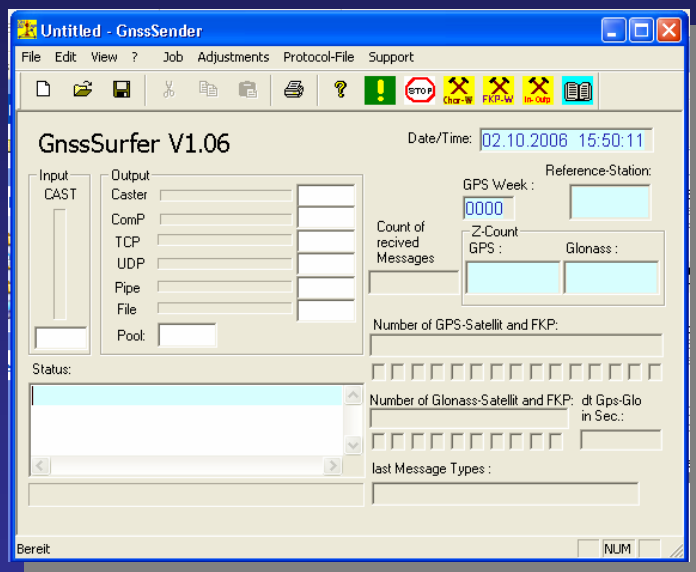


# BKG NTRIP Server Downloads



<i>Ntrip Server</i>	<i>Software</i>	<i>KB</i>
<u>Windows Server</u>	Windows NtripServer Reading from Serial Port, Vers. 1.3.0	EXE ~900
<u>Windows Server</u>	Command Line Version of Windows NtripServer Reading from TCP/IP Port, Vers. 1.6	ZIP ~50
<u>Linux Server</u>	Linux C-Version of NtripServer Reading from SISNeT server or TCP/UDP Port or Serial Port or NtripCaster, Vers. 0.17 GNU General Public License Provided by Dirk Stoecker, Euronik	ZIP ~25
<u>Linux Server</u>	Linux Perl-Version of NtripServer Reading from Standard Input, Vers. 0.2 GNU General Public License	ZIP ~20

# BKG Misc. Downloads




<i>Ntrip Miscellaneous</i>	<i>Software</i>	<i>KB</i>
<b><u>Windows Client &amp; Server &amp; RTCM 2.x Decoder</u></b>	GnsSurfer, Vers. 1.06 Combined Function Provided by Juergen Siebert, SAPOS Berlin	ZIP ~2000
<b><u>Windows RTCM 2.x Decoder</u></b>	RTCM 2.x DGPS/RTK Decoder Reading from TCP/IP Port, Vers. 2.1 Provided by Manfred Baeumker, FH Bochum	ZIP ~240
<b><u>Linux RTCM 2.x Decoder</u></b>	RTCM 2.x DGPS/RTK Decoder Reading from Standard Input, Vers. 1.1 GNU General Public License Provided by Carsten Becker, DLR, Neustrelitz	ZIP ~25
<b><u>Linux Client and RTCM 2.x to RINEX Converter</u></b>	Multi-Stream Client, translates RTCM 2.x RTK to RINEX, Vers. 1.21 GNU General Public License Provided by Carsten Becker, DLR, Neustrelitz	ZIP ~120
<b><u>Linux Client and RTCM 3 to RINEX Converter</u></b>	Single-Stream Client, translates RTCM 3 RTK to RINEX, Vers. 1.4 GNU General Public License Provided by Dirk Stoecker, Euronik	ZIP ~15
<b><u>TEQC, Linux</u></b>	UNAVCO's Teqc, translates Raw GNSS receiver data to RINEX	pdf ~40
<b><u>TEQC, Windows</u></b>	UNAVCO's Teqc, translates Raw GNSS receiver data to RINEX	zip ~340
<b><u>Linux Broadcaster</u></b>	Standard NtripCaster, Vers. 0.1.5 GNU General Public License	tgz ~265

# NTRIP Caster

Trimble NTRIP Caster [1st]

NtripCaster View Monitor Help

Users Mountpoints History



Mountpoint	Connection Type	Connections	Connected to Source	Source Host	Source Port
UNI_RAW	Broadcast	0	Yes	10.2.159.231	1053
AUG_RAW	Broadcast	0	Yes	10.2.159.231	1058
NEU_RAW	Broadcast	0	Yes	10.2.159.231	1047
moha	Broadcast	0	No		
MuenRTK-1	Broadcast	0	Yes	10.2.159.231	1034
MuenRTK-2	Broadcast	0	Yes	10.2.159.231	1035
MUE_RAW	Broadcast	0	Yes	10.2.159.231	1043
HoehRTK	Broadcast	0	Yes	10.2.159.231	1071
UniBWRTK-1	Broadcast	0	Yes	10.2.159.231	1048
UniBWRTK-2	Broadcast	0	Yes	10.2.159.231	1049
RTCM3Net	Broadcast	0	Yes	10.2.156.38	3856
HoehDGPS	Broadcast	0	Yes	10.2.159.231	1072
MAI_RAW	Broadcast	0	Yes	10.2.159.231	1044
RTCM3NetIn...	Broadcast	0	Yes	10.2.156.38	1212
HOE_RAW	Broadcast	0	Yes	10.2.159.231	1075
NS1	NtripServer	0	No		

Active connections: 0 Inbound data rate: 0 Bytes/sec

Total connections: 81256 Outbound data rate: 0 Bytes/sec

Caster uptime: 3d 00:55:43

Ports: TCP 6422 (10.2.159.231) - TCP 8080 (10.2.159.231)

# NTRIP Caster

SOURCETABLE 200 OK Server: Trimble NtripCaster Date: 2/10/2006:23:59:23 UTC Content-Type: text/plain Content-Length: 6224  
STR;NTRIP\_LNGB;NTRIP\_LNGB;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;;  
STR;NTRIP\_LINH;NTRIP\_LINH;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;; STR;TUMW;TUMW - Tumwater  
CMR;CMR+;1(1),3(10),18(1),19(1);2;GPS+GLONASS;PRSN;USA;46.98;122.92;0;0;Trimble GPSNet,None,B;N;0;;  
STR;NTRIP\_EPHR;NTRIP\_EPHR;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;; STR;TUMW-23;TUMW-23 -  
Tumwater RTCM2.3;RTCM 2.3;1(1),3(10),18(1),19(1);2;GPS+GLONASS;PRSN;USA;46.98;122.92;0;0;Trimble GPSNet,None,B;N;0;;  
STR;NTRIP\_CWAK;NTRIP\_CWAK;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;;  
STR;NTRIP\_CPUD;NTRIP\_CPUD;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;;  
STR;NTRIP\_COUP;NTRIP\_COUP;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;;  
STR;NTRIP\_ELSR;NTRIP\_ELSR;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;;  
STR;NTRIP\_BDRY;NTRIP\_BDRY;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;;  
STR;NTRIP\_BELV;NTRIP\_BELV;RAW;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;; STR;EPHR-23;EPHR-23 - Ephrata  
RTCM 2.3;RTCM 2.3;1(1),3(10),18(1),19(1);2;GPS;PRSN;USA;47.33;119.54;0;0;GPSNet,None,B;N;0;; STR;EPHR;EPHR - Ephrata CMR+;CMR+;1  
(1),3(10),18(1),19(1);2;GPS;PRSN;USA;47.33;119.54;0;0;GPSNet,None,B;N;0;; STR;P376-23;P376-23 - Salem RTCM2.3;RTCM 2.3;1(1),3(10),18  
(1),19(1);2;GPS;PRSN;USA;44.94;123.1;0;0;GPSNet,None,B;N;0;; STR;P376;P376 - Salem CMR+;CMR+;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;44.94;123.1;0;0;GPSNet,None,B;N;0;; STR;NTRIP\_Stream\_KNTC;NTRIP\_Stream\_KNTC;RAW;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;1;GPSNet,None,B;N;0;; STR;NTRIP\_ARLL;NTRIP\_ARLL;RAW;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;48;121;0;1;GPSNet,None,B;N;0;; STR;NTRIP\_CHCM;NTRIP\_CHCM;RAW;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;48;122;0;1;GPSNet,None,B;N;0;; STR;KNTC-23;KNTC-23 - City of Kent RTCM 2.3;RTCM 2.3;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;47.33;122.25;0;0;GPSNet,None,B;N;0;; STR;KNTC;KNTC - City of Kent CMR+;CMR+;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;47.33;122.25;0;0;Trimble 4700;None,B;N;0;; STR;BELL;BELL - Bellingham CMR+;CMR+;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;0;GPSNet,None,B;N;0;; STR;SSHO-23;SSHO-23 - Roosevelt RTCM 2.3;RTCM 2.3;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;0;GPSNet,None,B;N;0;; STR;BELL-23;BELL-23 - Bellevue RTCM 2.3;RTCM 2.3;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;0;GPSNet,None,B;N;0;; STR;BELL-23;BELL-23 - Bellingham RTCM2.3;RTCM 2.3;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;0;GPSNet,None,B;N;0;; STR;NTRIP\_Stream\_ENUM;NTRIP\_Stream\_ENUM;RAW;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;1;Trimble GPSNet,None,B;N;0;; STR;COUP;COUP - Coupeville CMR+;CMR+;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;0;Trimble GPSNet,None,B;N;0;; STR;CHCM;CHCM - Chimacum CMR+;CMR+;1(1),3(10),18(1),19  
(1);2;GPS;PRSN;USA;0;0;0;0;Trimble 5700;None,B;N;0;; STR;PFLD;PFLD - Paine CMR+;CMR+;1(1),3(10),18(1),19

# NTRIP – Tools and Solutions



Onboard Client and Server Applications