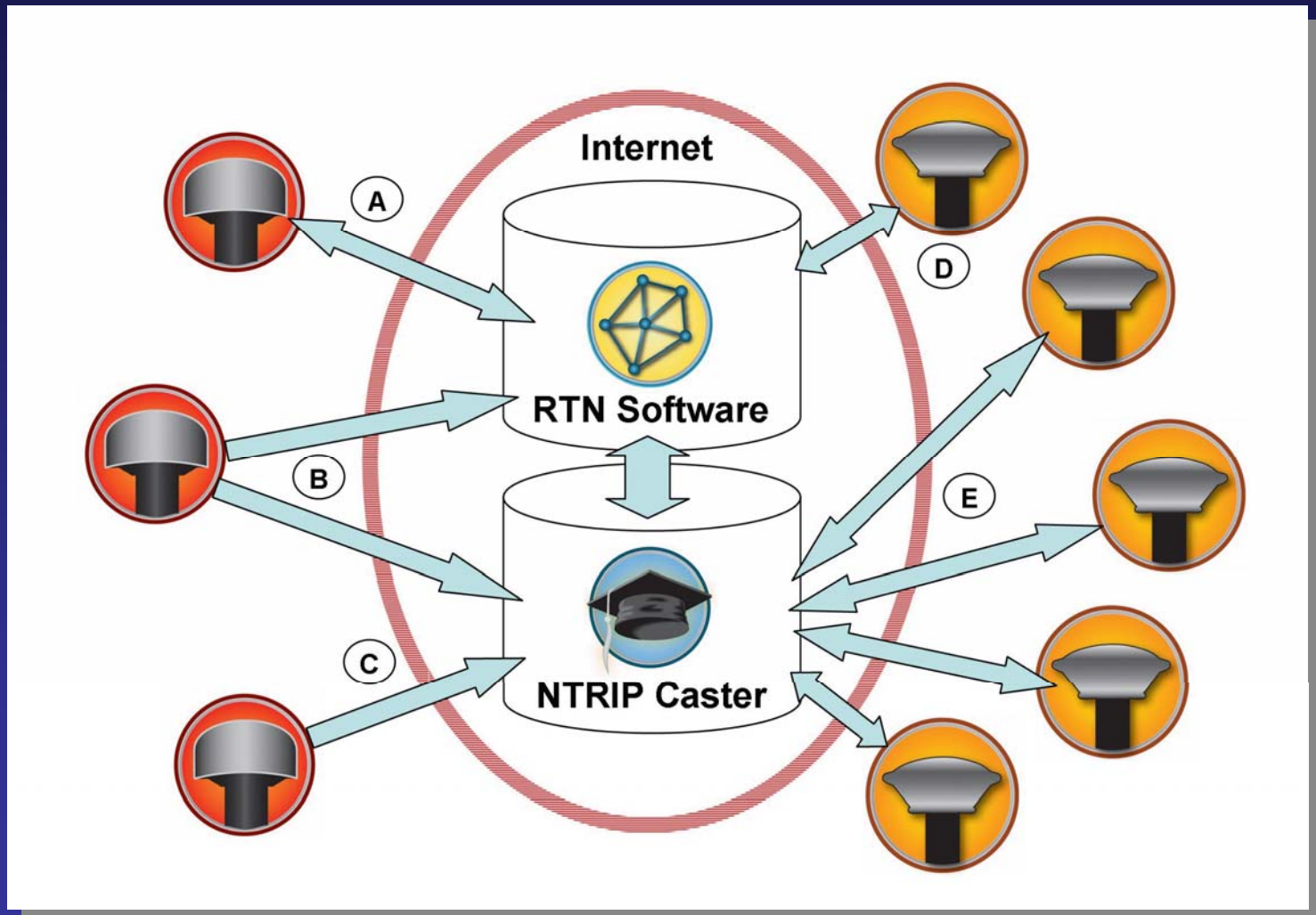
NTRIP Background – History, Development & BKG

Networked Transport of RTCM via Internet Protocol

NTRIP Background – History, Development & BKG



NTRIP Background – History, Development & BKG

Networked Transport of RTCM via Internet Protocol

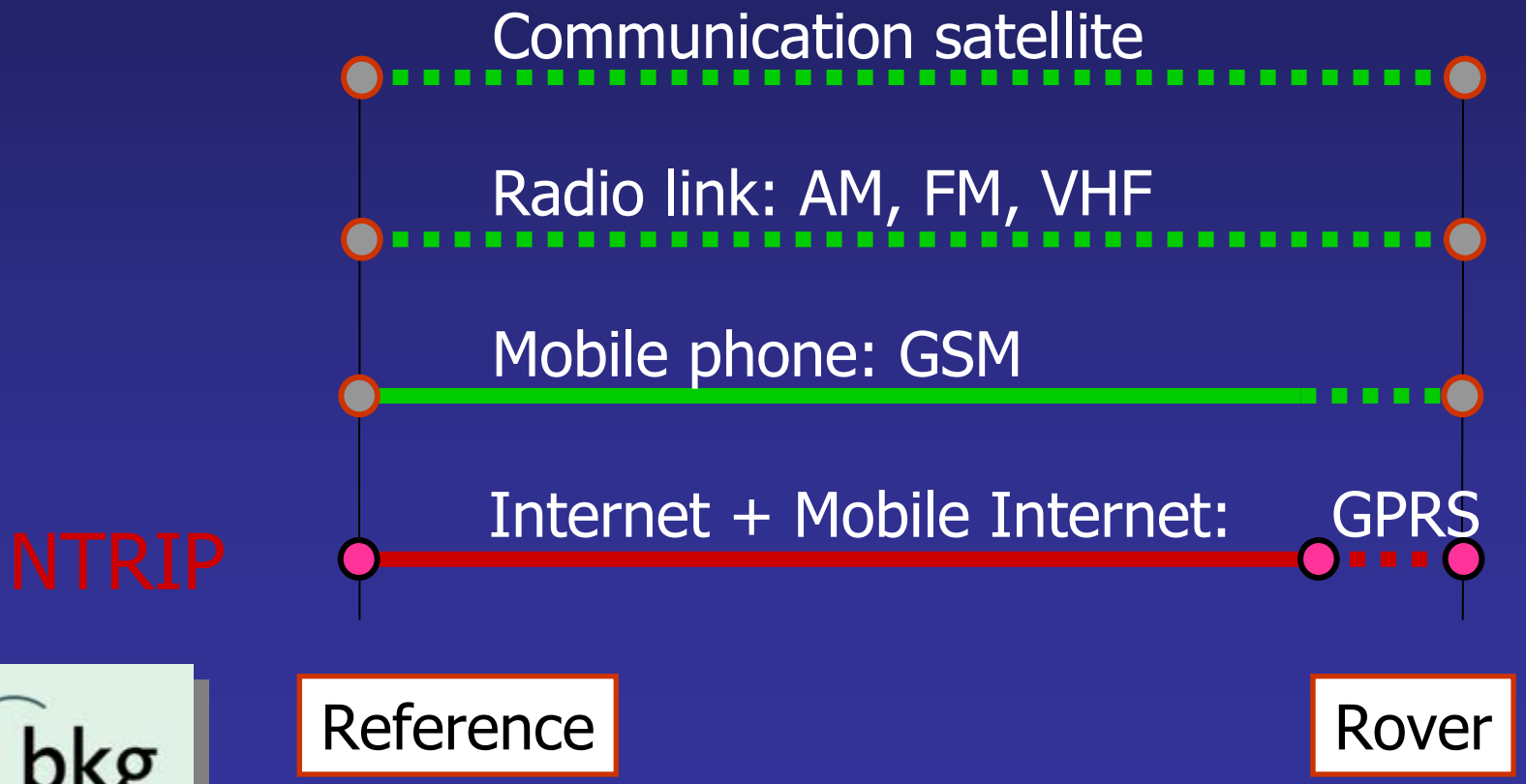
bkg

Bundesamt für Kartographie und Geodäsie

NTRIP Background – History, Development & BKG

Motivation:

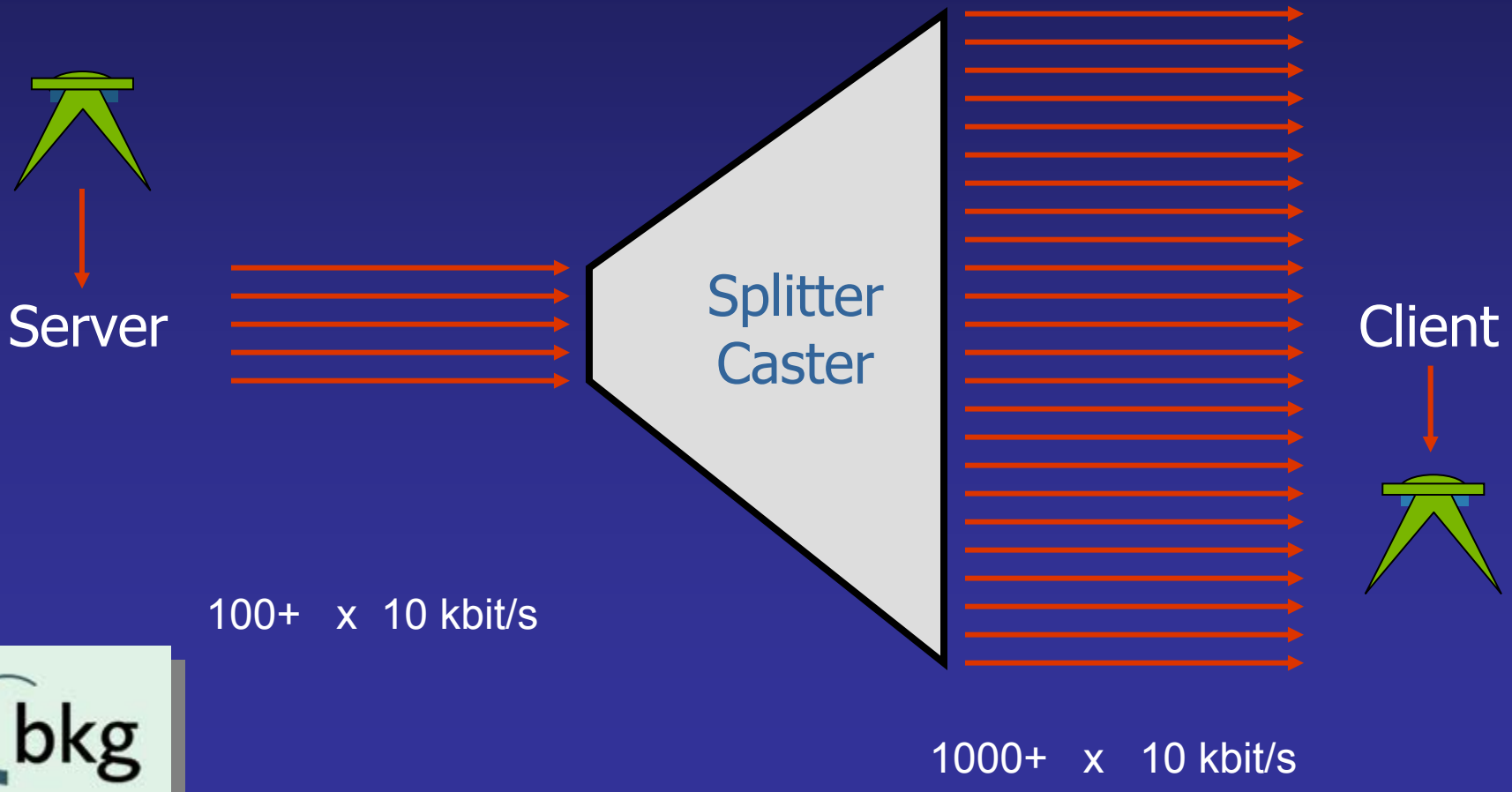
- **Use Internet to transport GNSS corrections**



NTRIP Background – History, Development & BKG

Motivation:

- Mass usage



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

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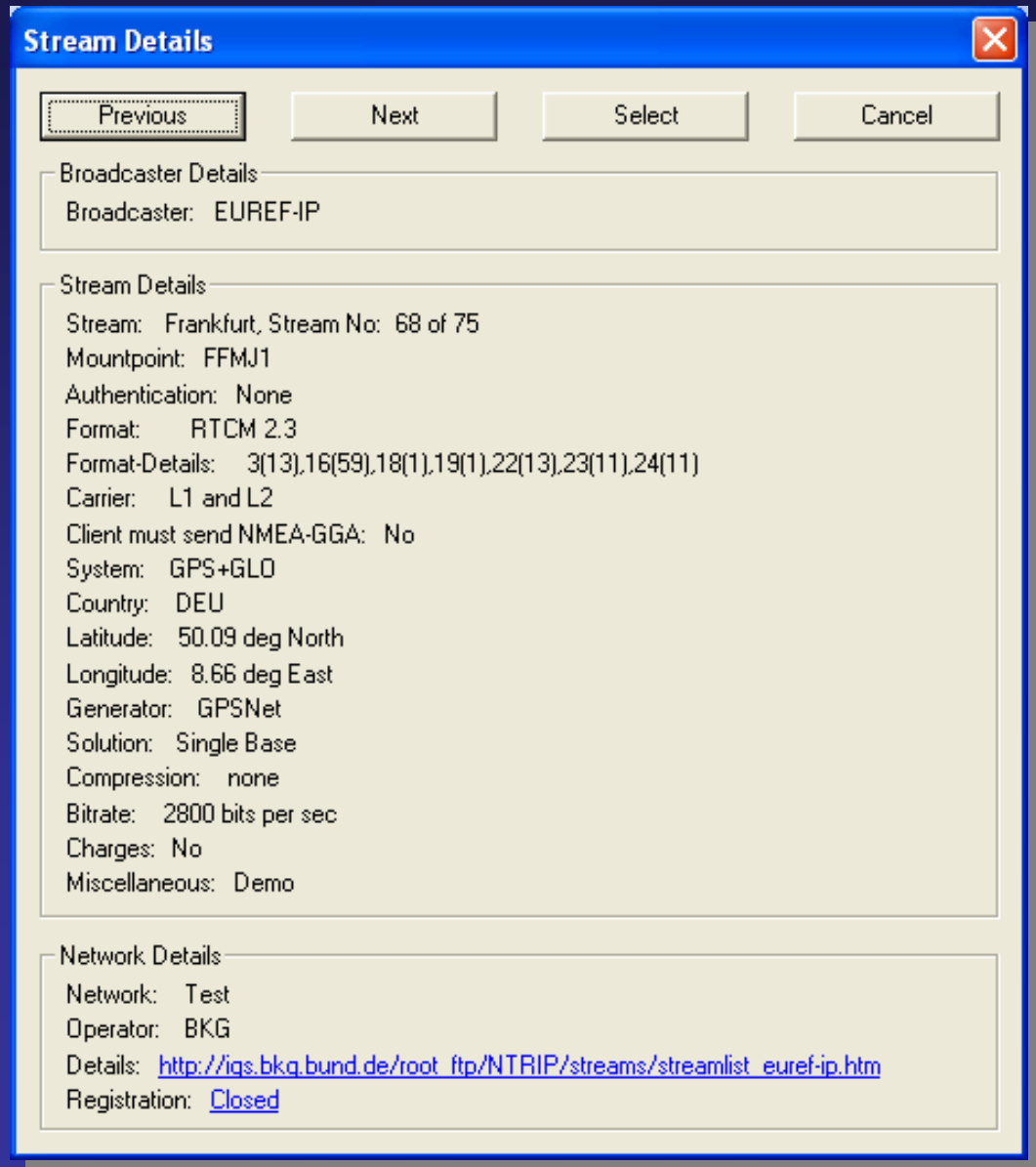
NTRIP Background – History, Development & BKG

Motivation:

- Metadata



NTRIP Background – History, Development & BKG

History – Scientific Community:

IGS-IP (Start: May 2006)

- BKG operates 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

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.rtcm.org and click on "Publications."

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 (ports 80, 2101)

- **EUREF Symposium 2005**

  - Stream also carrier phase data

NTRIP Background – History, Development & BKG

History – Scientific Community:

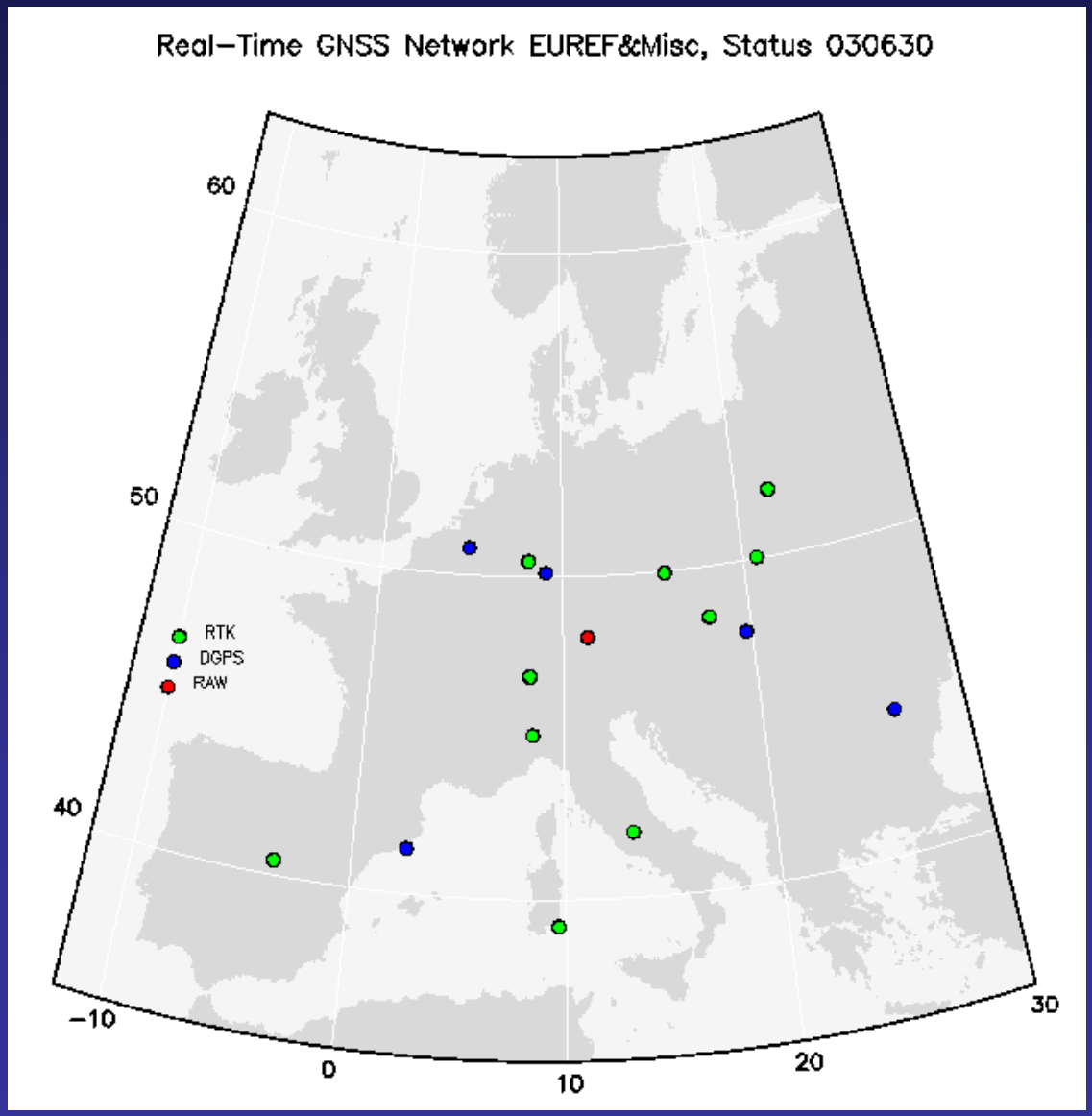
EUREF – IP (Start: 2002)

- 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:

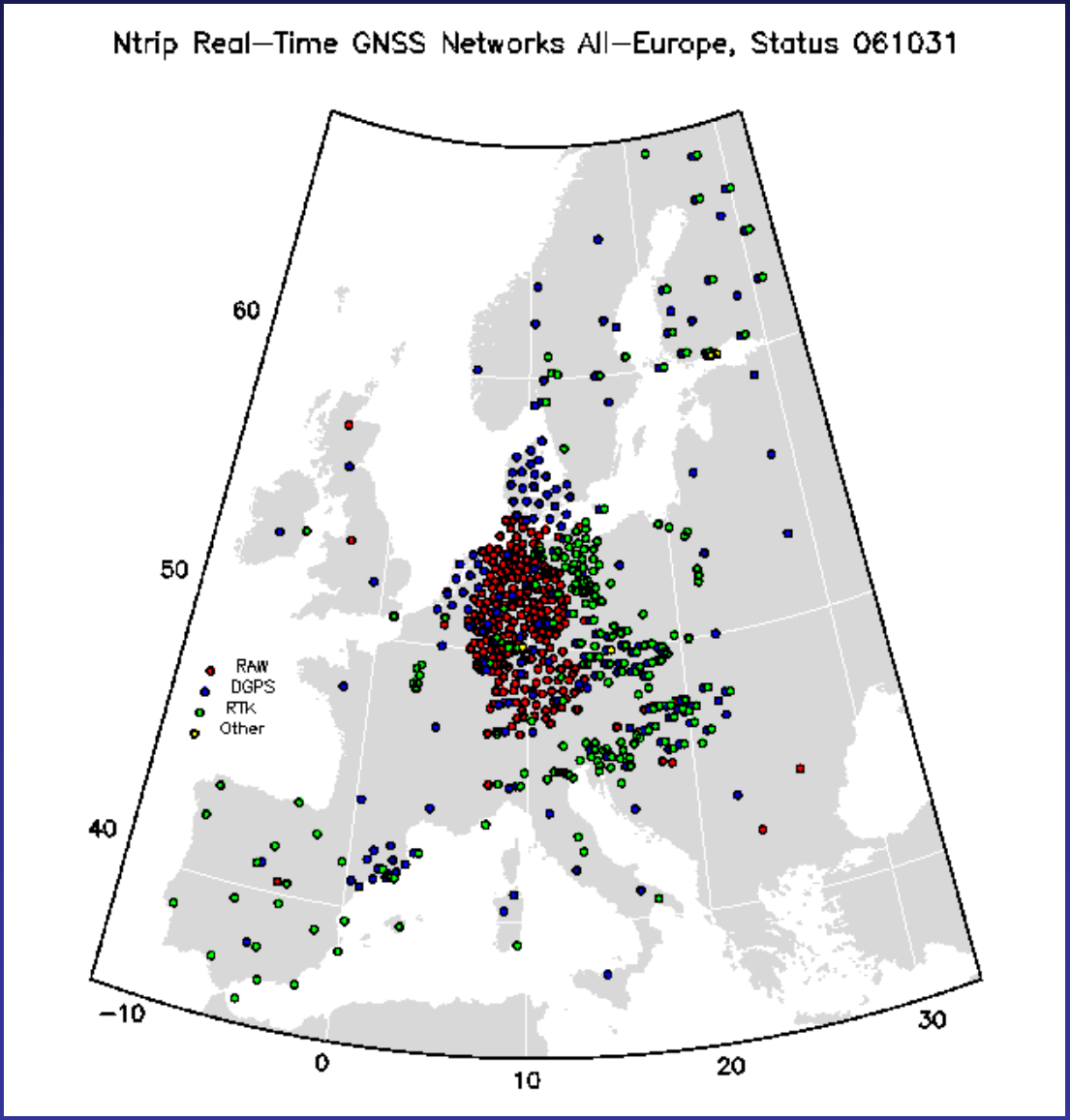
June 2003



NTRIP Background – History, Development & BKG

NTRIP Streams Europe:

October 2006



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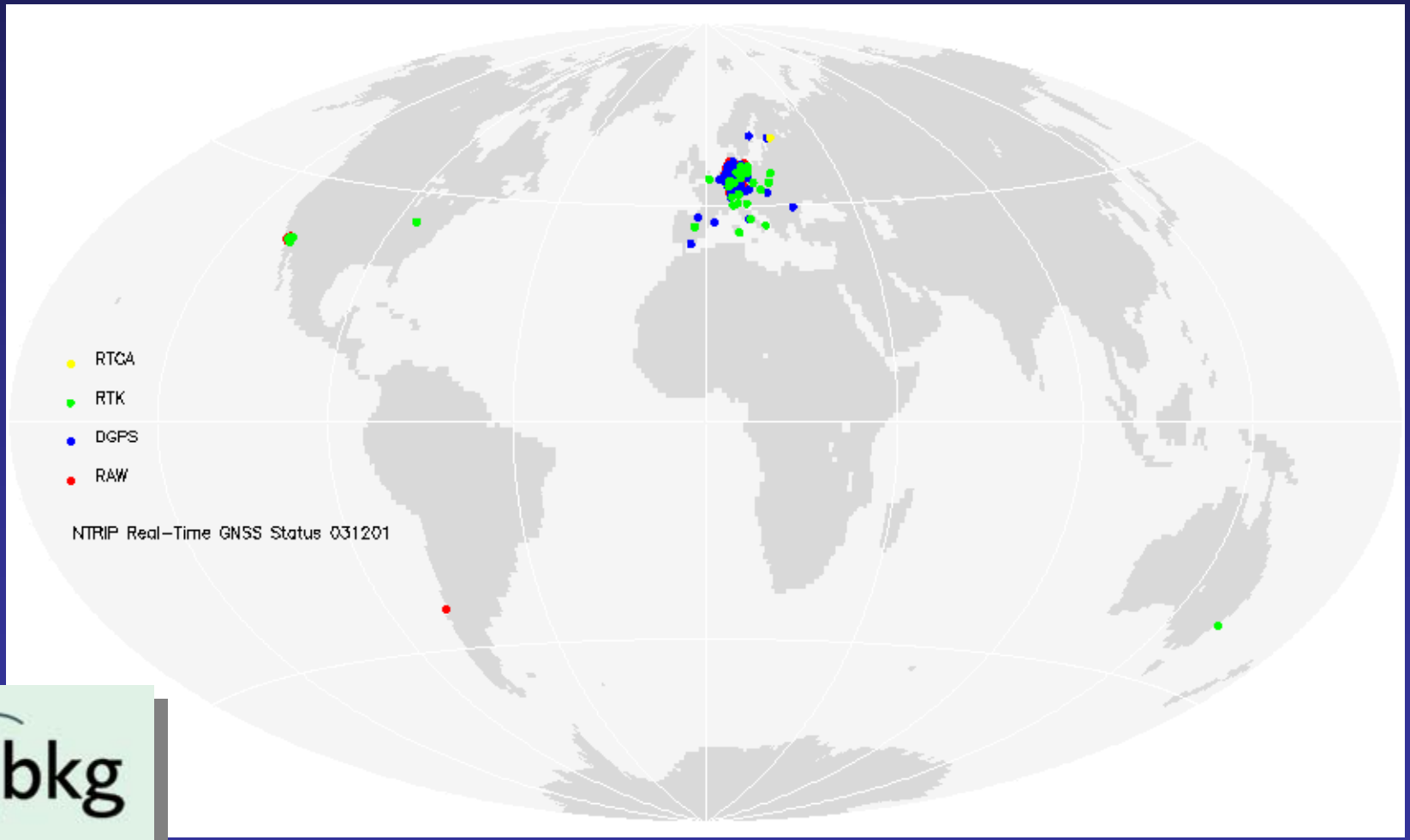
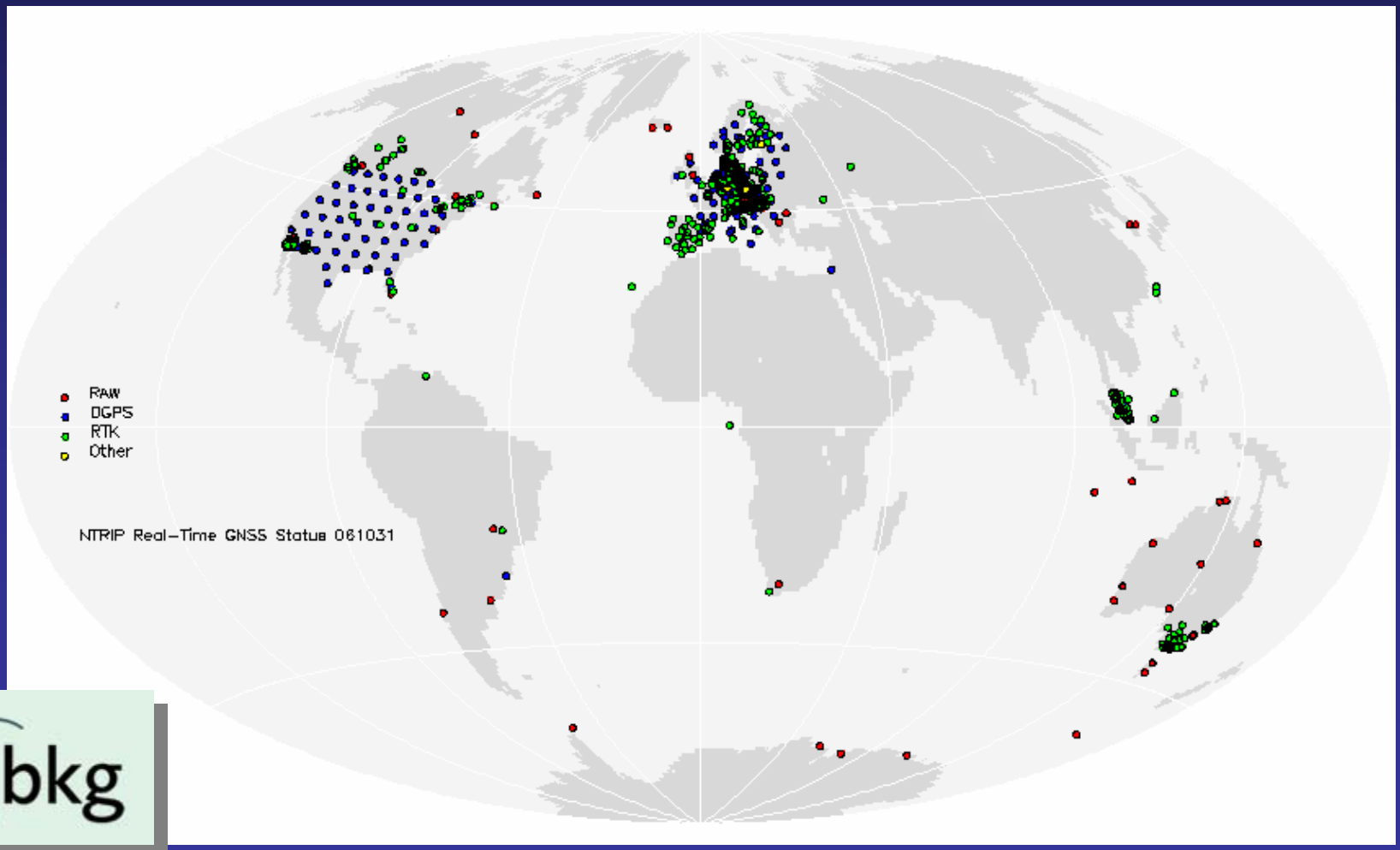
World-wide NTRIP Streams: December 2003



bkg

NTRIP Background – History, Development & BKG

World-wide NTRIP Streams: October 2006



bkg

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

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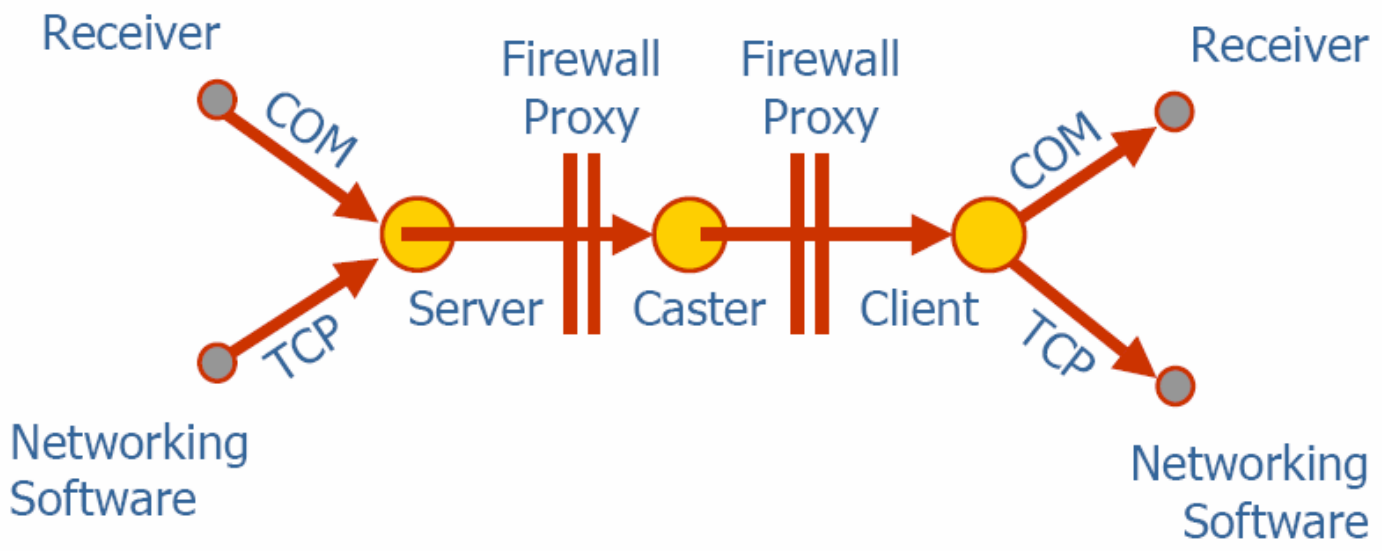
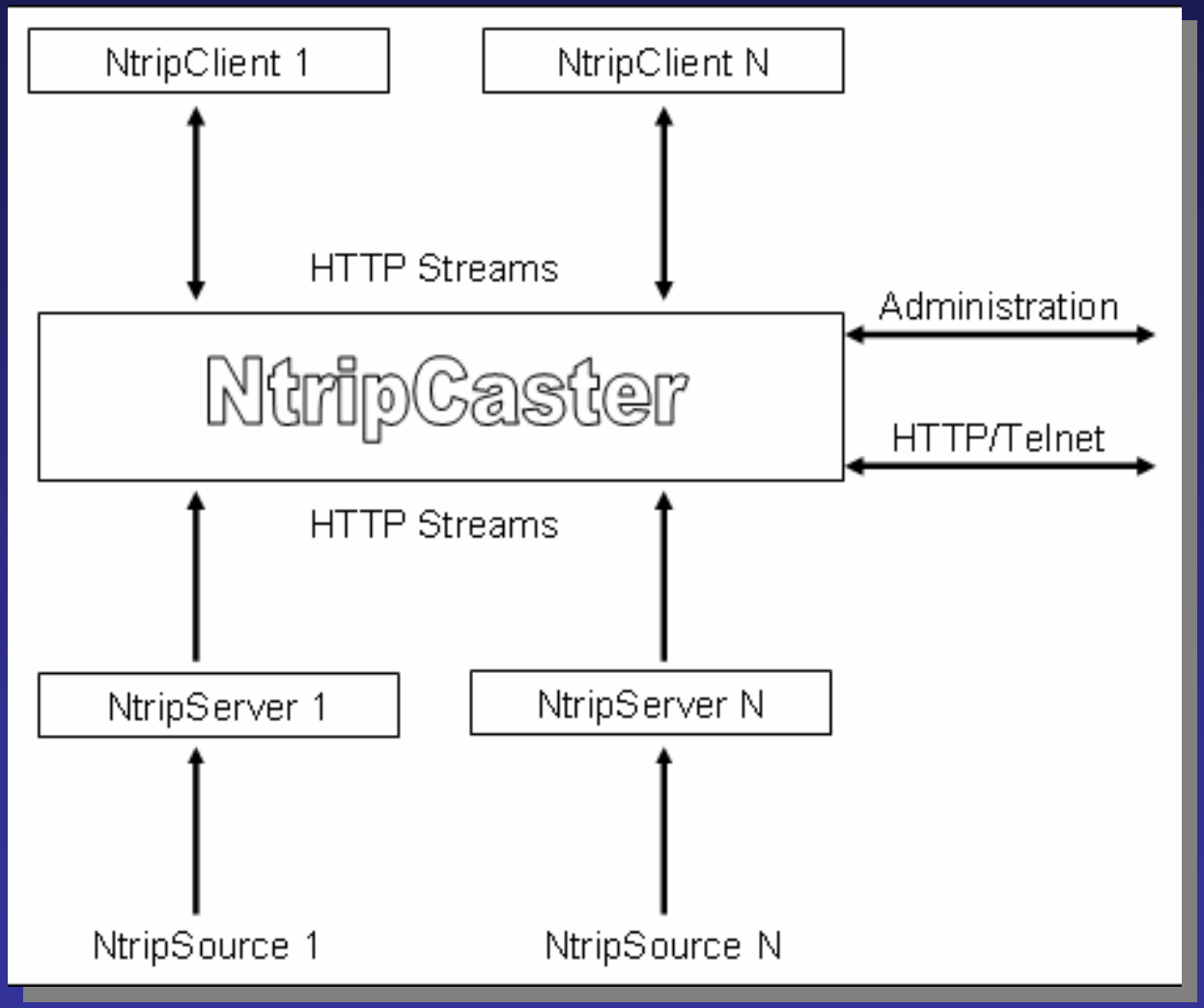
RTCM PAPER 166-2003/SC104-314

Internet Transport Configuration



NTRIP Background – History, Development & BKG



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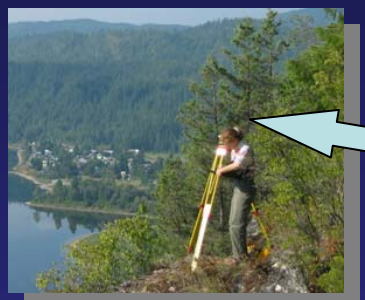


NTRIP Background – History, Development & BKG

NTRIP – network Transportation of RTCM via Internet Protocol

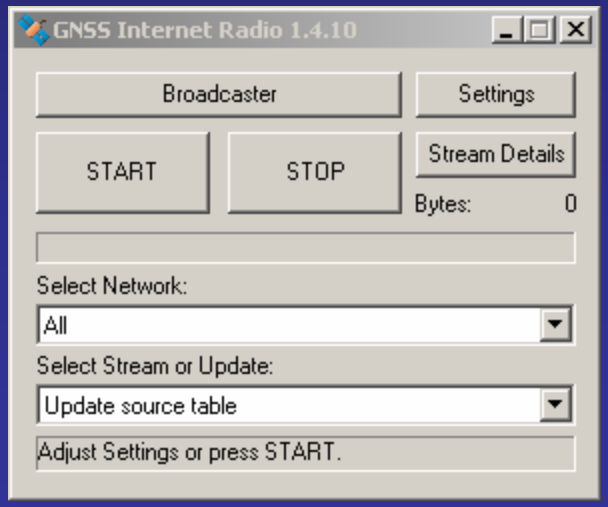
Server – what sends data to a caster (CORS or RTN Software)

Caster – the ‘exchange’ for incoming and outgoing data

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

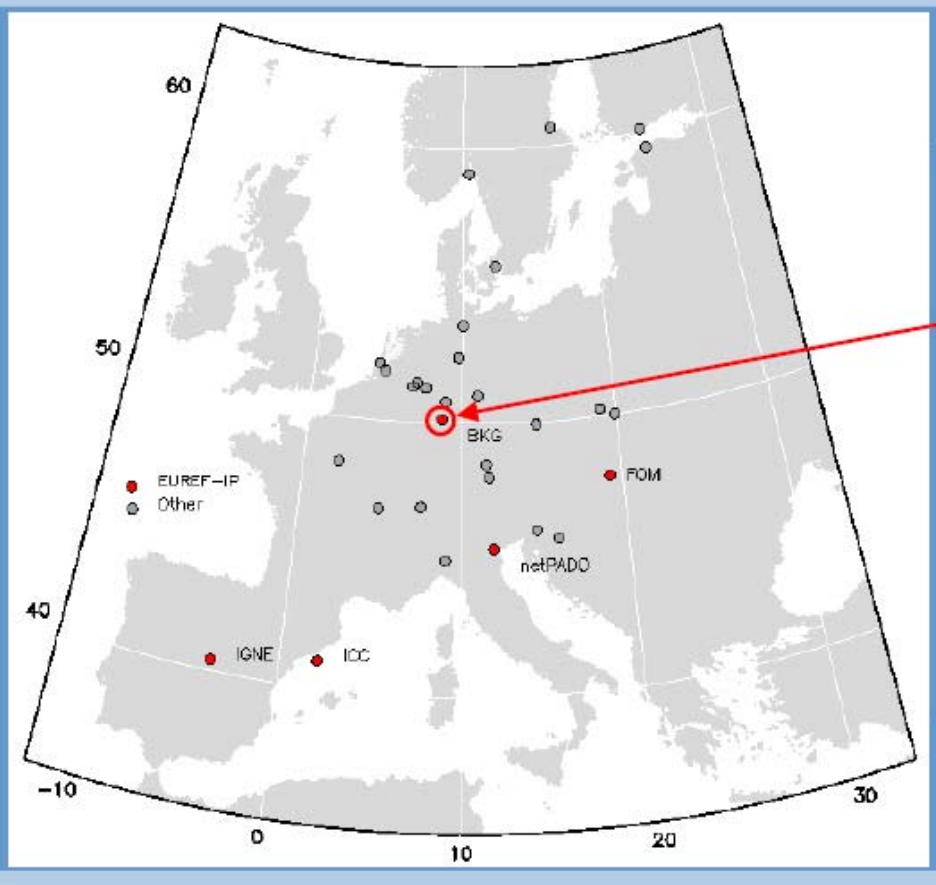
Download a free client for testing, training (and correction relaying) from:

http://igs.bkg.bund.de/ntrip/ntrip_down.htm



NTRIP Background – History, Development & BKG

NtripCasters in Europe



EUREF-IP
www.euref-ip.net

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

(14/Jan/2006)

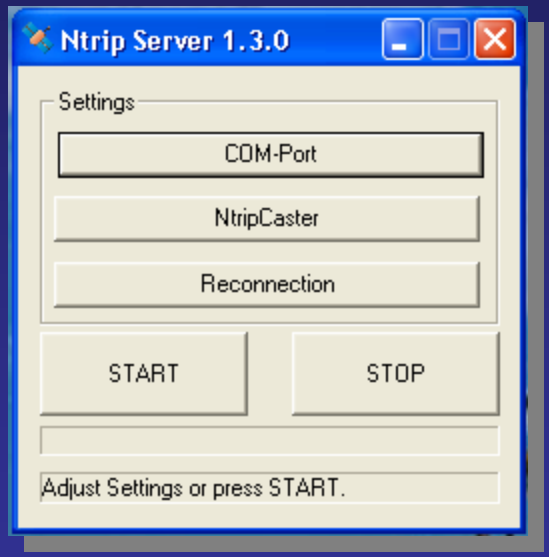
Stream Sharing – Beyond RTN

- Tectonic Plate Studies
- Geodetic Monitoring Agencies / Services / Programs
- National CORS Program
- National / World Iono & Tropo 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

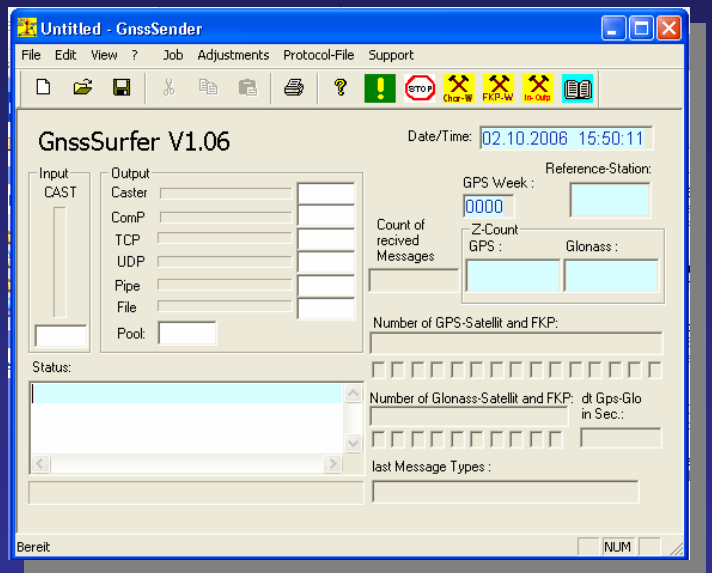
Ntrip Client	*Software*	*KB*
Windows Client	GNSS Internet Radio, Vers. 1.4.10	EXE ~680
Linux Client	Plain Example NtripClient Program, Vers. 1.14 GNU General Public License Provided by Dirk Stoecker, Euronik	ZIP ~7
Linux Perl Client	Perl NtripClient Program for Linux, Vers. 0.6 GNU General Public License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

BKG NTRIP Server Downloads



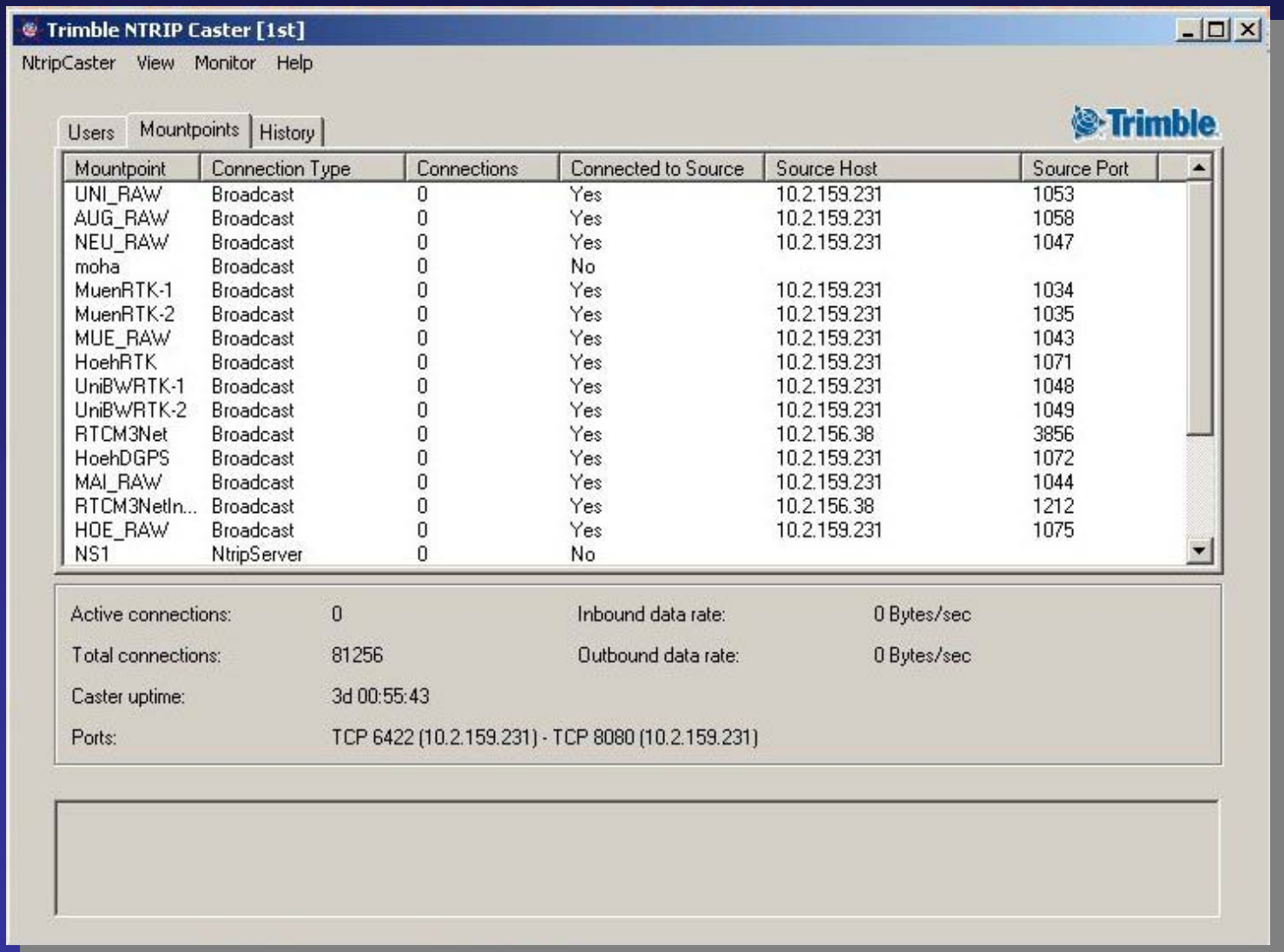
Ntrip Server	*Software*	*KB*
Windows Server	Windows NtripServer Reading from Serial Port, Vers. 1.3.0	EXE ~900
Windows Server	Command Line Version of Windows NtripServer Reading from TCP/IP Port, Vers. 1.6	ZIP ~50
Linux Server	Linux C-Version of NtripServer Reading from SISNeT server or TCP/UDP Port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

BKG Misc. Downloads



Ntrip Miscellaneous	*Software*	*KB*
Windows Client & Server & RTCM 2.x Decoder	GnssSurfer, Vers. 1.06 Combined Function Provided by Juergen Siebert, SAPOS Berlin	ZIP ~2000
Windows RTCM 2.x Decoder	RTCM 2.x DGPS/RTK Decoder Reading from TCP/IP Port, Vers. 2.1 Provided by Manfred Baeumker, FH Bochum	ZIP ~240
Linux RTCM 2.x Decoder	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
Linux Client and RTCM 2.x to RINEX Converter	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
Linux Client and RTCM 3 to RINEX Converter	Single-Stream Client, translates RTCM 3 RTK to RINEX, Vers. 1.4 GNU General Public License Provided by Dirk Stoecker, Euronik	ZIP ~15
TEQC, Linux	UNAVCO's Teqc, translates Raw GNSS receiver data to RINEX	pdf ~40
TEQC, Windows	UNAVCO's Teqc, translates Raw GNSS receiver data to RINEX	zip ~340
Linux Broadcaster	Standard NtripCaster, Vers. 0.1.5 GNU General Public License	tgz ~265

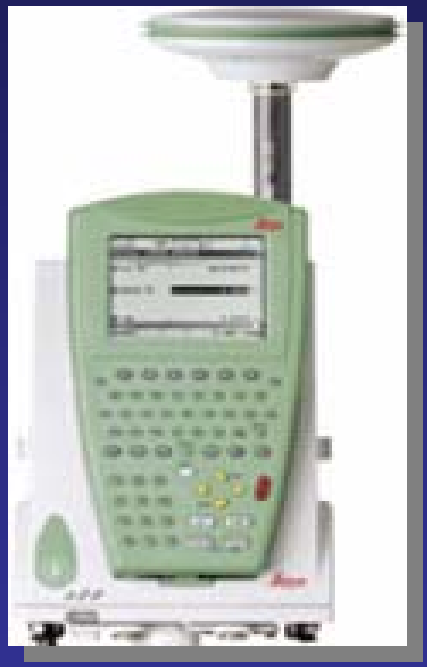
NTRIP Caster



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_ARLI;NTRIP_ARLI;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;BELI;BELI - 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;BELI-23;BELI-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