



Alberding-QC

a multi-purpose GNSS service performance monitoring tool

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Outline



Alberding GmbH

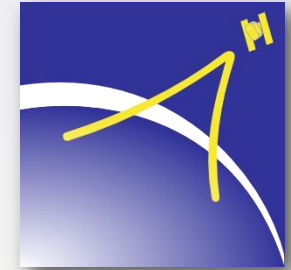
Alberding-QC

Displacement monitoring with low-cost GNSS receivers

Alberding GmbH



- German GNSS software and hardware development company
- Based in Wildau (near Berlin)
- 20 years of experience with high accuracy GNSS
- Specialised in GNSS data communication, management, processing and monitoring
- 9 engineers + external employees
- Independent from receiver manufacturers





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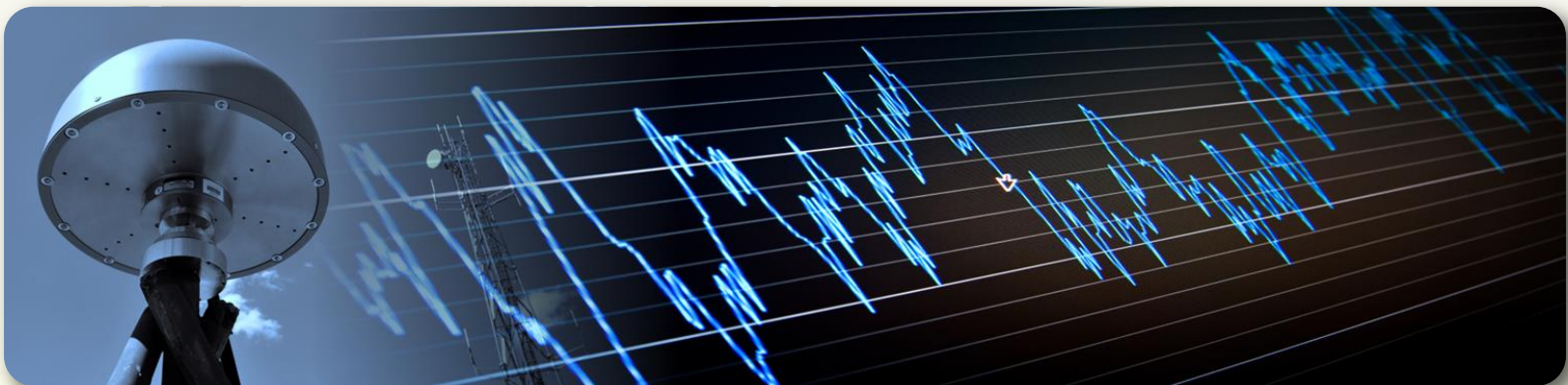
Alberding-QC

Displacement monitoring with low-cost GNSS receivers

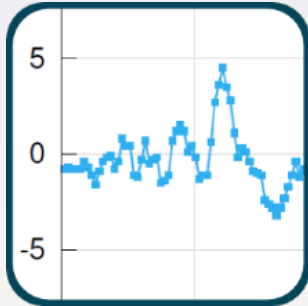
Alberding-QC



- Motivation: help operators improve service quality
= detect outages and performance degradations, generate warnings
- Developed for RTK / Network RTK, DGNSS, PPP service providers
- Monitors data availability, positioning accuracy and consistency
- Multi-purpose tool: 3 modules integrated into a single web interface
- Available for Linux and Windows
- Available for purchase or as a service by Alberding GmbH



Alberding-QC software modules



RTK-Check

- Positioning accuracy and RTK fixing time

Stream	
AMDS [0]	alberding
① LEIJ_RTK [0]	alberding
① SE001_TEST [0]	alberding
TITZ_CMR [0]	alberding
WALTB_D_RAW [0]	ntrip client

Checkstream

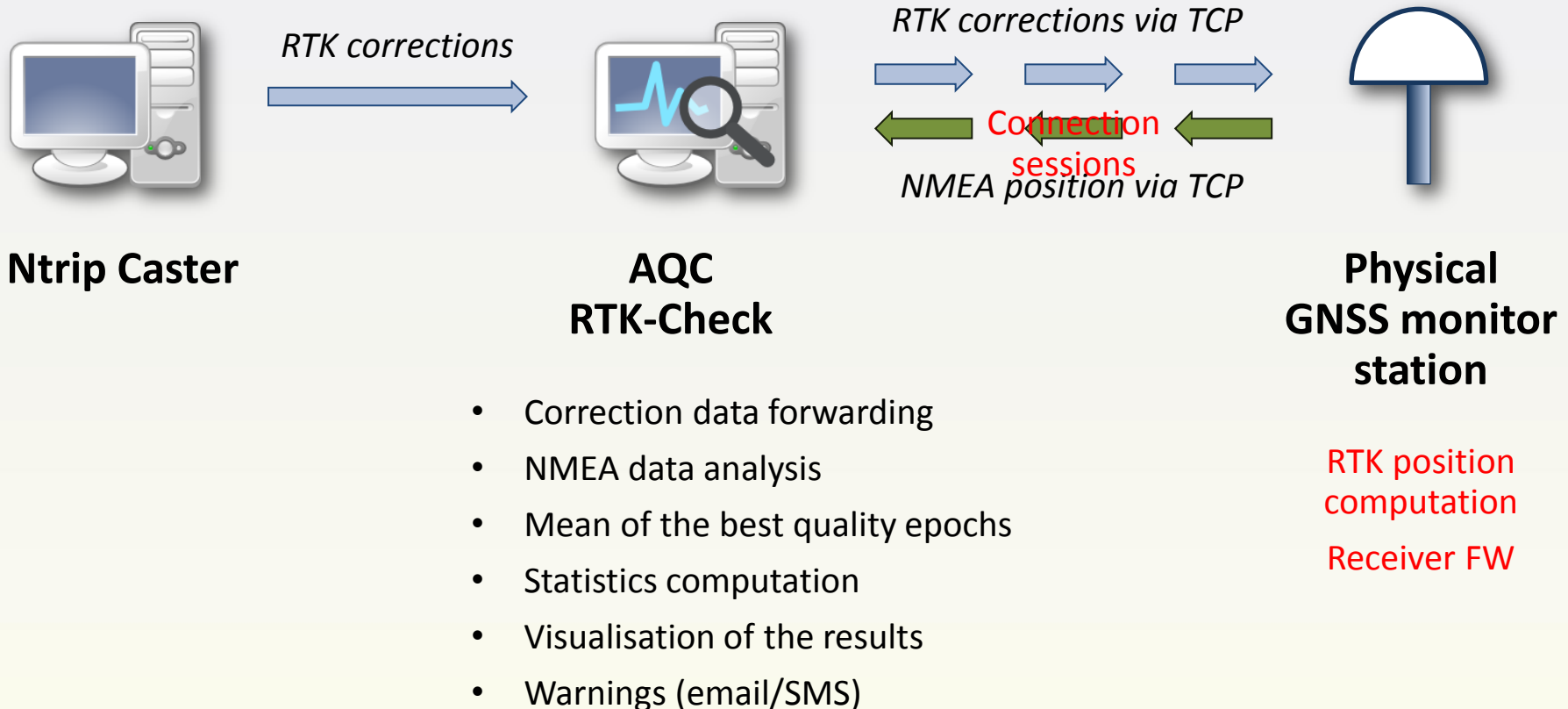
- Ntrip stream availability and consistency monitoring



InspectRTCM

- GNSS binary data decoding and visualisation

RTK-Check concept – physical station



RTK-Check configuration



- Connection session settings:

Name	Data Flow	Checking Parameter	Rx Position	Antenna Height	Delete	Inactive	Owner
WALTB02-POTS0	Correction Data Source: ntrip:POTS0/...@ntrip.dgpsonline.eu:2101 Correction Data Input: tcp:Waltersdorf4.dgpsonline.eu:7720 NMEA Output: tcp:Waltersdorf4.dgpsonline.eu:7719	Connection Time: <input type="radio"/> 300 [s] Position (ΔNE): <input type="radio"/> [cm] Timeout: 120 [s]	Latitude/X: 3793859.1838 [m] Longitude/Y: 915385.7010 [m] Height/Z: 5027929.9525 [m]	0.0 [m]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> alberding <input type="checkbox"/> alldayrtk <input type="checkbox"/> asgeupos

- Warning settings:

Name	E-Mail	Mobile Phone	No NMEA Data	No Fix	Position (ΔNE)	Height (ΔH)	Satellites	HDOP	Data Age	Delete	Inactive
			<input type="checkbox"/> [s]	<input type="checkbox"/>	<input type="checkbox"/> [cm] (<input type="checkbox"/> [s])	<input type="checkbox"/> [cm] (<input type="checkbox"/> [s])	<input type="checkbox"/> (<input type="checkbox"/> [s])	<input type="checkbox"/> (<input type="checkbox"/> [s])	<input type="checkbox"/> (<input type="checkbox"/> [s])	<input type="checkbox"/>	<input type="checkbox"/>
horvath	horvath@alberding.eu		600 [s]	<input checked="" type="checkbox"/>	10 [cm] (60 [s])	10 [cm] (60 [s])	6 (60 [s])	3 (60 [s])	5 (60 [s])	<input type="checkbox"/>	<input checked="" type="checkbox"/>

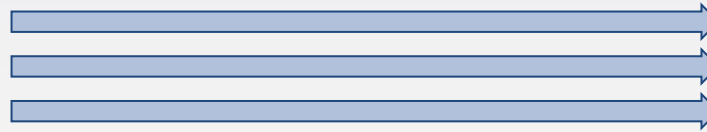
Edit

RTK-Check concept – internal processing



Ntrip Caster


GNSS raw data streams



Ephemeris data stream



**AQC
RTK-Check**

- Internal data processing in sessions (RTKLIB) 
- NMEA data analysis
- Statistics computation
- Visualisation of the results
- Warnings (email/SMS)

RTK-Check – internal processing



- Full flexibility:
 - GPS-only, GPS+GLO, GPS+GLO+Gal, etc.
 - L1 only, L1+L2, L1+L2+L5, etc.
 - Rover and Base can be physical or virtual stations
 - Various raw data input formats e.g. RTCM 2.x, 3.x, NovAtel, Javad, etc.
 - Numerous ionosphere and troposphere models
 - Several processing techniques: standalone, DGNSS, RTK, PPP
- Special tests:
 - Zero baseline test between neighbouring networks
 - Zero baseline test between successive network RTK software versions

RTK-Check configuration



- Connection session settings:

Name	RTKLIB Conf.	Data Flow	Auto. Position	X	Y	Z	Antenna	Checking Parameter	Delete	Inactive	Owner
RTKLIBTEST		<div style="border: 1px solid #ccc; padding: 5px;"> <div style="display: flex; justify-content: space-between;"> <div style="background-color: #0070c0; color: white; padding: 2px 5px; font-weight: bold;">Rover</div> <div style="border-bottom: 1px solid #ccc; width: 80%; padding: 2px;">Ntrip-Client ▾</div> </div> <div style="border-bottom: 1px solid #ccc; width: 80%; padding: 2px;">@ntrip.dgpsonline.eu:2101/WALT</div> <div style="display: flex; justify-content: space-between;"> <div style="background-color: #0070c0; color: white; padding: 2px 5px; font-weight: bold;">Base</div> <div style="border-bottom: 1px solid #ccc; width: 80%; padding: 2px;">Ntrip-Client ▾</div> </div> <div style="border-bottom: 1px solid #ccc; width: 80%; padding: 2px;">@ntrip.dgpsonline.eu:2101/WILD_</div> <div style="border-bottom: 1px solid #ccc; width: 80%; padding: 2px;">RTCM 3 ▾</div> </div>	<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="text" value="3793859.475"/> [m]	<input type="text" value="915385.487"/> [m]	<input type="text" value="5027929.695"/> [m]	<input type="text" value="automatic"/> ▾ <input type="text" value="automatic"/> ▾	<div style="border: 1px solid #ccc; padding: 5px;"> <div style="background-color: #0070c0; color: white; padding: 2px 5px; font-weight: bold;">Connection Time</div> <div style="display: flex; justify-content: space-between;"> <input checked="" type="radio"/> <input type="text" value="570"/> [s] </div> <div style="background-color: #0070c0; color: white; padding: 2px 5px; font-weight: bold;">Position (ANE)</div> <div style="display: flex; justify-content: space-between;"> <input type="radio"/> <input type="text" value=""/> [cm] </div> <div style="background-color: #0070c0; color: white; padding: 2px 5px; font-weight: bold;">Timeout</div> <div style="display: flex; justify-content: space-between;"> <input type="text" value="30"/> [s] </div> </div>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> alberding <input checked="" type="checkbox"/> aldayrktk

[Edit](#)

RTK-Check configuration



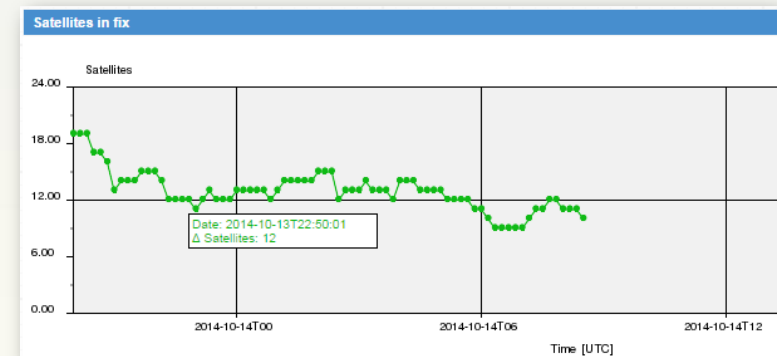
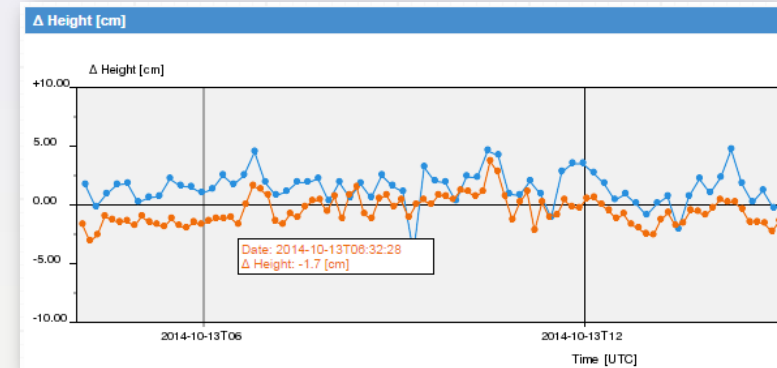
- RTKLIB configuration:

```
# rtkrcv configuration options (2013/04/29, v.2.4.2)
console-passwd =admin
console-timetype =gpst # (0:gpst,1:utc,2:st,3:tow)
console-soltype =deg # (0:0ms,1:deg,2:xy1,3:enu,4:py1)
console-solflag =2 # (0:off,1:std,2:age,3:ratio/ns)
inpstr1-type =ntripcli
inpstr2-type =ntripcli
inpstr3-type =tcpcli # (0:off,1:serial,2:file,3:tcpsvr,4:tcpcli,7:ntripcli,8:ftp,9:http)
inpstr1-path = /ntrip.gpsonline.eu:2181/WALTB0_RTCM3:
inpstr2-path = /ntrip.gpsonline.eu:2181/WALTB0_RTCM3:
inpstr3-path =:localhost:11001/:
inpstr1-format =rtcm3
inpstr2-format =rtcm3
inpstr3-format =rtcm3 # (0:rtcm2,1:rtcm3,2:0em4,3:0em3,4:ubx,5:ss2,6:hemis,7:skytraq,8:sp3)
inpstr2-nmeasq =off # (0:off,1:latlon,2:single)
inpstr2-nmealat =0 # (deg)
inpstr2-nmealon =0 # (deg)
outstr1-type =tcpsvr # (0:off,1:serial,2:file,3:tcpsvr,4:tcpcli,6:ntripsvr)
outstr2-type =file # (0:off,1:serial,2:file,3:tcpsvr,4:tcpcli,6:ntripsvr)
outstr1-path =:localhost:11002/:
outstr2-path = /var/euronav/rtk/RTKLIBTEST/rtcm3_123456789.nmea::T
outstr1-format =nmea # (0:1lh,1:xy2,2:enu,3:nmea)
outstr2-format =nmea # (0:1lh,1:xy2,2:enu,3:nmea)
logstr1-type =off # (0:off,1:serial,2:file,3:tcpsvr,4:tcpcli,6:ntripsvr)
logstr2-type =off # (0:off,1:serial,2:file,3:tcpsvr,4:tcpcli,6:ntripsvr)
logstr3-type =off # (0:off,1:serial,2:file,3:tcpsvr,4:tcpcli,6:ntripsvr)
logstr1-path =
logstr2-path =
logstr3-path =
misc-svrcycle =10 # (ms)
misc-timeout =30000 # (ms)
misc-reconnect =30000 # (ms)
misc-nmeacycle =5000 # (ms)
misc-buffsize =32768 # (bytes)
misc-navmsgsel =all # (0:all,1:rover,1:base,2:corr)
misc-startcmd =/usr/bin/rtkstart.sh
misc-stopcmd =/usr/bin/rtkshut.sh
file-cmdfile1 = # ../../data/oem4_raw_1hz.cmd
file-cmdfile2 = # ../../data/oem4_raw_1hz.cmd
file-cmdfile3 =
pos1-posmode =static # (0:single,1:dgps,2:kinematic,3:static,4:movingbase,5:fixed,6:ppp-kin,7:ppp-static)
pos1-frequency =11+12 # (1:11,2:11+12,3:11+12+15,4:11+12+15+16,5:11+12+15+16+17)
pos1-soltype =forward # (0:forward,1:backward,2:combined)
pos1-elmask =15 # (deg)
pos1-snrmask_r =off # (0:off,1:on)
pos1-snrmask_b =off # (0:off,1:on)
pos1-snrmask_L1 =0,0,0,0,0,0,0,0,0
pos1-snrmask_L2 =0,0,0,0,0,0,0,0,0
pos1-snrmask_L5 =0,0,0,0,0,0,0,0,0
```

RTK-Check features



- Compare different solutions
 - Different baseline lengths
 - Different processing techniques
 - Different receiver/software settings
- User defined connection intervals
- Real-time, epoch-by-epoch analysis
- Customised warning thresholds
 - No NMEA data
 - No RTK Fix
 - High position error
 - Low number of SVs
 - High data age
- PDF reports , CSV export



RTK-Check web interface



RTK-Check >> Monitoring
Time Zone: 2014-10-13T14:06:59 UTC

Settings

Begin: 2014-10-08 12:00
End: 2014-10-14 0:00
Time frame: 1.0 [h]

Streams:
 RTKLIBTEST_Real
 WALT-POTS_RTKLIB_Real
 WALTB-D-WILD_RTK_Real
 Select all Invert selection Remove selection

NE: 10 [cm]
 Height: 10 [cm]
 Satellites: 24 [#]
 Data-Age: 20 [s]
 HDOP: 4
 TTFA: 600 [s]
 Peaks

CSV PDF Ok

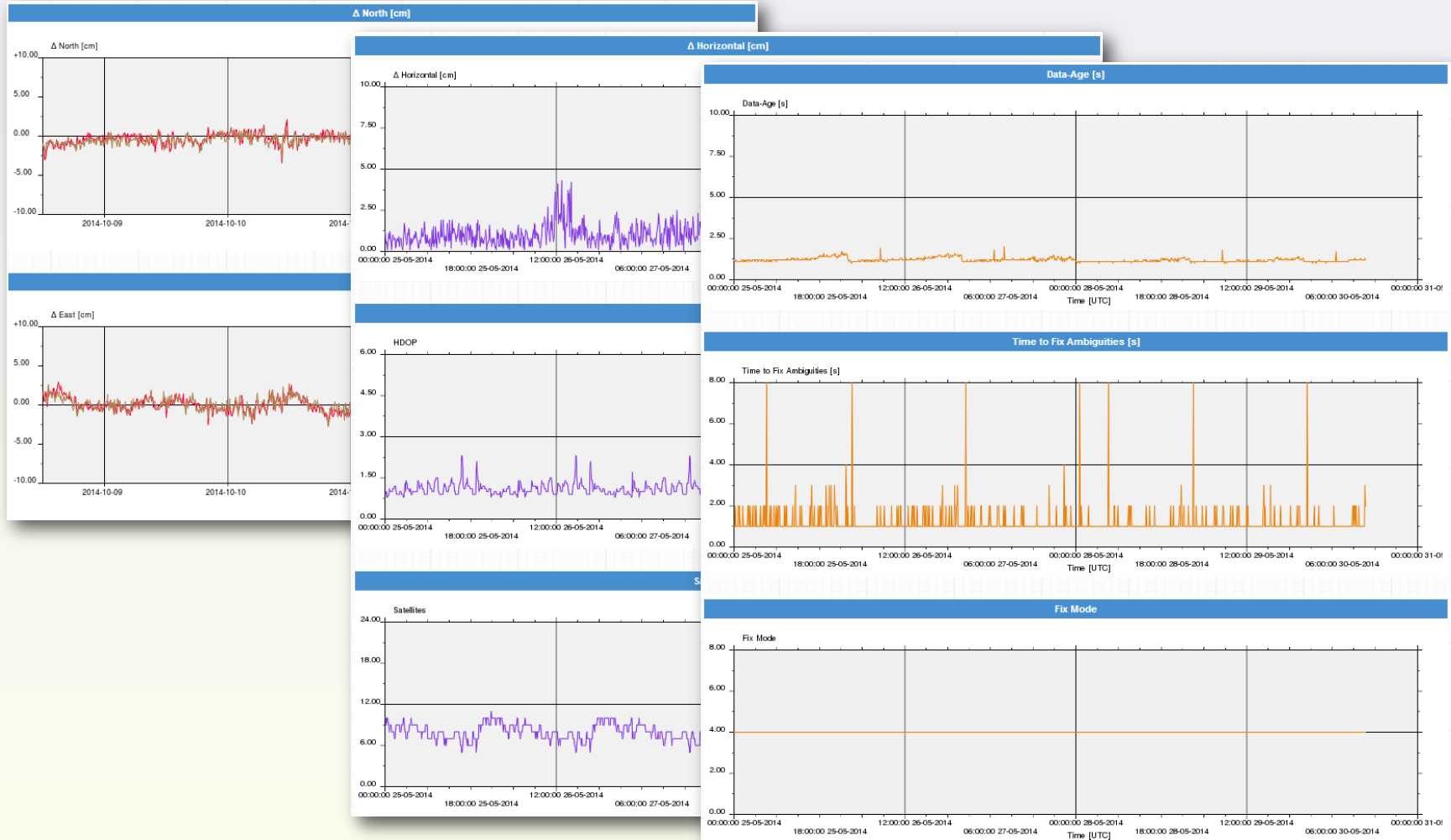
Sessiondata - [RTKLIBTEST]

Event Time [UTC]	Connection Delay	Solution	Epochs	ΔN [cm]	ΔE [cm]	ΔH [cm]	ΔNE [cm]	TTFA [s]	# of Sat.	HDOP	Data-Age [s]	Checktype
2014-10-13 13:51:43	2	RTK Fixed	562 / 570	0.2	1.4	2.0	1.5	3	15	1.0	0.2	Interval Check
2014-10-13 13:41:43	3	RTK Fixed	561 / 570	-0.1	-0.3	0.9	0.3	8	15	1.0	0.2	Interval Check
2014-10-13 13:31:43	3	RTK Fixed	492 / 570	-1.7	1.6	-2.0	2.4	76	15	1.0	0.1	Interval Check
2014-10-13 13:21:43	2	RTK Fixed	566 / 570	-0.6	1.6	1.2	1.7	3	14	1.1	0.1	Interval Check
2014-10-13 13:11:43	3	RTK Fixed	560 / 570	0.3	1.5	0.8	1.5	8	15	0.9	0.2	Interval Check
2014-10-13 13:01:43	2	RTK Fixed	564 / 570	-0.8	2.0	-0.8	2.1	6	16	0.9	0.2	Interval Check
2014-10-13 12:51:43	3	RTK Fixed	534 / 570	-1.4	0.3	0.2	1.4	1	16	0.9	0.1	Interval Check
2014-10-13 12:41:43	3	RTK Fixed	558 / 570	0.5	1.7	1.2	1.8	7	15	1.0	0.2	Interval Check
2014-10-13 12:31:43	2	RTK Fixed	564 / 570	-0.3	1.0	0.7	1.0	5	13	1.3	0.2	Interval Check
2014-10-13 12:21:43	3	RTK Fixed	565 / 570	0.6	1.8	1.6	1.9	2	13	1.4	0.2	Interval Check
2014-10-13 12:11:42	2	RTK Fixed	567 / 570	1.7	0.7	2.9	1.9	1	15	1.2	0.2	Interval Check
2014-10-13 12:01:42	2	RTK Fixed	563 / 570	0.8	1.4	3.4	1.6	6	14	1.2	0.2	Interval Check
2014-10-13 11:51:42	2	RTK Fixed	559 / 570	0.7	0.6	3.2	0.9	3	13	1.5	0.2	Interval Check
2014-10-13 11:41:42	2	RTK Fixed	559 / 570	1.0	0.5	3.8	1.1	2	12	1.5	0.2	Interval Check
2014-10-13 11:31:42	2	RTK Fixed	583 / 570	0.6	-0.2	-0.4	0.6	7	13	1.3	0.2	Interval Check
2014-10-13 11:21:42	2	RTK Fixed	438 / 570	-0.9	0.3	1.3	1.0	4	14	1.3	0.2	Interval Check
2014-10-13 11:11:41	2											Interval Check
2014-10-13 11:01:41	2											Interval Check
2014-10-13 10:51:41	2											Interval Check
2014-10-13 10:41:41	4											Interval Check
2014-10-13 10:31:41	?											Interval Check

Statistics

	RTKLIBTEST - 727 records					WALTB-D-WILD_RTK - 1041 records				
	Min.	Max.	Mean	σ		Min.	Max.	Mean	σ	
Δ North [cm]	-5.4	2.1	-0.4	0.8		-2.7	1.3	-0.5	0.6	
Δ East [cm]	-4.9	9.1	0.1	1.1		-2.7	3.3	0.2	0.9	
Δ Height [cm]	-3.9	14.6	0.5	1.4		-4.8	4.0	-1.5	1.2	
Δ Horizontal [cm]	0.1	9.2	1.1	0.8		0.1	3.7	1.0	0.6	
TTFA [s]	1.0	542.0	22.5	54.6		-	80.0	1.4	3.9	
# of Sat.	9.0	19.0	13.8	1.9		6.0	12.0	9.9	1.6	
HDOP	0.8	3.5	1.3	0.4		0.7	1.7	0.9	0.1	
Data-Age [s]	-2.7	1.0	0.1	0.3		1.0	4.8	1.4	0.3	

RTK-Check history data analysis



Checkstream – Ntrip monitoring



- Ntrip Caster and Ntrip stream availability analysis
- Data format check (RTCM, CMR, raw data)
- Data age analysis
- Monitoring multiple casters from a single website
- Monitoring hundreds of Ntrip mountpoints
- Colour-coded status tables and bar graphs
- Individual sampling rate and alarm thresholds for each mountpoint
- NMEA output for network RTK streams
- Availability statistics for 24/7 and normal working hours
- PDF reporting

Checkstream web interface



Alberding-QC
RTK-Check InspectRTCM Checkstream Admin

Checkstream >> Checkstream-Monitoring

Time Zone: 2014-05-30T12:22:16 UTC

Reload in: 00:00:30

Statistics

Stream	Caster	Subnet	Activation	Last Accessed	Σ	Connection		Message		Data Age	
						Σ	Last Error(24h),(NWH)	Σ	Last Error(24h)	Σ	Last Error(24h)
AMDS [0]	alberdingcaster.dgpsonline.eu	-	2013-08-29T16:36:59	00:01:51	0	3 day(s) 03:29:31 (100.00 %),(100.00 %)	0	00:00:00 (100.00%)	0	00:00:00 (100.00%)	
BORJO_DGNSS [0]	alberdingcaster.dgpsonline.eu	-	2013-08-29T16:33:44	-	0	273 day(s) 19:47:31 (0.00 %),(0.00 %)	0	00:00:00 (100.00%)	0	00:00:00 (100.00%)	
EBERCMR [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	1	11:03:31 (51.75 %),(60.86 %)	1	11:05:31 (51.22%)	0	153 day(s) 18:39:31 (100.00%)	
EBERH [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	1	11:03:31 (52.02 %),(51.25 %)	1	11:05:31 (51.48%)	0	00:00:00 (100.00%)	
EBERRTCM [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	1	11:03:31 (51.75 %),(60.86 %)	1	11:05:31 (51.22%)	0	38 day(s) 08:01:31 (100.00%)	
ENSICMR [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	0	9 day(s) 19:27:30 (100.00 %),(100.00 %)	0	9 day(s) 19:29:31 (100.00%)	0	95 day(s) 23:57:31 (100.00%)	
ENSIRAW [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	-	0	16 day(s) 19:05:30 (100.00 %),(100.00 %)	0	242 day(s) 09:23:31 (100.00%)	0	00:00:00 (100.00%)	
ENSIRTCM [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	0	9 day(s) 19:27:31 (100.00 %),(100.00 %)	0	15 day(s) 19:37:31 (100.00%)	0	39 day(s) 08:01:31 (100.00%)	
FLEPOSCMRGLO [0]	ntrip.flepos.be	-	-	-	-	-	-	inactive!	-	-	
FLEPOSVRS31 [0]	ntrip.flepos.be	-	-	-	-	-	-	inactive!	-	-	
FLEPOSVRS31GLO [0]	ntrip.flepos.be	-	-	-	-	-	-	inactive!	-	-	
HOZD_RTCM_3_1 [0]	system.asgeupos.pl	-	-	-	-	-	-	inactive!	-	-	
HUEGCMR [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	0	13:17:31 (100.00 %),(100.00 %)	0	1 day(s) 13:17:31 (100.00%)	0	145 day(s) 12:43:31 (100.00%)	
HUEGTCM [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:01:48	0	13:17:31 (100.00 %),(100.00 %)	0	24 day(s) 11:43:31 (100.00%)	0	140 day(s) 12:49:31 (100.00%)	
KARLSCMR [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	0	1 day(s) 22:17:31 (100.00 %),(100.00 %)	0	1 day(s) 00:45:31 (100.00%)	0	39 day(s) 07:57:30 (100.00%)	
KARLRTC [0]	aka.dgpsonline.eu	-	2013-08-27T13:52:48	00:00:14	0	1 day(s) 00:45:31 (100.00 %),(100.00 %)	0	15 day(s) 08:03:31 (100.00%)	0	243 day(s) 09:33:30 (100.00%)	
TITZ_CMR [0]	alberdingcaster.dgpsonline.eu	-	2013-10-14T06:43:01	00:00:48	0	3 day(s) 03:30:31 (100.00 %),(100.00 %)	0	4 day(s) 10:25:31 (100.00%)	0	12 day(s) 15:11:31 (100.00%)	
WILD_RTK [0]	alberdingcaster.dgpsonline.eu	-	2013-08-30T09:16:27	00:01:48	0	3 day(s) 03:29:31 (100.00 %),(100.00 %)	0	27 day(s) 04:23:31 (100.00%)	0	14 day(s) 13:35:31 (100.00%)	
test [0]	test.dgpsonline.eu	-	2013-10-24T08:51:52	-	0	231 day(s) 02:41:01 (0.00 %),(0.00 %)	0	00:00:00 (100.00%)	0	00:00:00 (100.00%)	

Settings

Begin: 2014-05-30 00:00:00

End: 2014-05-31 00:00:00

Time Interval: 2013 2014

Streams:

- AMDS@alberdingcaster.dgpsonline.eu
- BORJO_DGNSS@alberdingcaster.dgpsonline.eu
- EBERCMR@aka.dgpsonline.eu
- EBERH@aka.dgpsonline.eu
- EBERRTCM@aka.dgpsonline.eu
- ENSICMR@aka.dgpsonline.eu
- ENSIRAW@aka.dgpsonline.eu
- ENSIRTCM@aka.dgpsonline.eu
- FLEPOSCMRGLO@ntrip.flepos.be

Select all Invert selection Remove selection

Ok PDF

Availability Plot

2014-05-30T00:00:00 - 2014-05-31T00:00:00

Legend

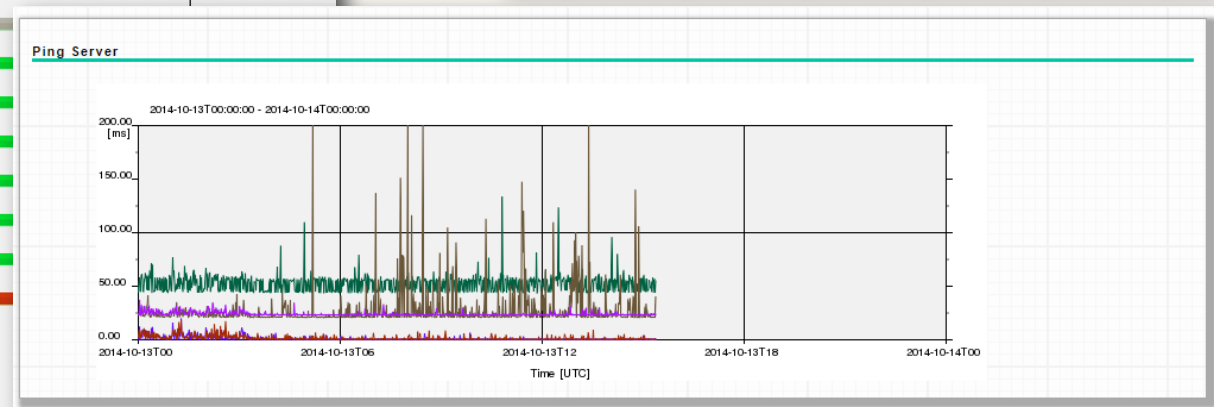
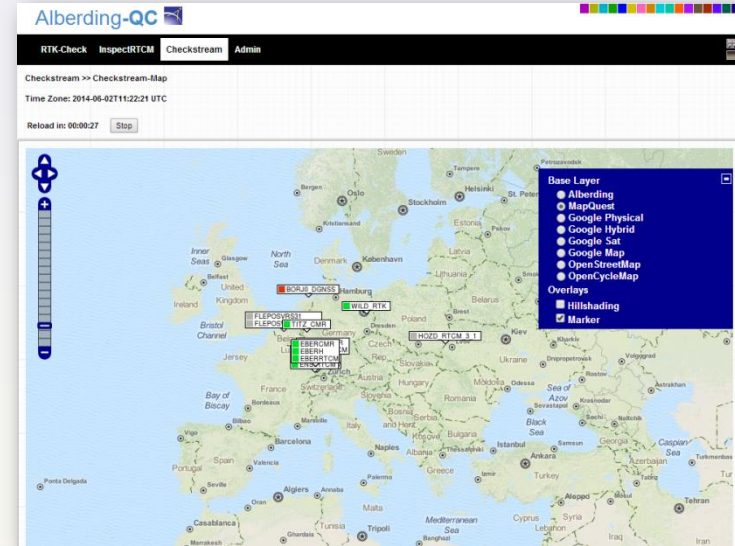
- Connection Error
- Login Error
- NMEA Error
- Message Error
- Nullframe
- Data-Age High
- Ok
- Inactive

Tamás Horváth

Alberding Quality Control

15 October 2014 17/28

Checkstream – history data analysis



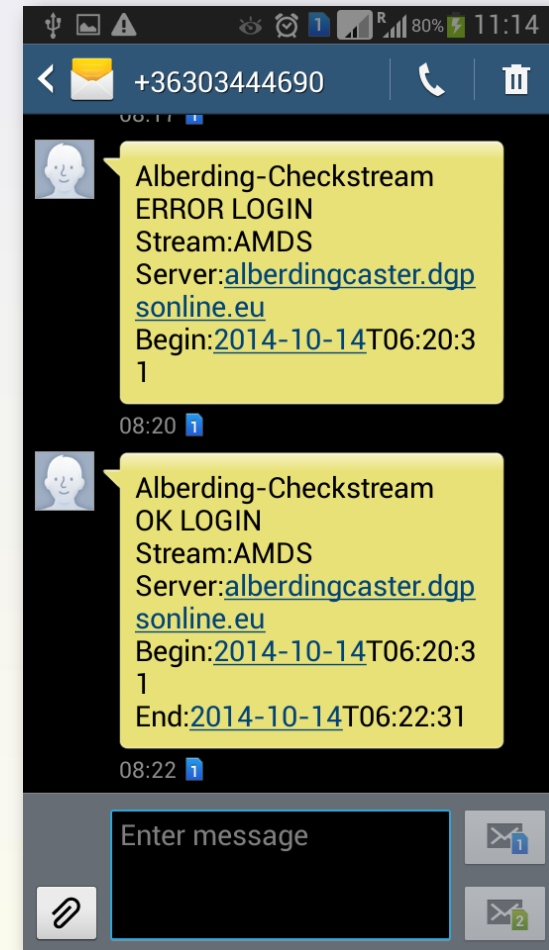
Checkstream – history data analysis



```

Error Log

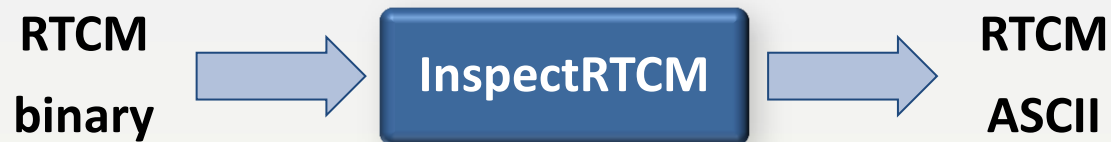
[2014-05-30T07:18:31] - MESSAGE OK DATA - EBERRTCM on aka.dgpsonline.eu begin 2014-05-30T01:16:31
[2014-05-30T07:18:31] - MESSAGE OK DATA - EBERCMR on aka.dgpsonline.eu begin 2014-05-30T01:16:31
[2014-05-30T07:16:31] - MESSAGE OK DATA - EBERH on aka.dgpsonline.eu begin 2014-05-30T01:16:31
[2014-05-30T07:16:31] - OK CONNECTION - EBERRTCM on aka.dgpsonline.eu begin 2014-05-30T01:18:31
[2014-05-30T07:16:31] - OK CONNECTION - EBERCMR on aka.dgpsonline.eu begin 2014-05-30T01:18:31
[2014-05-30T07:14:31] - OK CONNECTION - EBERH on aka.dgpsonline.eu begin 2014-05-30T01:18:31
[2014-05-30T01:18:31] - ERROR CONNECTION - EBERH on aka.dgpsonline.eu
[2014-05-30T01:18:31] - ERROR CONNECTION - EBERRTCM on aka.dgpsonline.eu
[2014-05-30T01:18:31] - ERROR CONNECTION - EBERCMR on aka.dgpsonline.eu
[2014-05-30T01:16:31] - MESSAGE ERROR DATA - EBERH on aka.dgpsonline.eu
[2014-05-30T01:16:31] - MESSAGE ERROR DATA - EBERRTCM on aka.dgpsonline.eu
[2014-05-30T01:16:31] - MESSAGE ERROR DATA - EBERCMR on aka.dgpsonline.eu
  
```



InspectRTCM



- GNSS binary data decoder software for detailed data content analysis



- Real-time visualisation
- RTCM, CMR, RTCA, raw binary input
- NMEA GGA output for network RTK streams
- Transmission delay analysis
- Data rate analysis of individual message types

- **Real-time streams (TCP/UDP/Ntrip/serial) and file input**

InspectRTCM web interface



Alberding-QC

RTK-Check
InspectRTCM
Checkstream
Admin

InspectRTCM

Time Zone: 2014-05-30T12:38:51 UTC

Check successful!

Inspect-Stream

Connection-String

ntrip:mountpoint[/username[:password]][@server[:port]][[:nmea[:sec]]
top:server[:port]
serial[:baud][[:bits;parity;stop;protocol]][@device]

Correction-Inputs

Data-Rate

Inspect-File

Inspect File No file chosen

Output

```

RTCM (2014-05-30T12:38:54.61 delay 1.0s) Type 18: ID=560, zcnt=2349.6, SeqNr=6, blocks=19,
Health='UDRE Scale Factor 1', discontinuity detected
  Frequency=L1, Time of measurement=2350.00000000
SV= 4, Multi= yes, Code=C/A, Type=GPS, Qual=4 (<= 0.03933c), Loss=13, cp= 7414663.465c
SV=12, Multi= yes, Code=C/A, Type=GPS, Qual=0 (<= 0.00391c), Loss=10, cp=-7912195.121c
SV=14, Multi= yes, Code=C/A, Type=GPS, Qual=1 (<= 0.00696c), Loss=20, cp=-3929313.266c
SV=15, Multi= yes, Code=C/A, Type=GPS, Qual=3 (<= 0.02208c), Loss=26, cp= 8300132.441c
SV=17, Multi= yes, Code=C/A, Type=GPS, Qual=1 (<= 0.00696c), Loss=13, cp=-3140950.336c
SV=22, Multi= yes, Code=C/A, Type=GPS, Qual=5 (<= 0.07006c), Loss=13, cp= 3016321.824c
SV=24, Multi= yes, Code=C/A, Type=GPS, Qual=0 (<= 0.00391c), Loss= 8, cp=-5906300.203c
SV=25, Multi= yes, Code=C/A, Type=GPS, Qual=2 (<= 0.01239c), Loss=10, cp=-5369131.031c
RTCM (2014-05-30T12:38:54.61 delay 1.0s) Type 18: ID=560, zcnt=2349.6, SeqNr=7, blocks=19,
Health='UDRE Scale Factor 1'
  Frequency=L2, Time of measurement=2350.00000000
SV= 4, Multi= yes, Code= P, Type=GPS, Qual=4 (<= 0.03933c), Loss=13, cp= 1855661.840c
SV=12, Multi= yes, Code= P, Type=GPS, Qual=0 (<= 0.00391c), Loss=10, cp= -718256.027c
SV=14, Multi= yes, Code= P, Type=GPS, Qual=1 (<= 0.00696c), Loss=23, cp= 6089356.977c
SV=15, Multi= yes, Code= P, Type=GPS, Qual=3 (<= 0.02208c), Loss= 0, cp= 2545657.238c
SV=17, Multi= yes, Code= P, Type=GPS, Qual=1 (<= 0.00696c), Loss=13, cp= 6703653.461c
SV=22, Multi= yes, Code= P, Type=GPS, Qual=5 (<= 0.07006c), Loss=13, cp=-1571588.727c
SV=24, Multi= yes, Code= P, Type=GPS, Qual=0 (<= 0.00391c), Loss=14, cp= 844774.281c
          
```



Alberding GmbH

Alberding-QC

Displacement monitoring with low-cost GNSS receivers

Monitoring with low-cost GNSS receivers



- Can we use low-cost receivers for high-accuracy displacement monitoring?
- Is it possible to overcome power supply and communication limitations?



An integrated L1 GNSS receiver is required with telemetry and power supply modules



Alberding A07-MON

Alberding A07-N-11 – key features



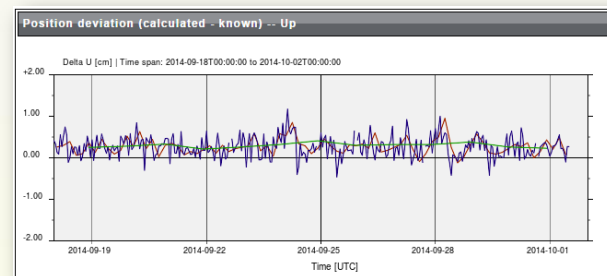
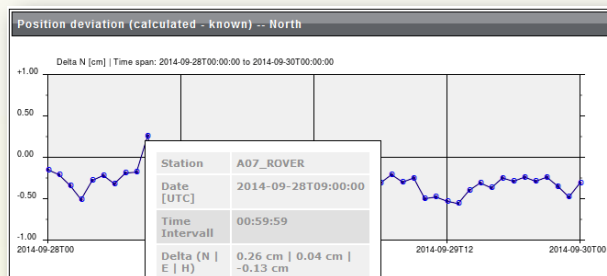
- Low-cost L1 GNSS receiver (GPS, GLONASS, Galileo, SBAS)
- Raw code and carrier phase output
- GPRS modem with Ntrip support
- Integrated processor
- Alberding processing software
- Flexible GNSS antenna options
- Additional sensors for urban positioning
- MicroSD card
- Bluetooth 4.0 Low Energy
- Integrated Li-Ion battery
- Low power consumption

A07-MON

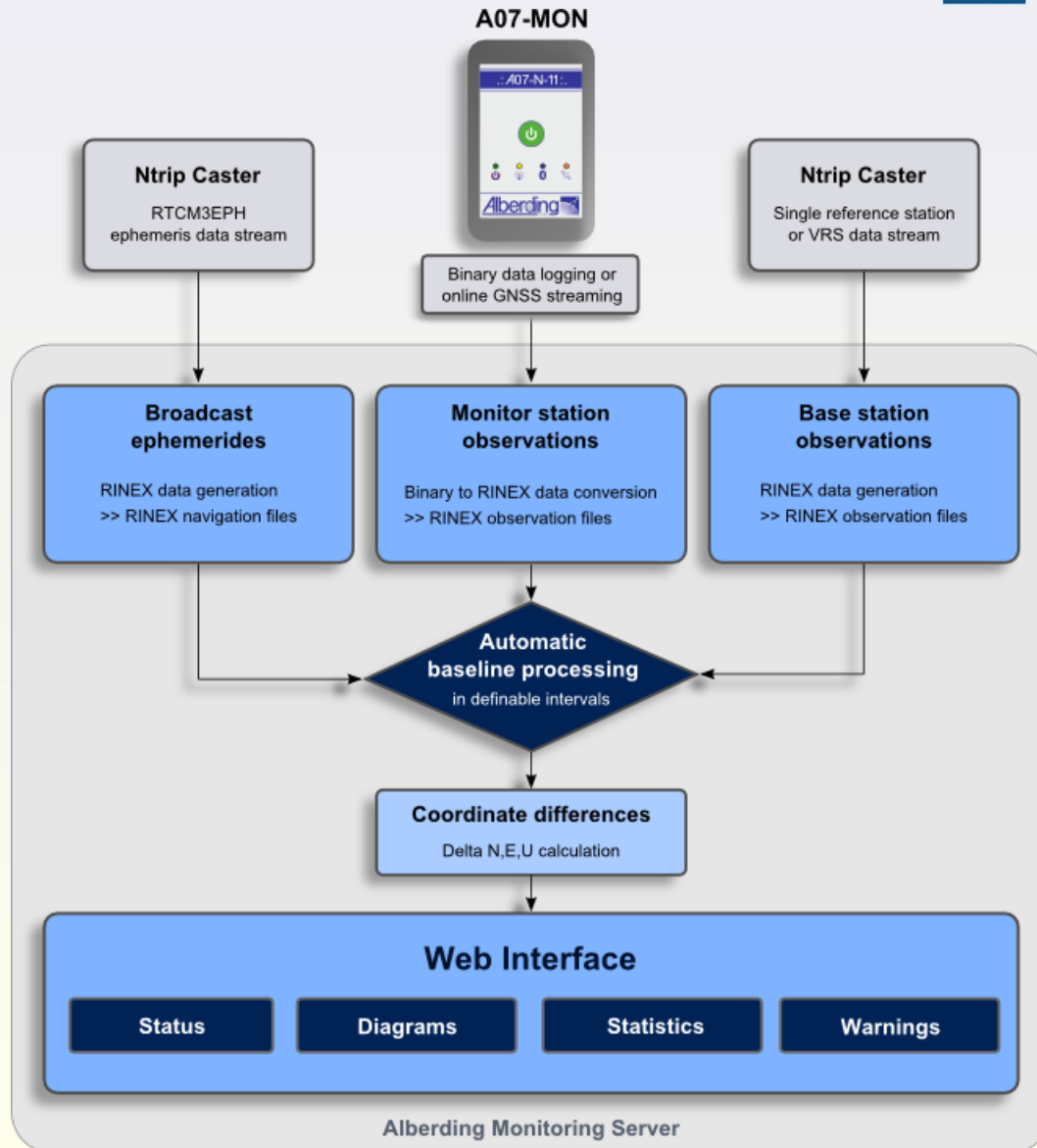


Deformation monitoring with cm accuracy

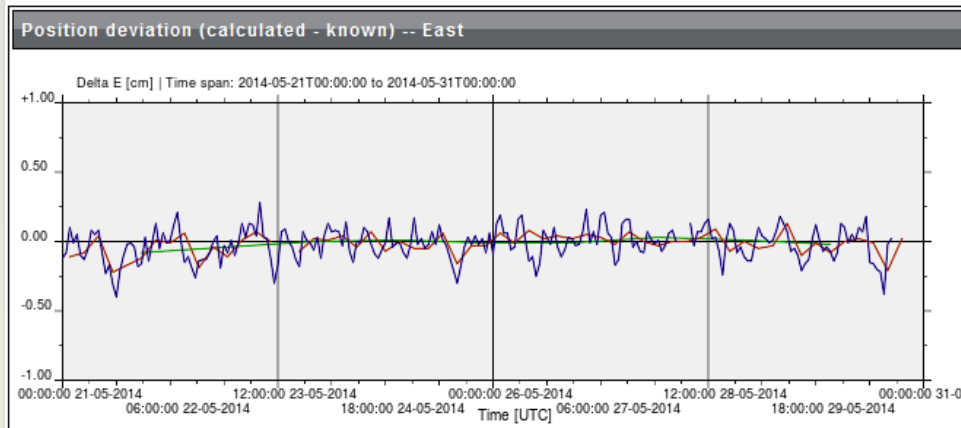
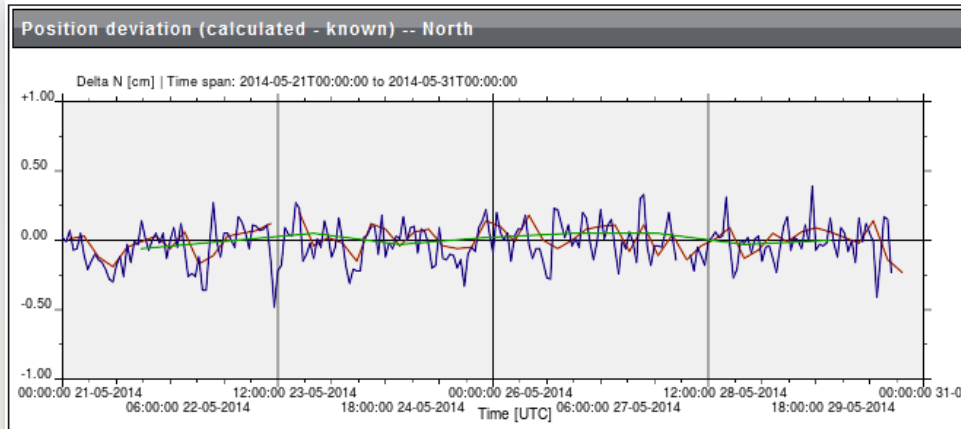
- Monitoring of natural and man-made objects
- L1 GNSS raw data streaming via Ntrip or internal data storage and file transfer to a central server
- Near real-time baseline processing and visualisation in the Alberding Monitoring software
- Automatic alarming function



A07-MON processing data flow



Alberding Monitoring web interface



Settings

Start: 2014-05-21 T 00 : 00 : 00

End: 2014-05-31 T 00 : 00 : 00

Monitor Station: A07_ROVER

Base Station: SAPOS_VRS WALTBD_RTCM3 WILD_RTCM3

Processing Interval: 1 hour 4 hours 24 hours

Choices:

Peaks:

North Scale: Default value: 1 [cm]

East Scale: Default value: 1 [cm]

Up Scale: Default value: 2 [cm]

Processing Options

	Settings
Navigation Systems	GPS, GLONASS
Solution Type	FixedL1
Elevation mask	10°
Data rate	1s
Ephemeris	Broadcast



Thank you for your attention!

Contact:

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1139 Budapest, Petneházy u. 50-52.

Tel.: +36 1 7843 813

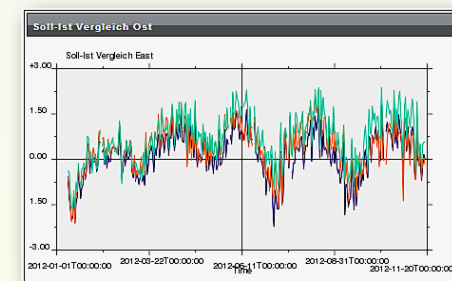
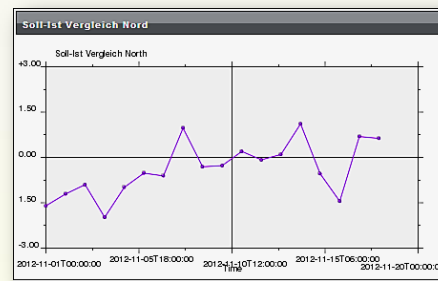
Mobile: +49 151 188 048 99

E-Mail: horvath@alberding.eu

Post-processed PPP monitoring



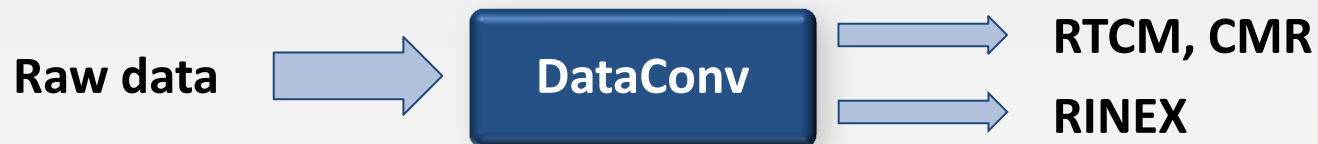
- Reference station coordinates
- Independent from the RTK networking algorithms
- Post processing of 24h RINEX files
- Web based status monitoring
- History data on time series plots
- Comparative analysis, differential plots
- Customisable alarm generation



DataConv



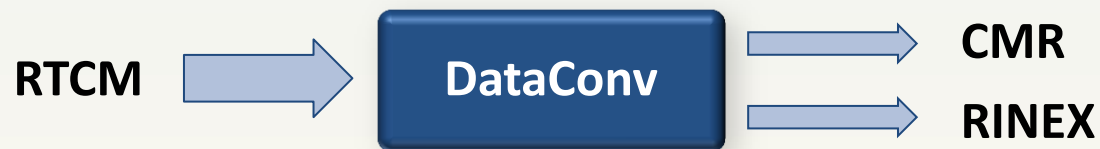
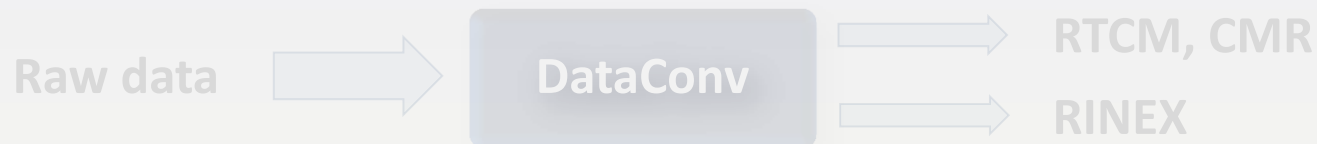
- Data conversion tool



DataConv



- Data conversion tool





A07-MON

