DEVELOPMENT STATUS OF LITHUANIAN NATIONAL GEODETIC CONTROL

National Report

Eimuntas Parseliunas

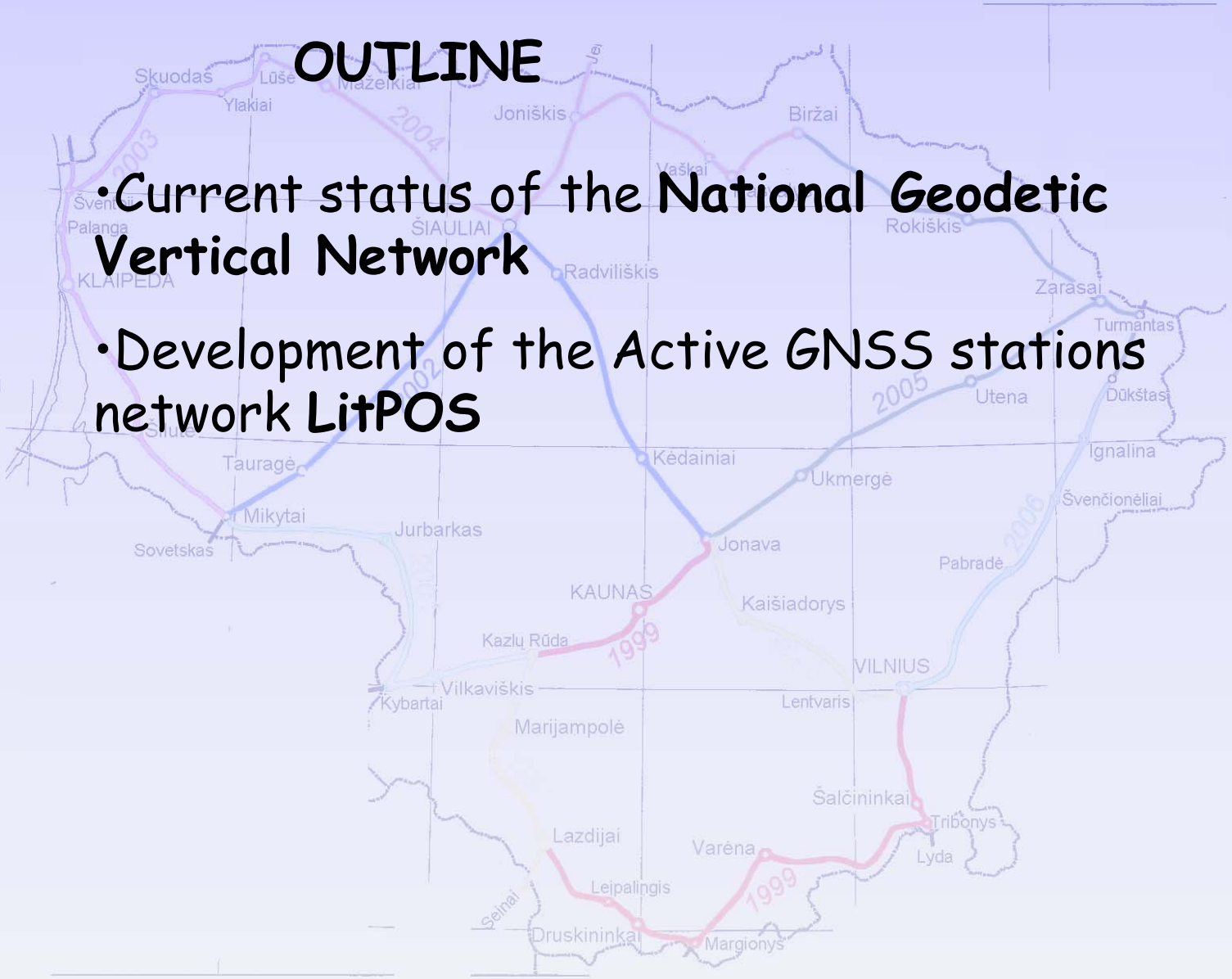
Geodetic Institute of Vilnius Technical University

eimis@ap.vgtu.lt

Co-authors: S.Urbanas, E.Sleiteris, P.Petroskevicius

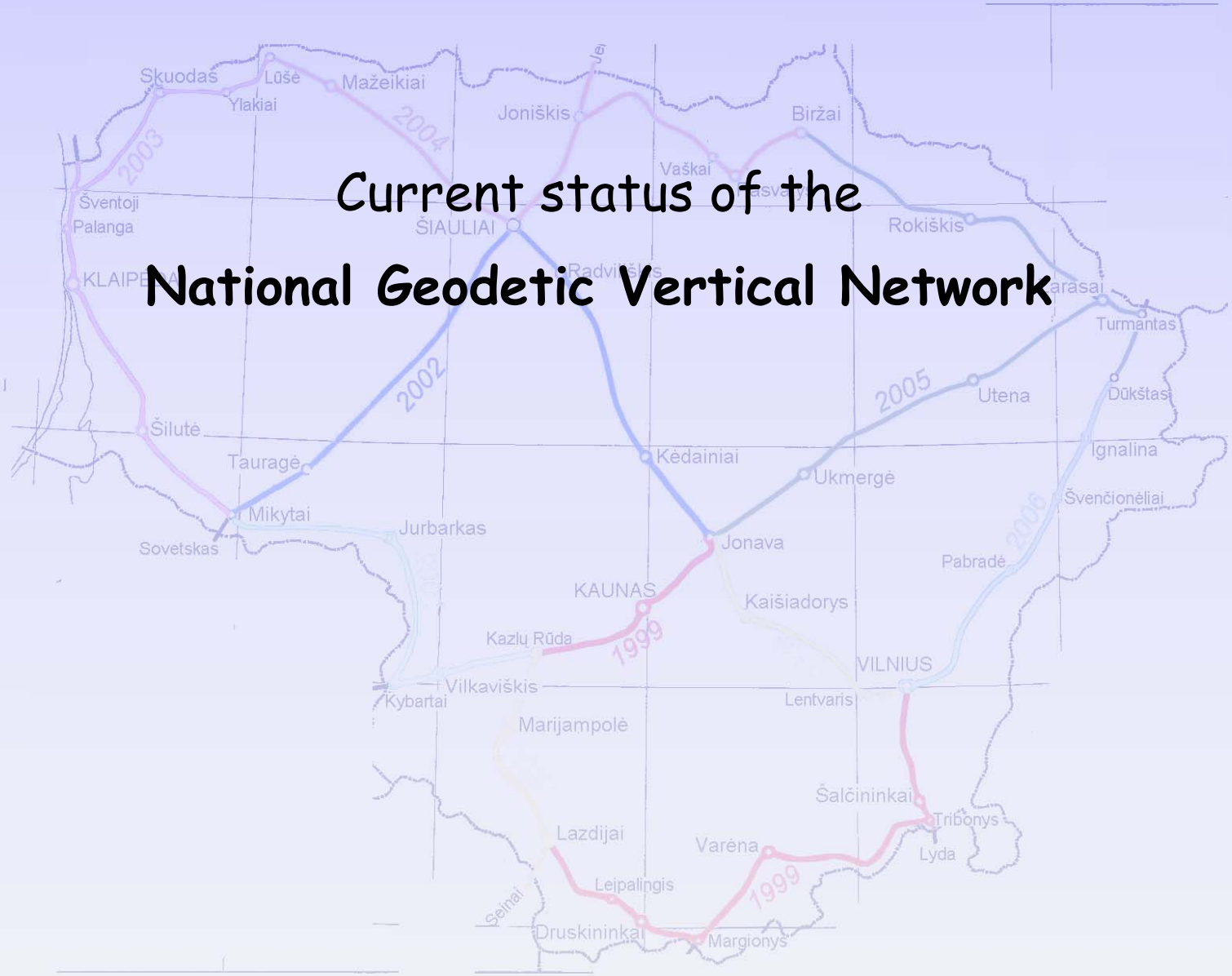
OUTLINE

- Current status of the **National Geodetic Vertical Network**
- Development of the Active GNSS stations network **LitPOS**

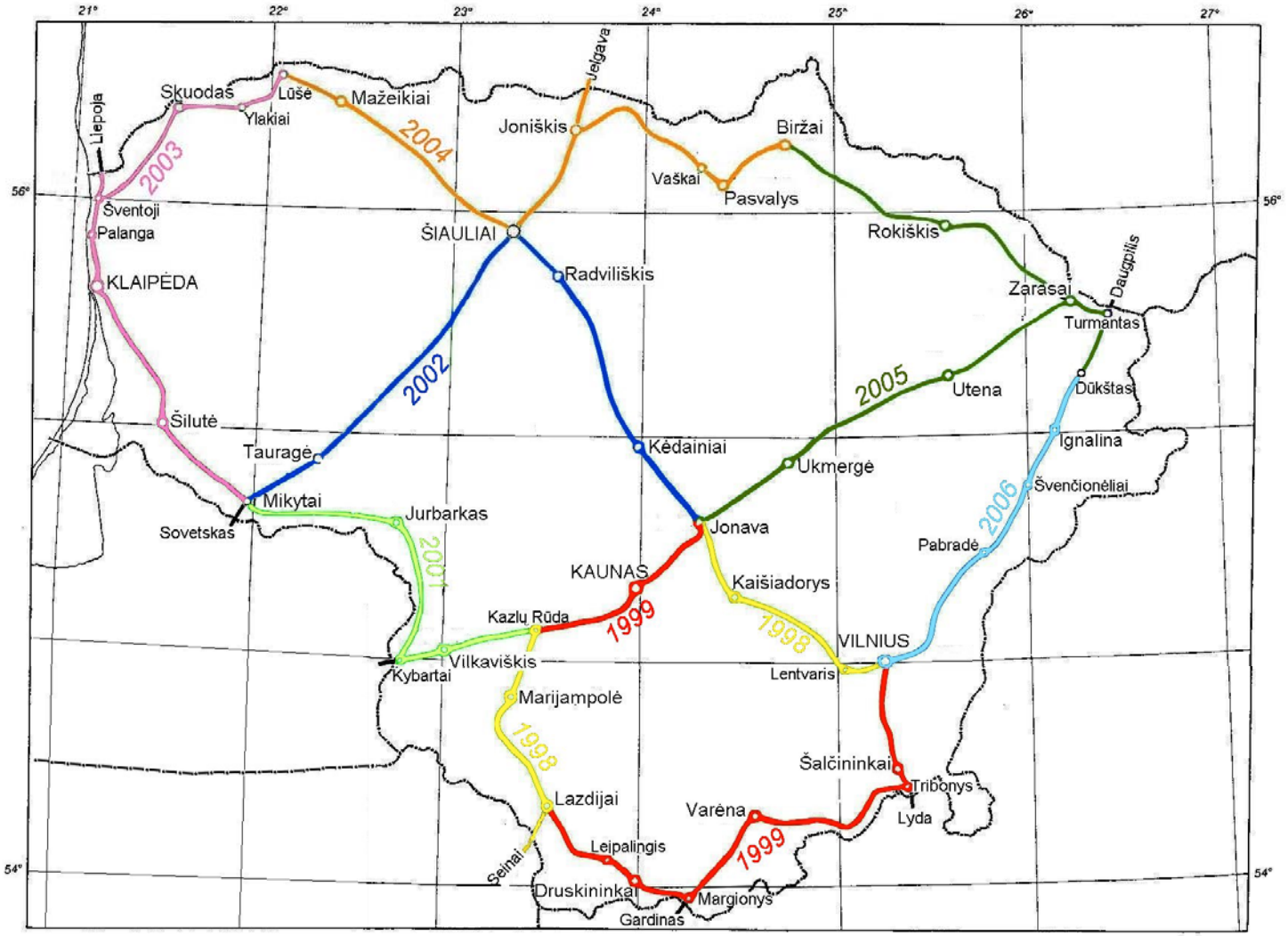


Current status of the

National Geodetic Vertical Network



National Geodetic Vertical Network (1)



National Geodetic Vertical Network (2)

Levelling instrumentation

1. *Leica NA3003* No 92426

Wild GPCL3 No 26598, 26599

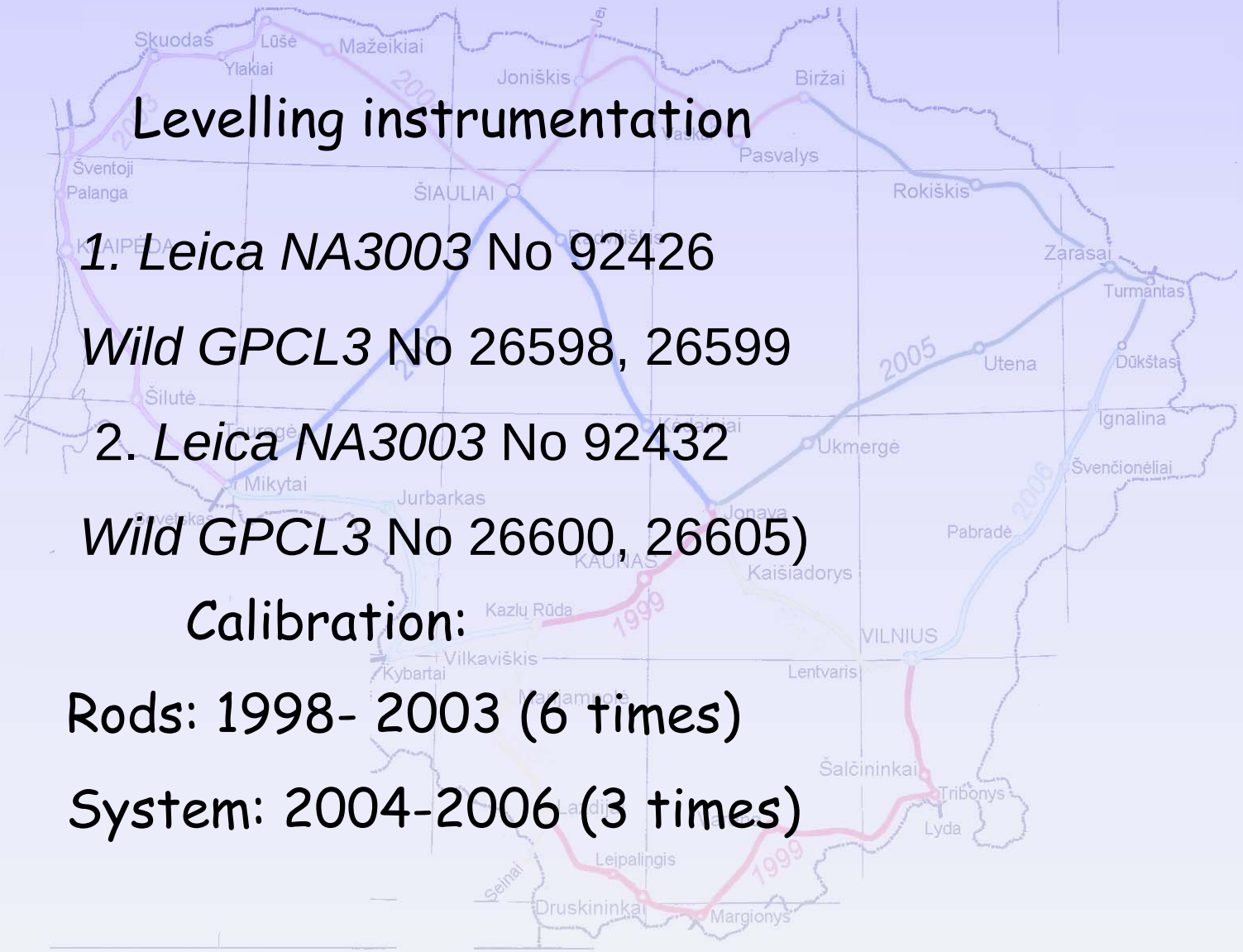
2. *Leica NA3003* No 92432

Wild GPCL3 No 26600, 26605)

Calibration:

Rods: 1998- 2003 (6 times)

System: 2004-2006 (3 times)

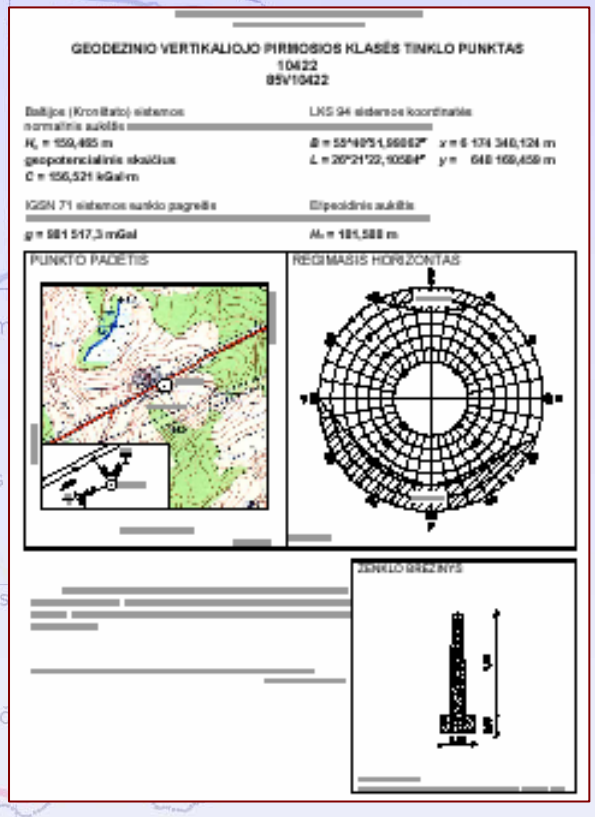


National Geodetic Vertical Network (3)

Data on benchmarks

Type	New	Old
Fundamental	8	62
Wall	413	285
Ground	441	175
Total	862 (62,3%)	522 (37,7%)
Sum		1384

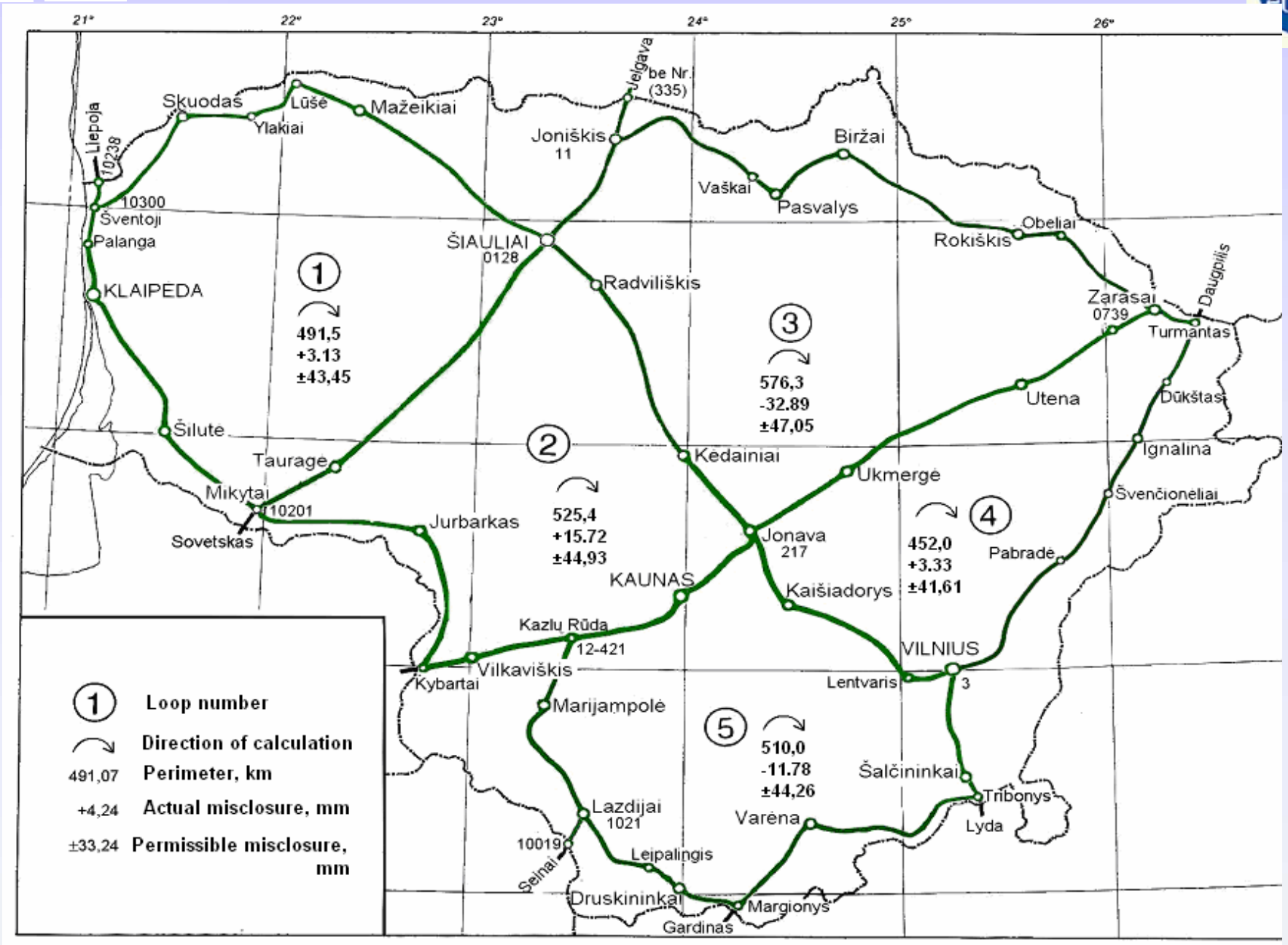
Kroki


GEODEZINIO VERTIKALIOJO PIRMOSIOS KLASĖS TINKLO PUNKTAS
10422
85V10422

PUNKTO PADĖTIS

REGIMASIS HORIZONTAS

National Geodetic Vertical Network (4)



National Geodetic Vertical Network (5)

Levelling accuracy characteristics

Year of levelling	m_{km}, mm
1998	0,48
1999	0,42
2001	0,39
2002	0,41
2003	0,43
2004	0,47
2005	0,35
2006	0,44

Misclosures of vertical network polygons

Polygon No	Polygon perimeter km	Actual misclosure mm	Permissible misclosure mm
1	491,5	+3,13	±43,45
2	525,4	+15,72	44,93
3	576,3	–32,89	47,05
4	452,0	+3,33	41,61
5	510,0	–11,78	44,26

National Geodetic Vertical Network (6)

Adjustment statistics

Number of fixed points:	**1,**
Number of unknowns:	**1359,**
Number of measurements:	**1364,**
Minimum length of the loop:	**452.0 km**
Maximum length of the loop:	**576.3 km**
Average length of the loops:	**511.0 km**
Degrees of freedom:	**5,**
Standard deviation:	**0.70 kGal×mm/km**

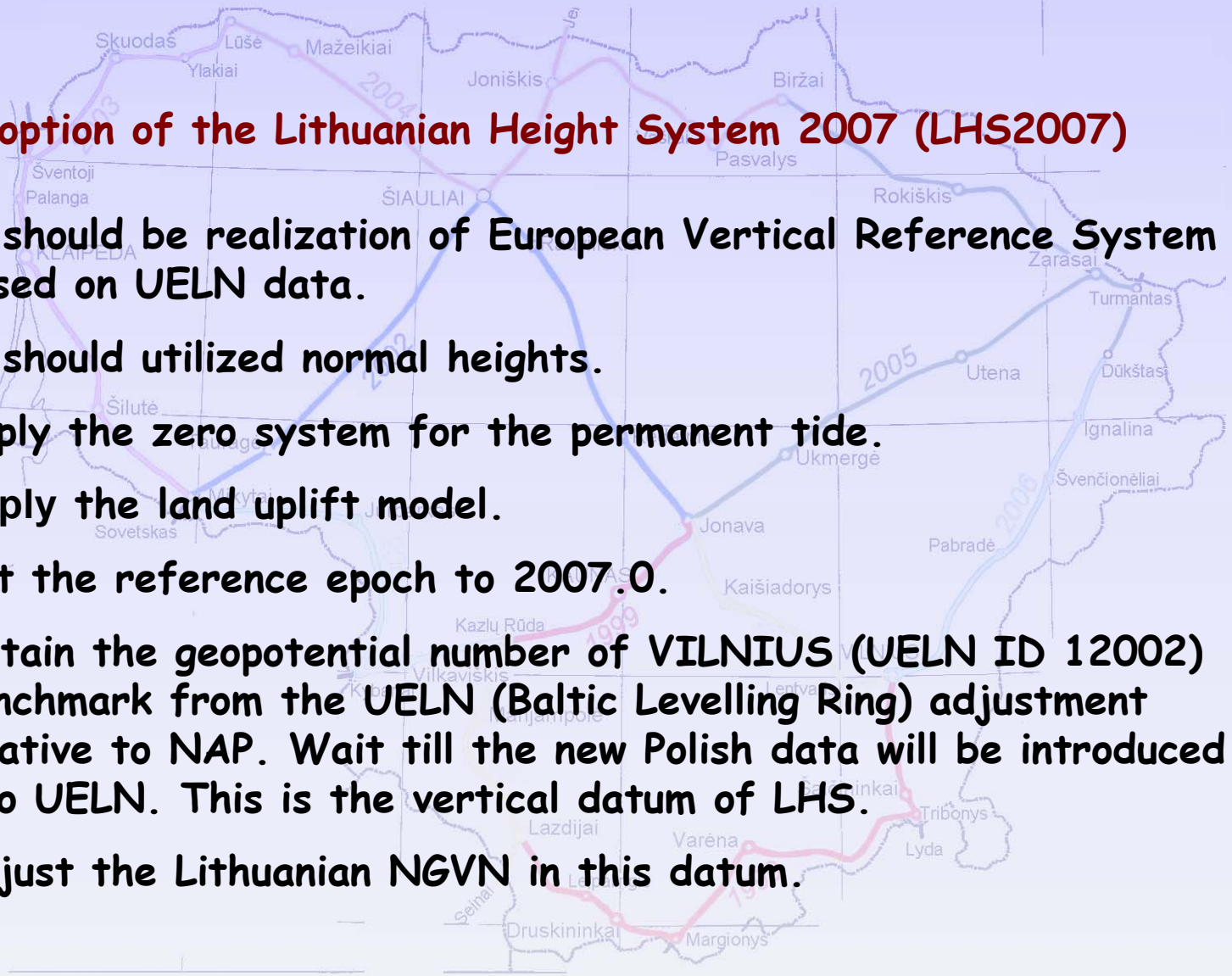
Mean value of the standard deviation of the adjusted geopotential differences: 0.83 kGal×mm,

Mean value of the standard deviation of the adjusted geopotential heights: 7.35 kgal×mm,

Biggest value of the standard deviation of the adjusted geopotential heights: 9.11 kGal×mm,

Average redundancy:	0.016.

National Geodetic Vertical Network - Future plans (1)

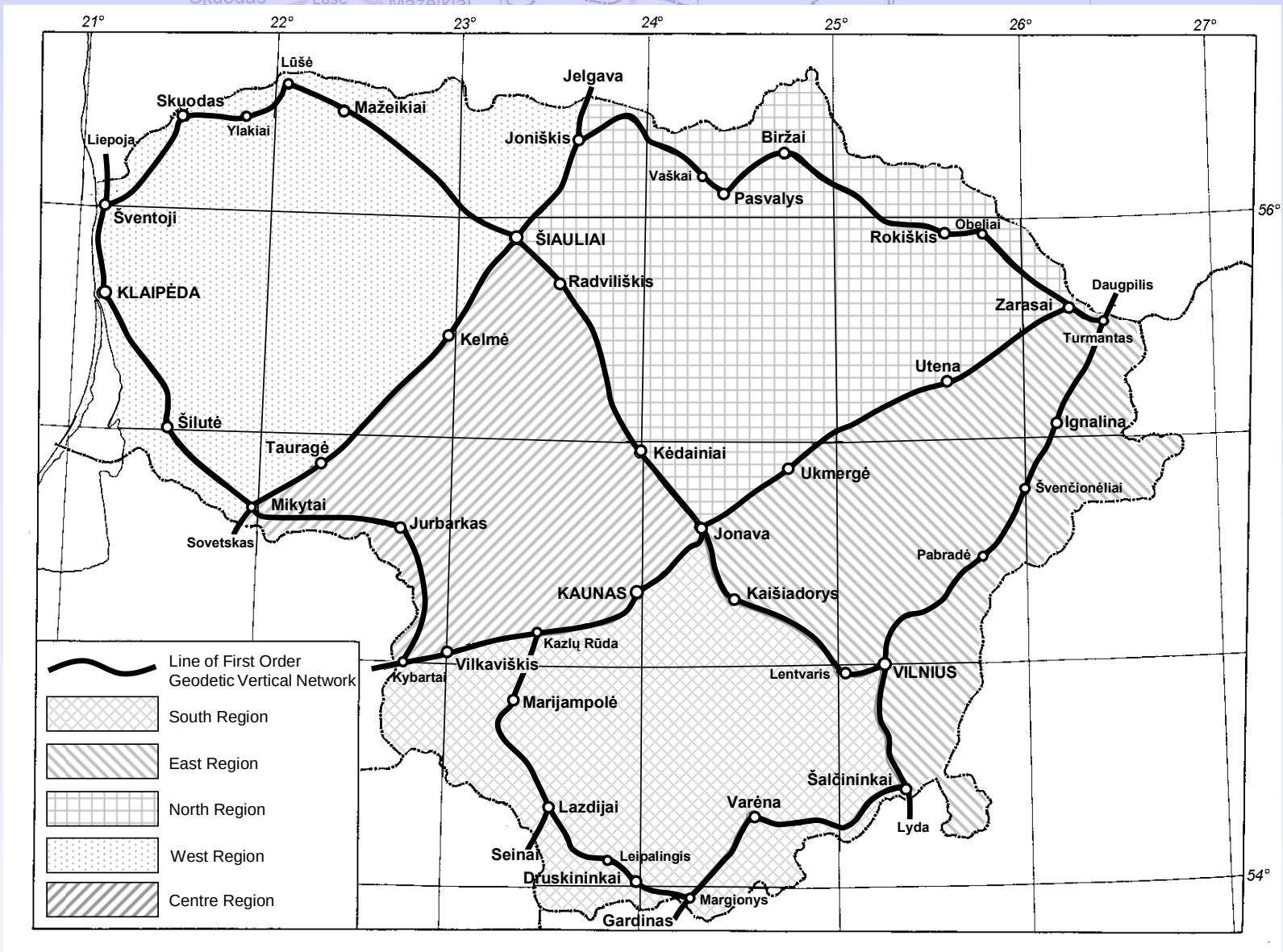


Adoption of the Lithuanian Height System 2007 (LHS2007)

1. It should be realization of European Vertical Reference System based on UELN data.
2. It should utilized normal heights.
3. Apply the zero system for the permanent tide.
4. Apply the land uplift model.
5. Set the reference epoch to 2007.0.
6. Obtain the geopotential number of VILNIUS (UELN ID 12002) benchmark from the UELN (Baltic Levelling Ring) adjustment relative to NAP. Wait till the new Polish data will be introduced into UELN. This is the vertical datum of LHS.
7. Adjust the Lithuanian NGVN in this datum.

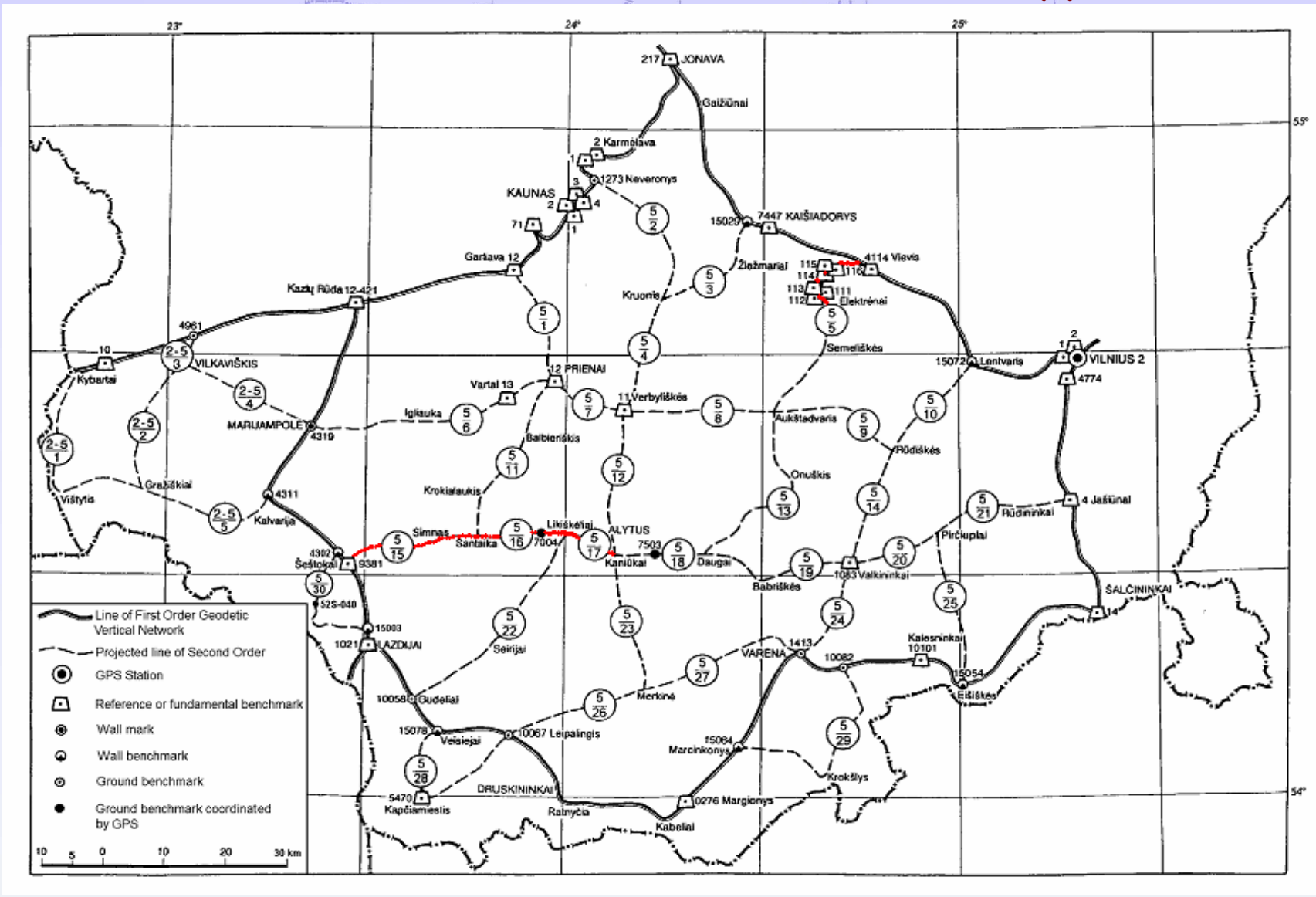
National Geodetic Vertical Network - Future plans (2)

National Geodetic Vertical Second Order Network (1)



National Geodetic Vertical Network - Future plans (3)

National Geodetic Vertical Second Order Network (2)



National Geodetic Vertical Network - Future plans (4)

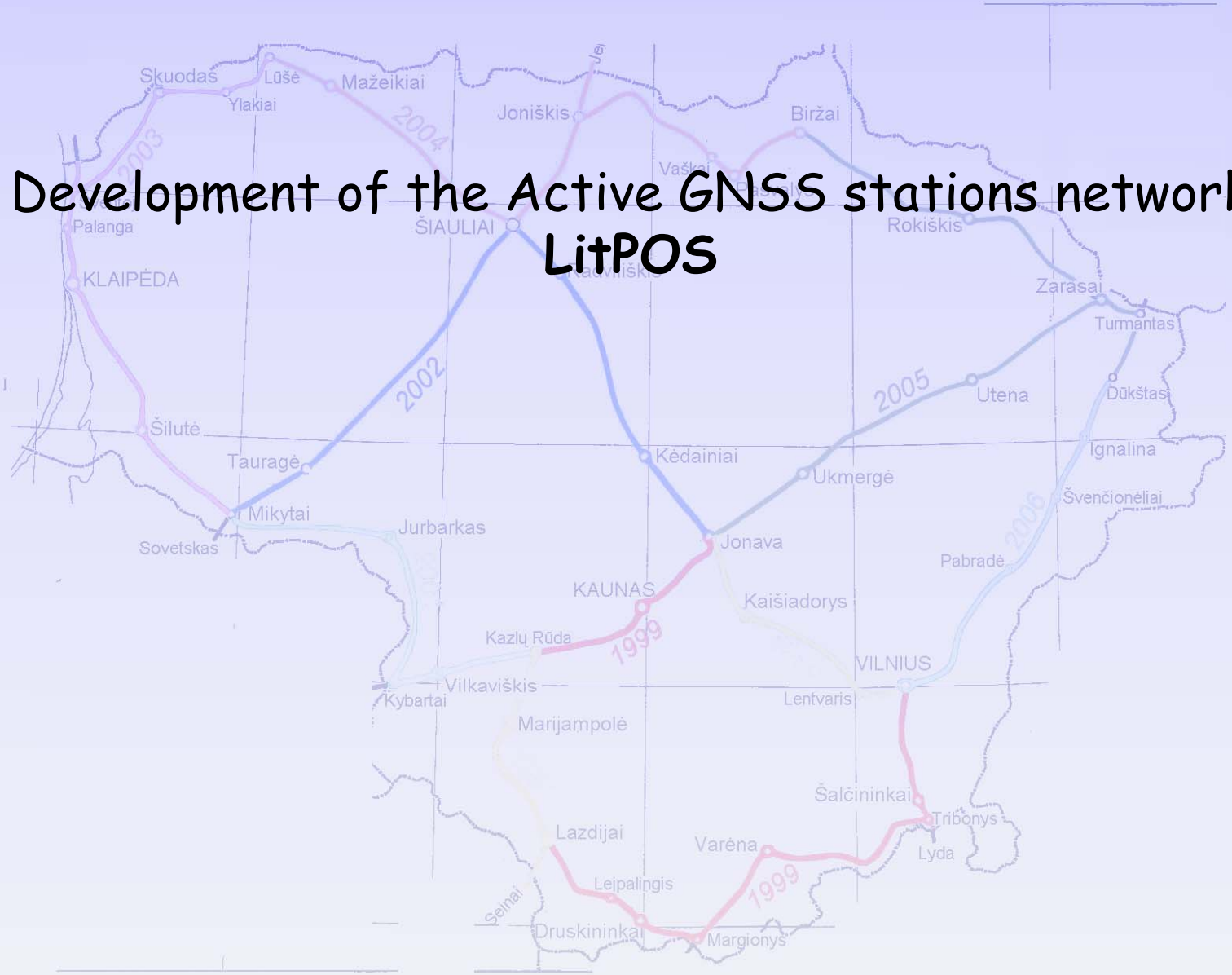
National Geodetic Vertical Second Order Network (3)

Characteristics of projected Network

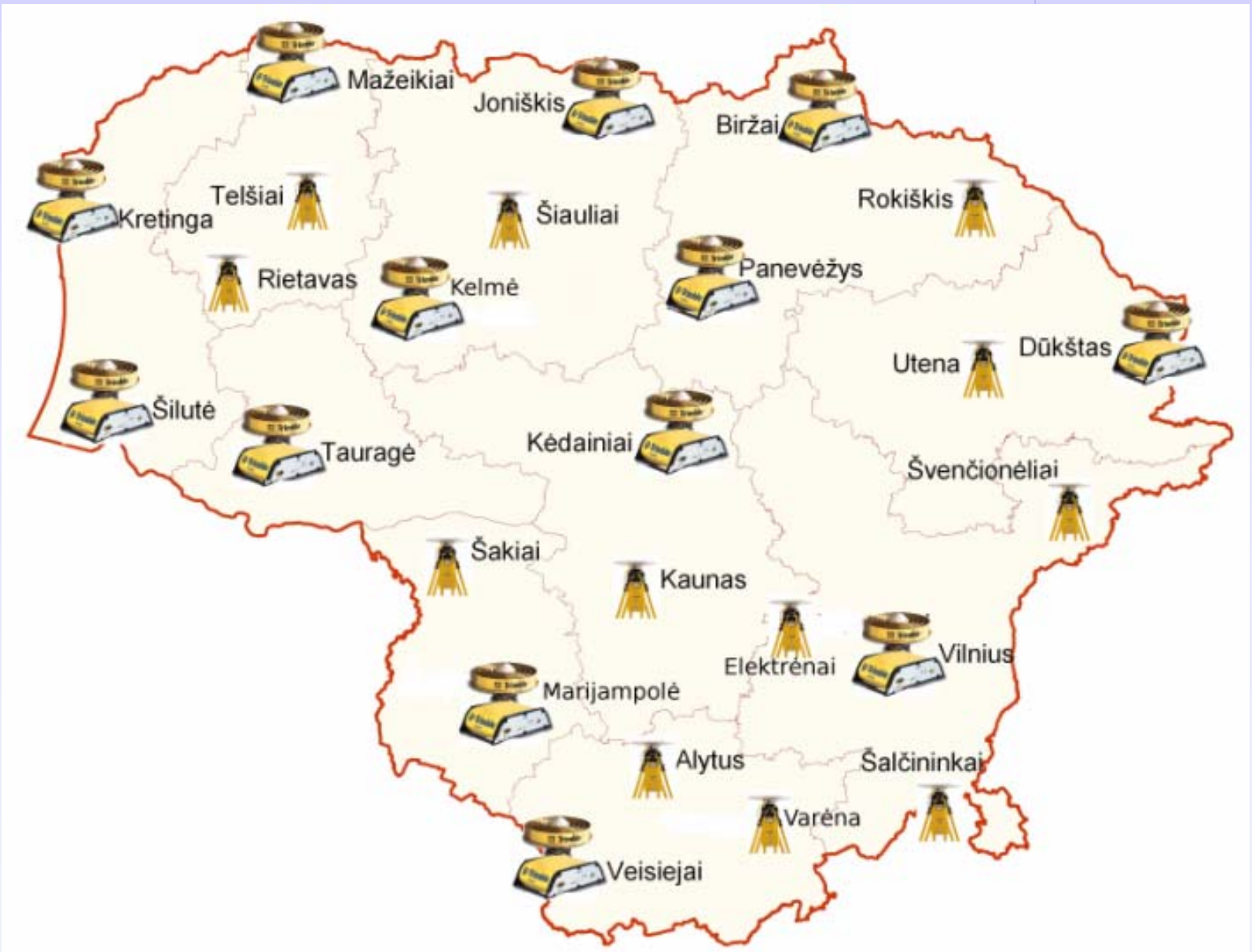
Region	Average length of line, km	Area, thousand km^2	Perimeter of projected network, km	Projected lines			Density of projected network, km/1000 km^2
				Number of lines	Runs which coincide with lines of old levelling, km	New runs, km	
South	27,4	12,6	958	35	692	266	76,0
East	32,8	11,5	854	26	276	578	74,3
North	29,6	15,3	1094	37	635	459	71,5
West	27,5	15,2*	1154	42	812	342	75,9
Centre	31,5	10,2	818	26	708	110	80,2
	29,4	**64,8**	**4878**	**166**	**3123**	**1755**	**75,3**

Total number of points - 3300 (new –2800)

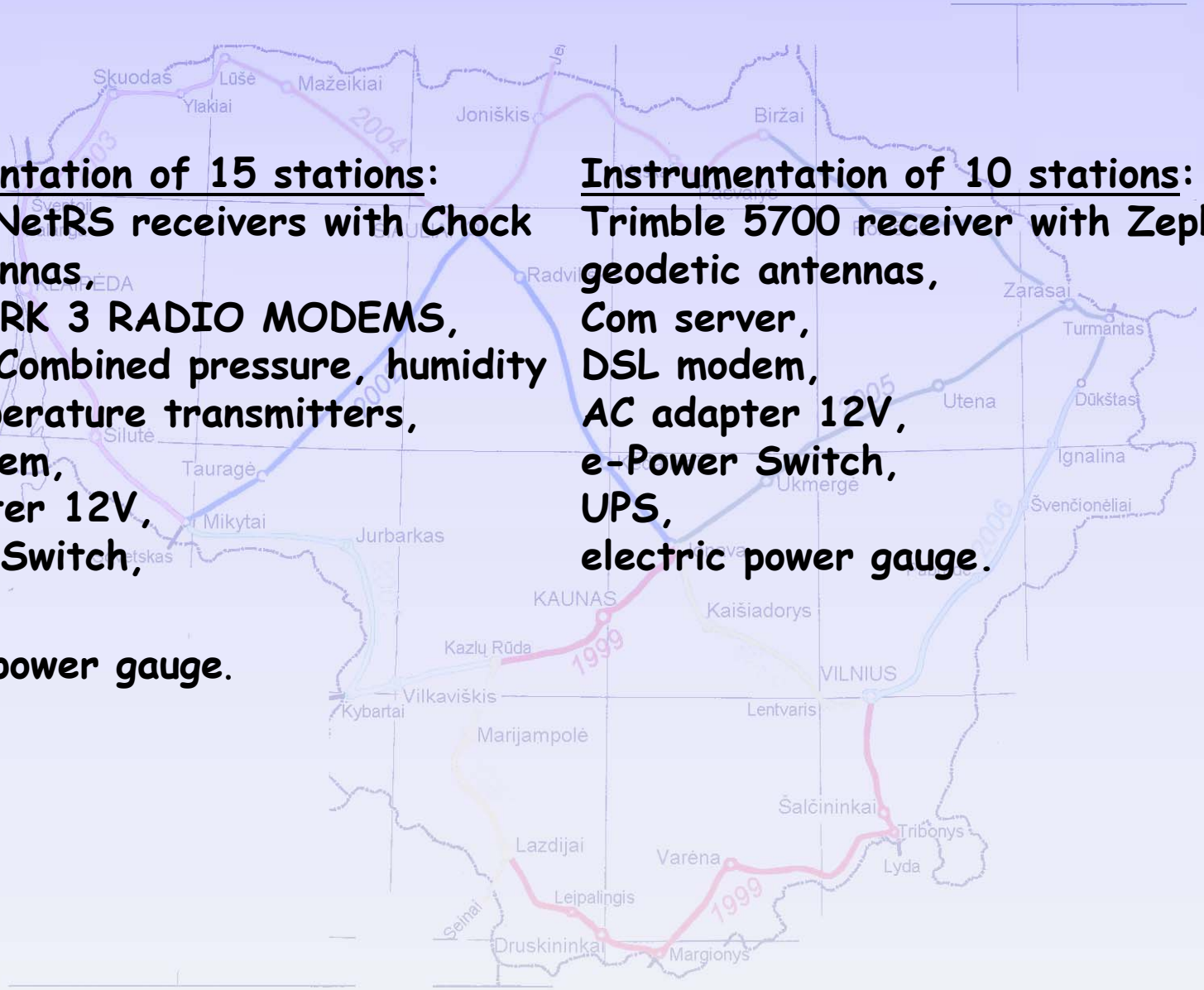
Development of the Active GNSS stations network
LitPOS



LitPOS – network scheme



LitPOS – station's instrumentation



Instrumentation of 15 stations:

Trimble NetRS receivers with Chock ring antennas,
TRIMMARK 3 RADIO MODEMS,
PTU200 Combined pressure, humidity and temperature transmitters,
DSL modem,
AC adapter 12V,
e-Power Switch,
UPS,
electric power gauge.

Instrumentation of 10 stations:

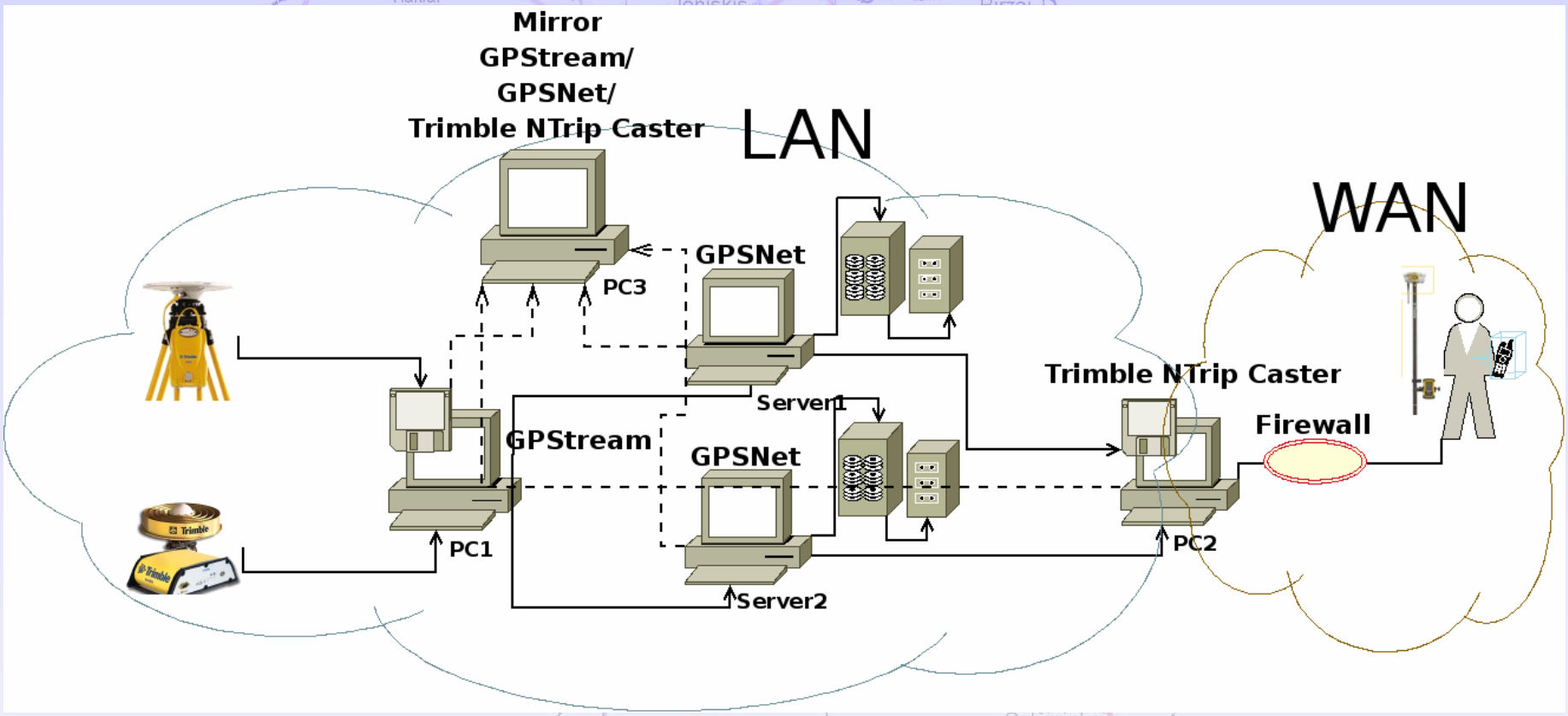
Trimble 5700 receiver with Zephyr geodetic antennas,
Com server,
DSL modem,
AC adapter 12V,
e-Power Switch,
UPS,
electric power gauge.

LitPOS – station with NetRS receiver

LitPOS – station with 5700 receiver

LitPOS – typical GPS antenna view on the tower of the fire station

LitPOS - hardware

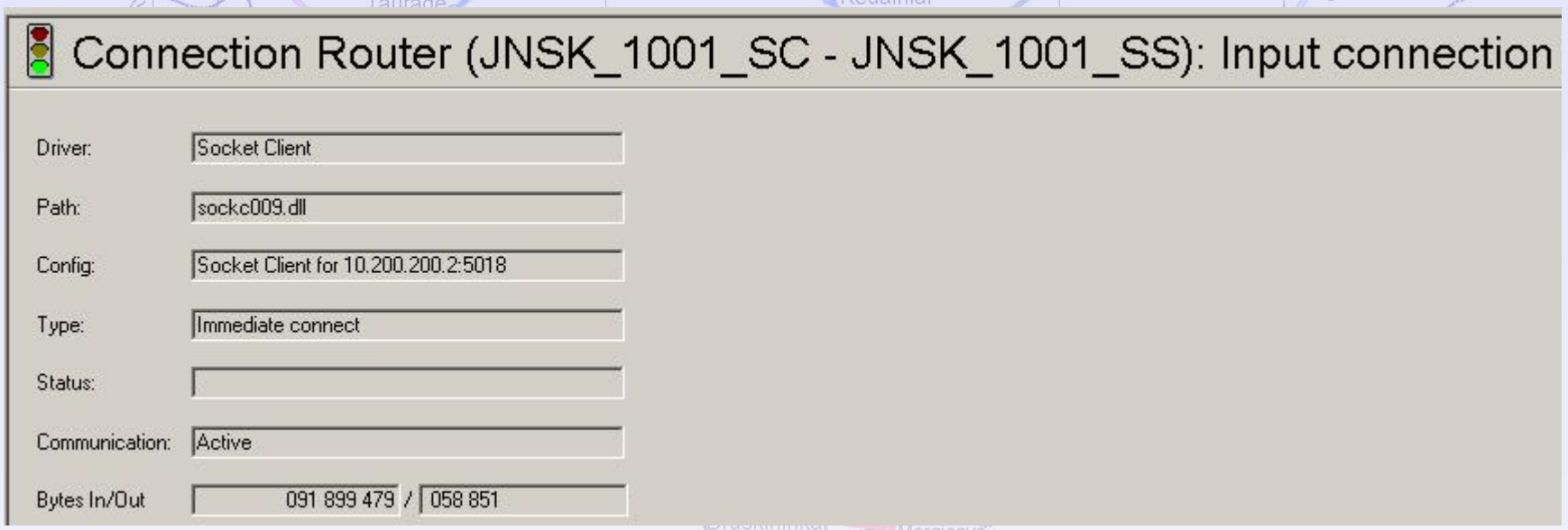


LitPOS hardware at operating centre consists of 3 PC and 2 servers

LitPOS – software (1)

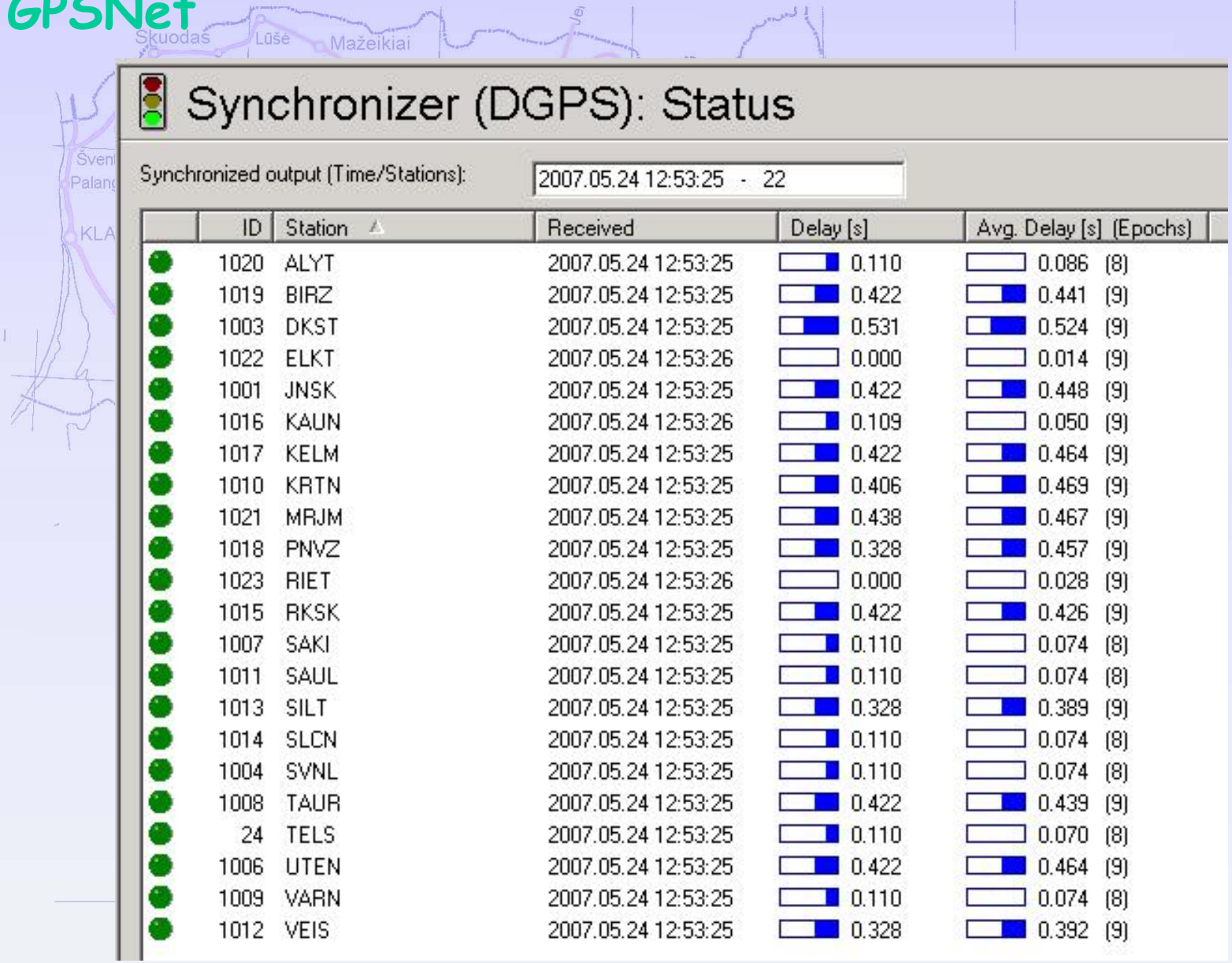
GPStream
GPSNet
NTRIP Caster

GPStream



LitPOS – software (2)

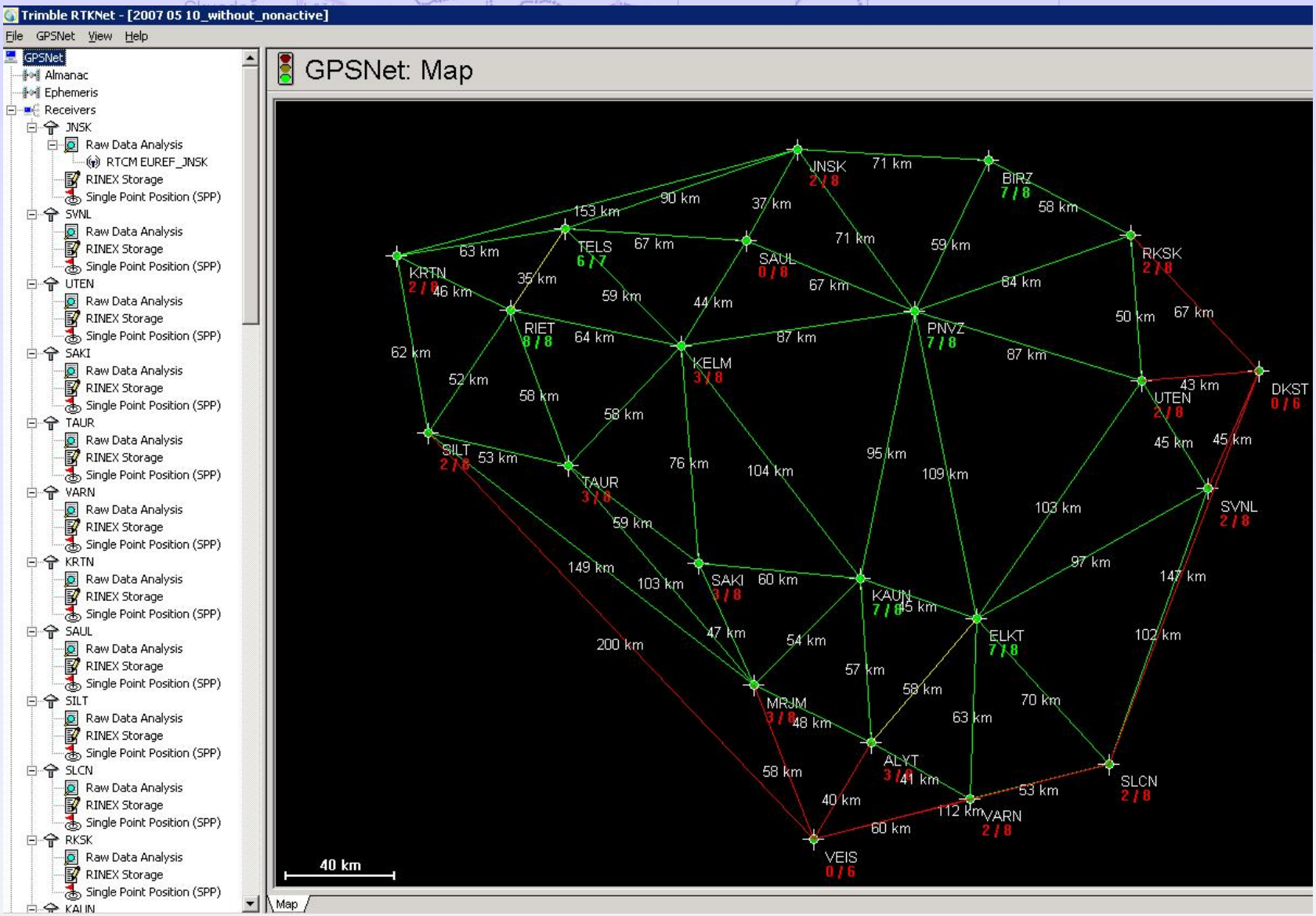
GPSNet



ID	Station	Received	Delay [s]	Avg. Delay [s] (Epochs)
1020	ALYT	2007.05.24 12:53:25	0.110	0.086 (8)
1019	BIRZ	2007.05.24 12:53:25	0.422	0.441 (9)
1003	DKST	2007.05.24 12:53:25	0.531	0.524 (9)
1022	ELKT	2007.05.24 12:53:26	0.000	0.014 (9)
1001	JNSK	2007.05.24 12:53:25	0.422	0.448 (9)
1016	KAUN	2007.05.24 12:53:26	0.109	0.050 (9)
1017	KELM	2007.05.24 12:53:25	0.422	0.464 (9)
1010	KRTN	2007.05.24 12:53:25	0.406	0.469 (9)
1021	MRJM	2007.05.24 12:53:25	0.438	0.467 (9)
1018	PNVZ	2007.05.24 12:53:25	0.328	0.457 (9)
1023	RIET	2007.05.24 12:53:26	0.000	0.028 (9)
1015	RKSK	2007.05.24 12:53:25	0.422	0.426 (9)
1007	SAKI	2007.05.24 12:53:25	0.110	0.074 (8)
1011	SAUL	2007.05.24 12:53:25	0.110	0.074 (8)
1013	SILT	2007.05.24 12:53:25	0.328	0.389 (9)
1014	SLCN	2007.05.24 12:53:25	0.110	0.074 (8)
1004	SVNL	2007.05.24 12:53:25	0.110	0.074 (8)
1008	TAUR	2007.05.24 12:53:25	0.422	0.439 (9)
24	TELS	2007.05.24 12:53:25	0.110	0.070 (8)
1006	UTEN	2007.05.24 12:53:25	0.422	0.464 (9)
1009	VARN	2007.05.24 12:53:25	0.110	0.074 (8)
1012	VEIS	2007.05.24 12:53:25	0.328	0.392 (9)

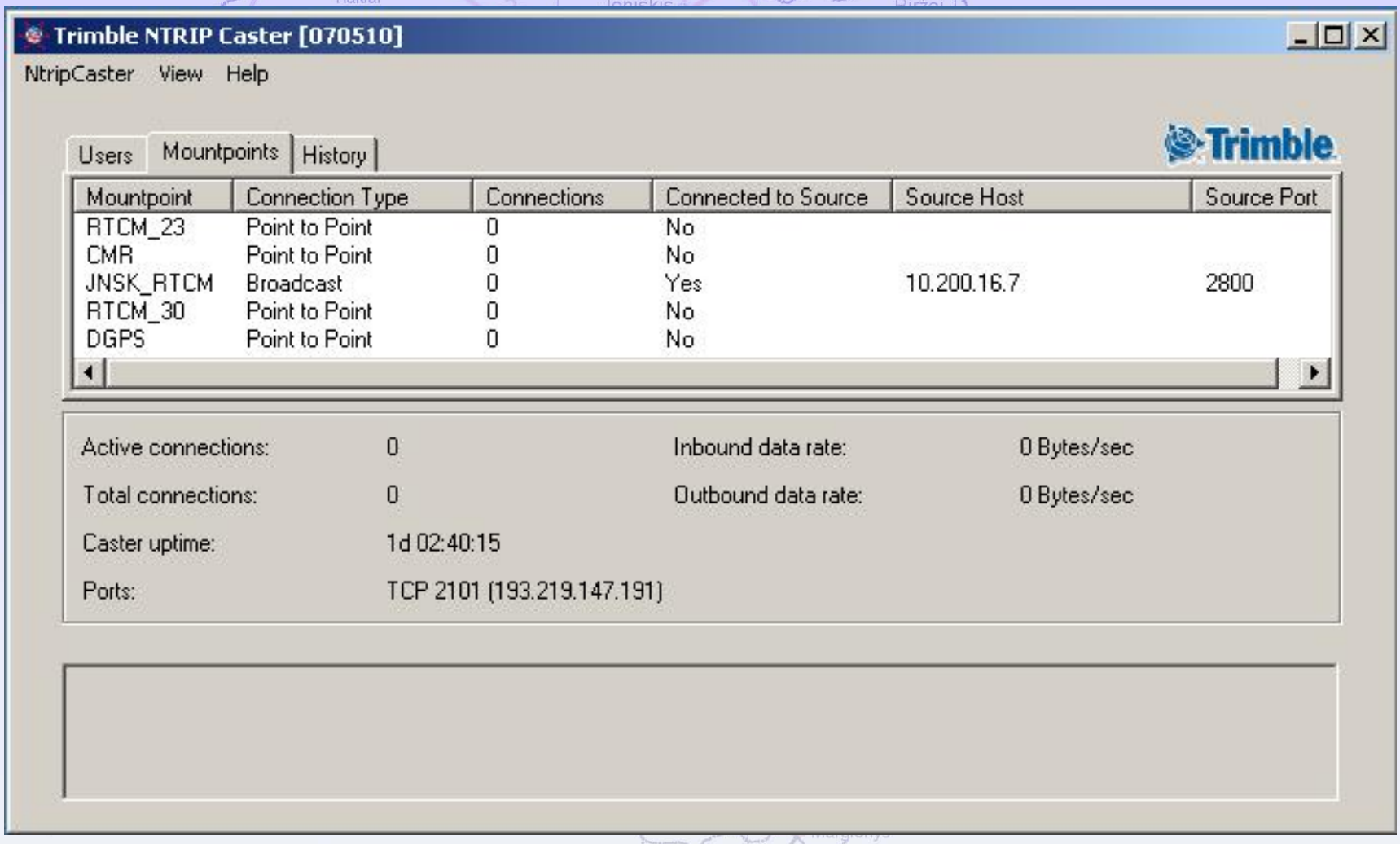
LitPOS – software (3)

GPSNet

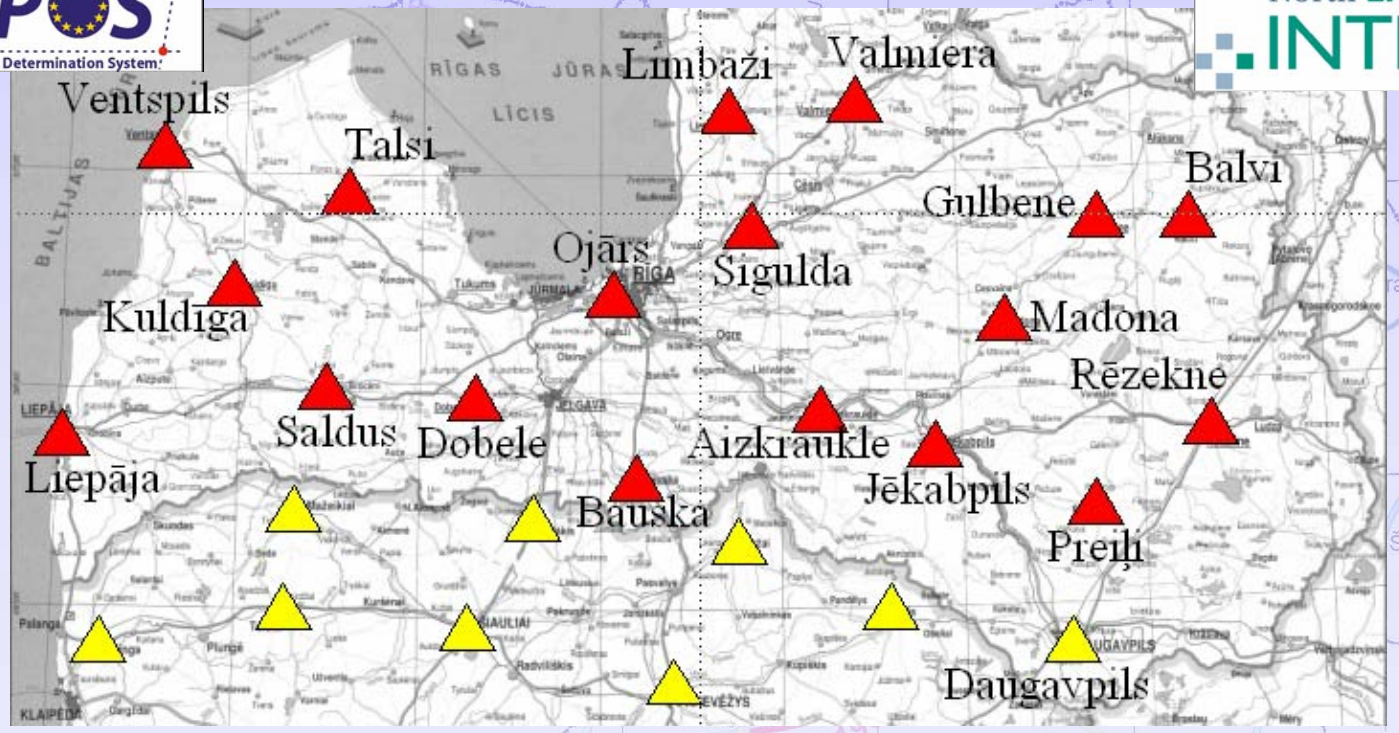


LitPOS – software (4)

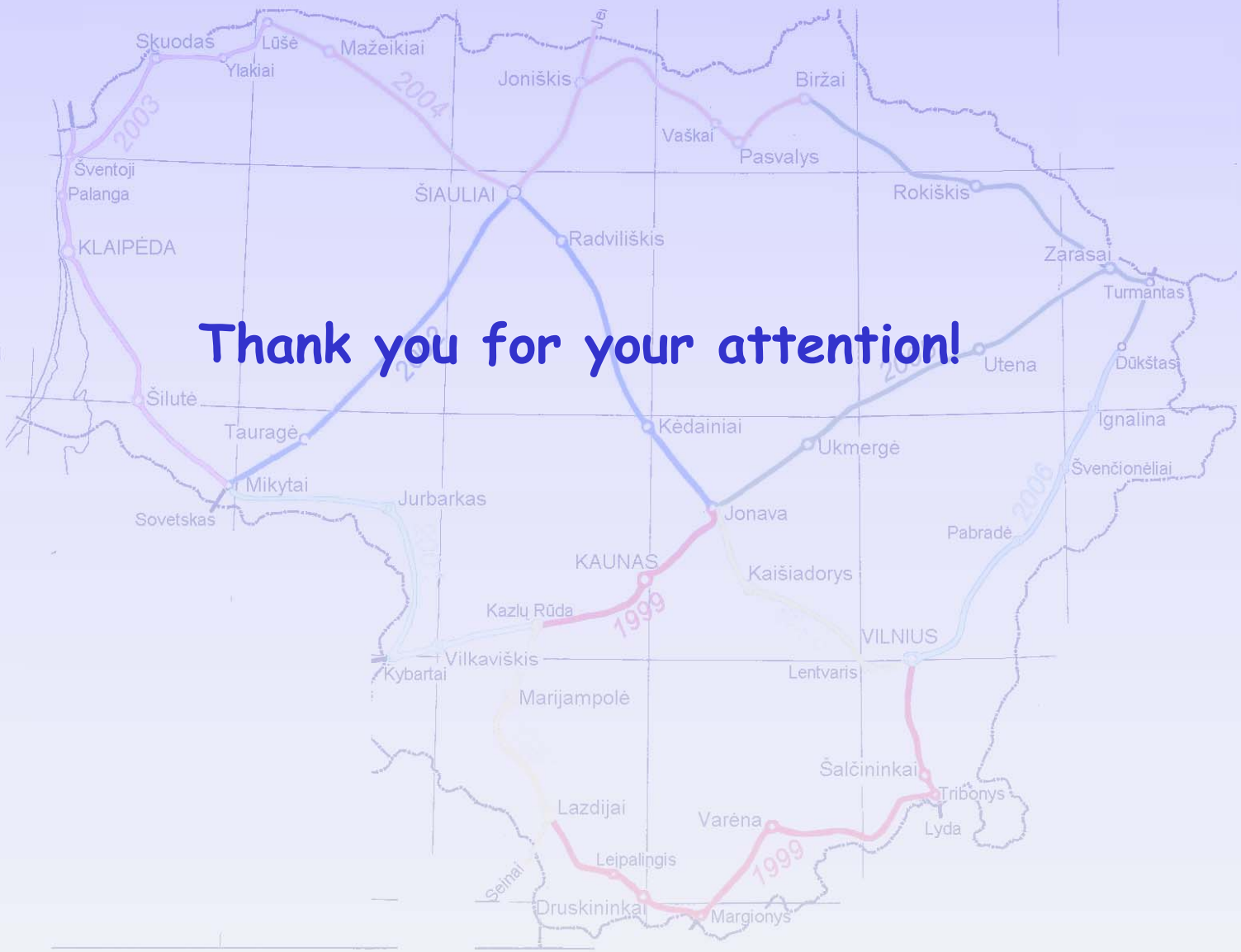
NTRIP Caster



LitPOS – a part of *EUPOS®*



Please, read a poster!



Thank you for your attention!