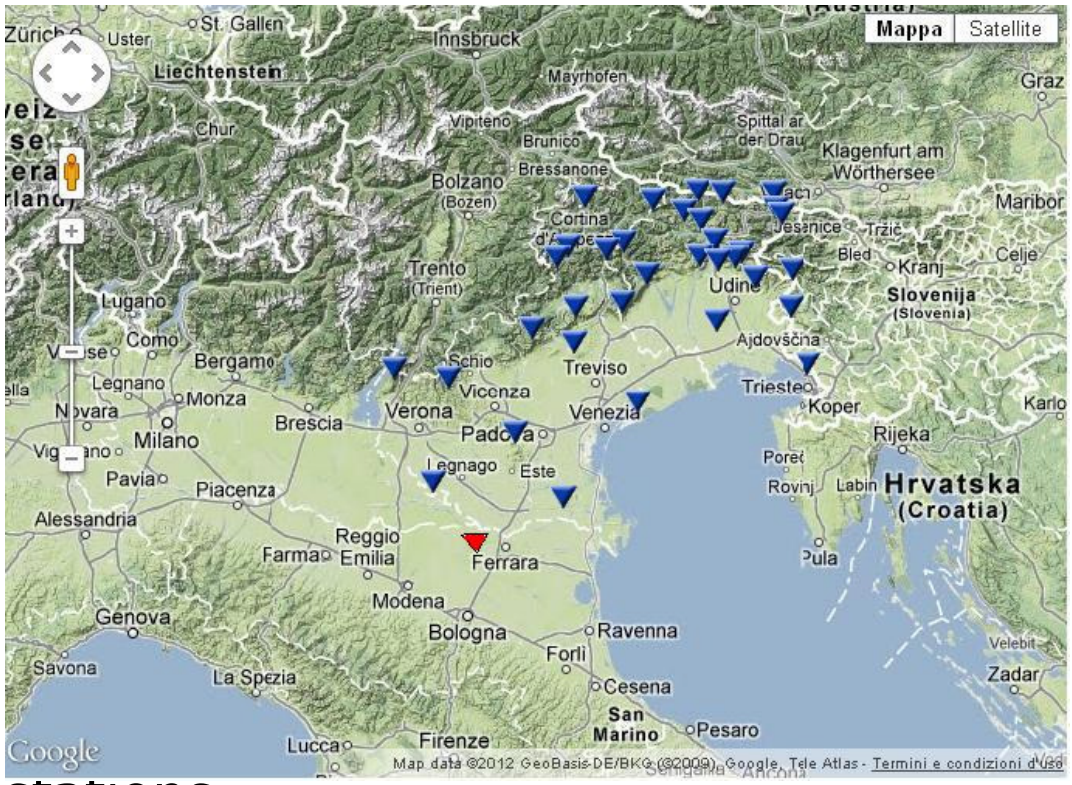
2014 status of the Northeast Italy Seismic Network

Damiano Pesaresi

dpesaresi@inogs.it

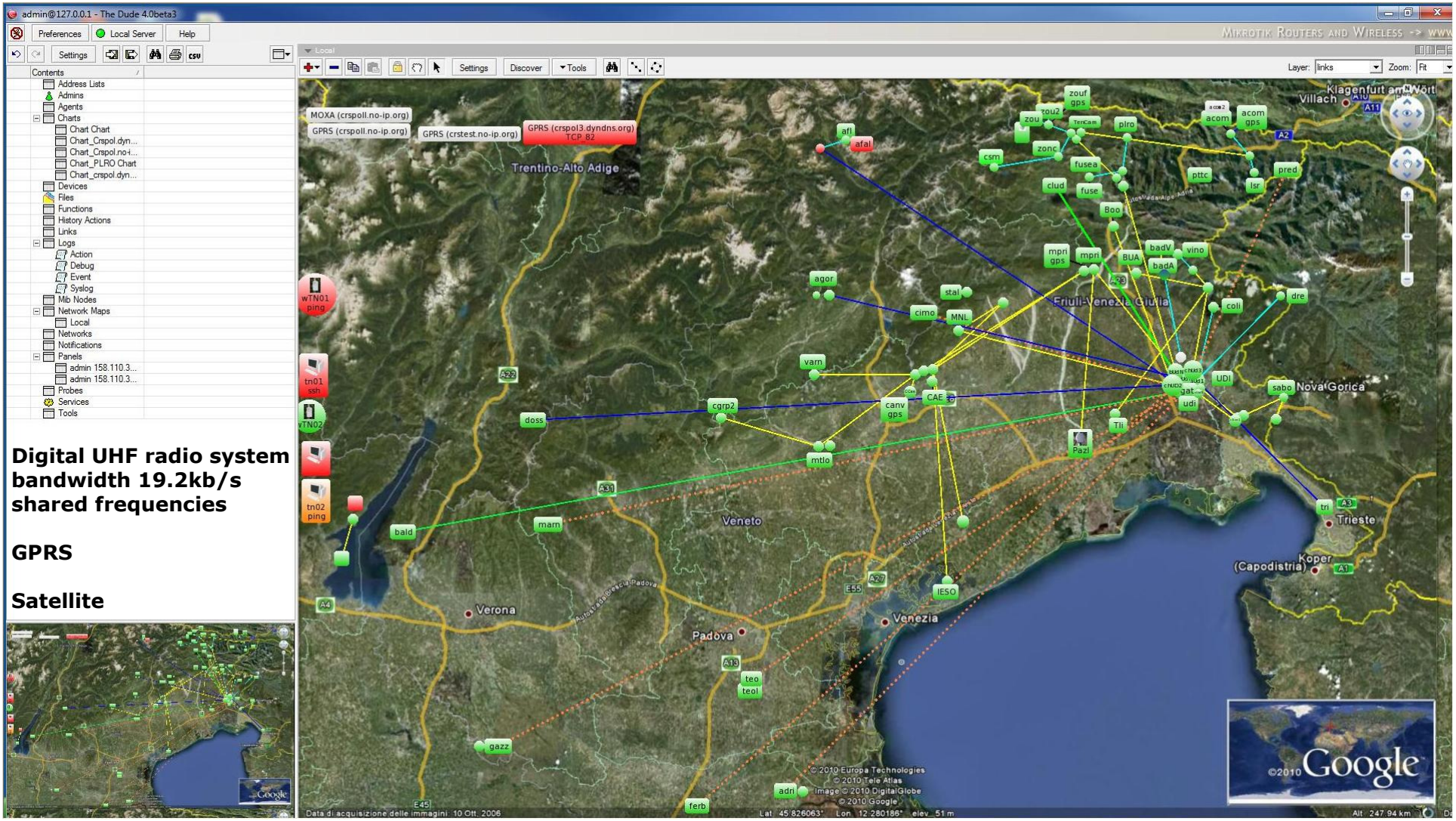
AUG Baku May 2014

NE Italy Seismic Network - OGS



- 19 BB stations
  - Q330 + STS-2/Trillium 40/120s
  - *DM24 + CMG-3TB*
  - real time, continuous
- 20 SP stations
  - Mars88 + Lennartz 1sec
  - real time, on trigger

How is data transmitted?



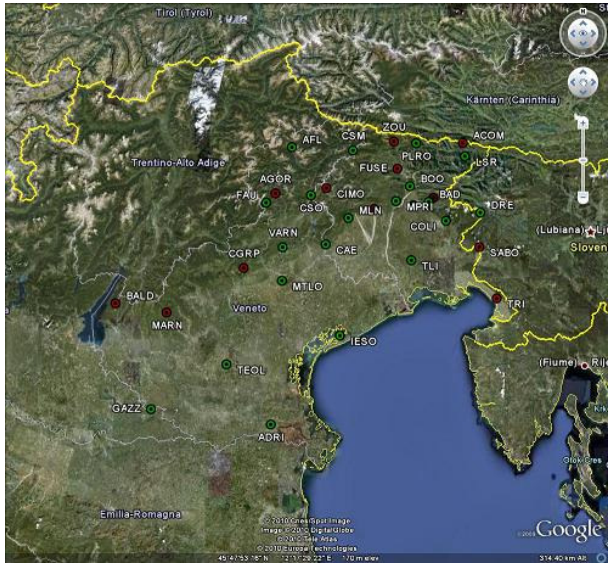
Digital UHF radio system bandwidth 19.2kb/s shared frequencies

GPRS

Satellite

OGS-CRS: monitoring NE Italy seismicity

- 2 people on call duty H24 for 1 week
  - 1 seismologist + 1 technician
- Intervention in office for events with M>3.5
- OGS staff intervention at Civil Protection headquarters for events with M>4.5

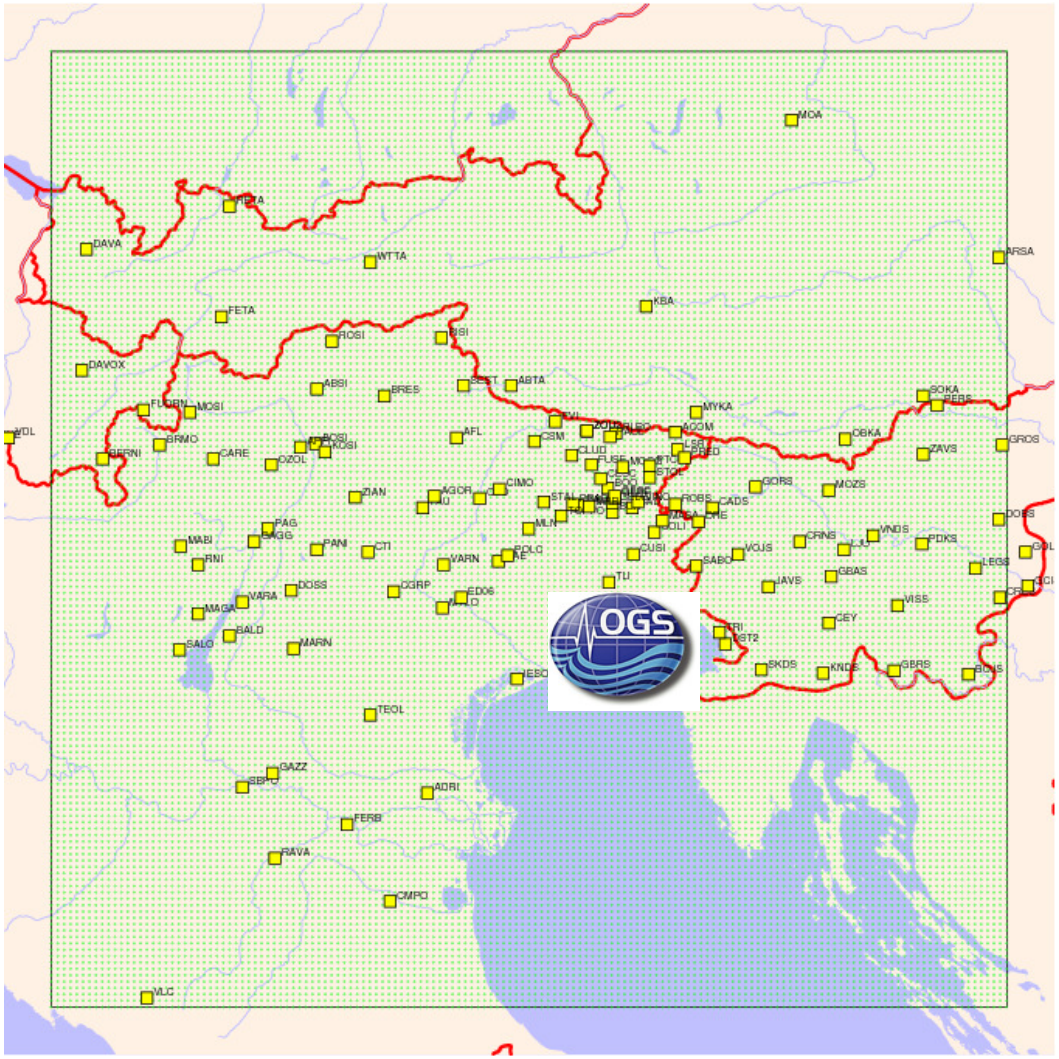


CRS headquarters in Udine (Italy)

Intervention at CRS headquarters for:

- operations checking
- review / confirmation of the location with magnitude (picking of S waves)
- control over any replicas of earthquake
- maintain the link with the structures of the regional Civil Protections

OGS Virtual Seismic Network (~100 real-time stations)



SED

Provincia di Trento

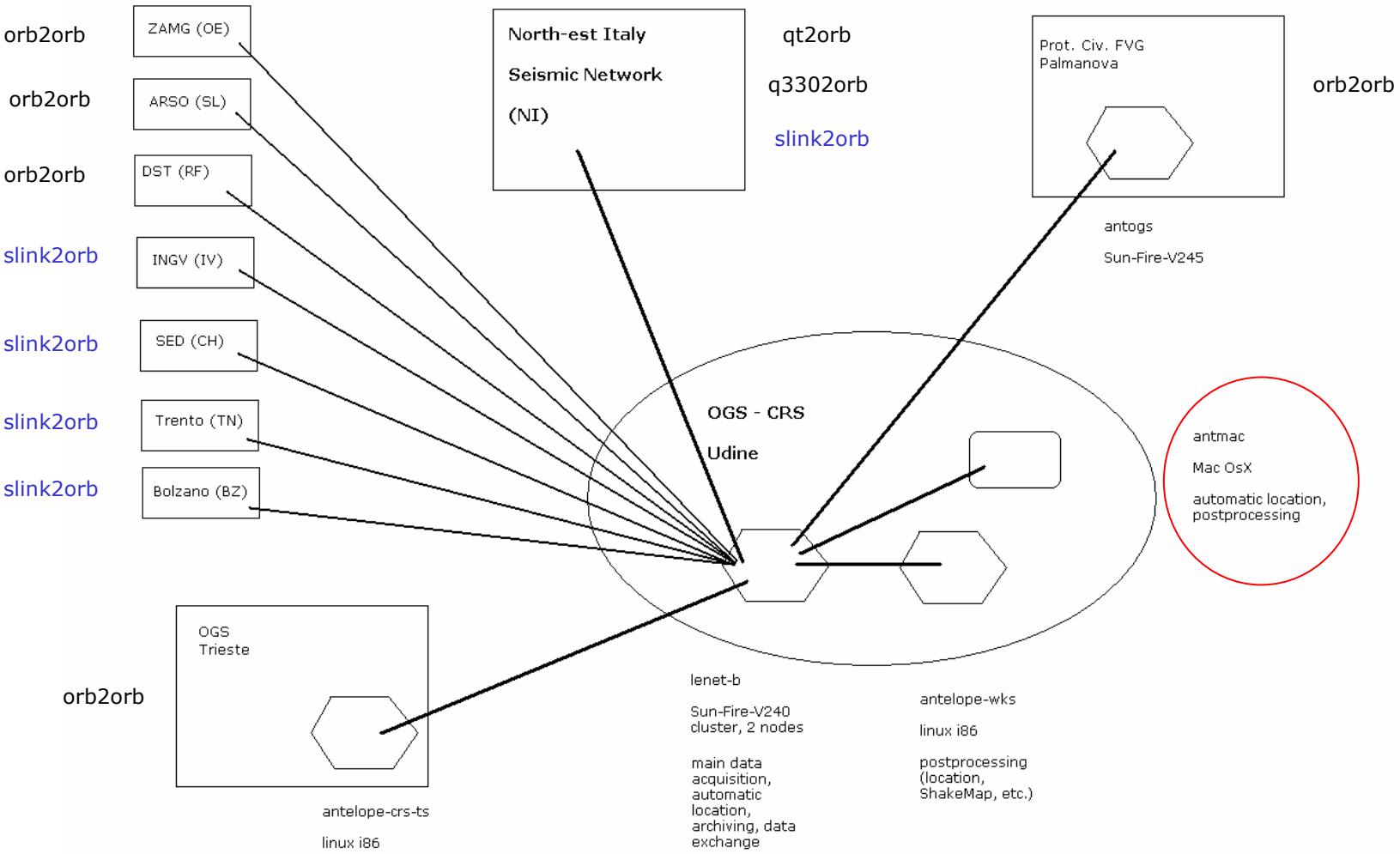
Provincia di Bolzano

INGV

ZAMG

Dipartimento di Geoscienze

OGS Antelope configuration



main rtexec processes table

```
Processes &Tbl{
orbserver           orbserver -p $ORB orbserver
orbexport           orbserver -p $ORBEXPORT orbexport
orbinIV             orbserver -p $ORBINIV orbinIV
qt2orb              qt2orb -dataorb $ORB -cmdorb $ORB -calib_db $DB
q3302orb            q3302orb  -calib_db $DB -S state/q3302orb -v OGS dataorb $ORB
TN2orb              slink2orb -v -dc $DB -dm $DB -S state/TN2orb -pf pf/TN2orb.pf $TNSEISCOMP $ORB
TNsecond2orb        slink2orb -v -dc $DB -dm $DB -S state/TNsecond2orb -pf pf/TNsecond2orb.pf $TNSEISCOMP2 $ORB
MN2orb              slink2orb -v -dc $DB -dm $DB -S state/MN2orb -pf pf/MN2orb.pf discovery.rm.ingv.it:39962 $ORB
IV_TEOL2orbinIV slink2orb -v -dc dbmaster/dbINGV -dm dbmaster/dbINGV -S state/IV_TEOL2orb -pf pf/IV_TEOL2orb.pf discovery.rm.ingv.it:39962 $ORBINIV
orbinIV2orb         orb2orb -S state/orbinIV2orb -m '(IV_TEOL|EV_ED06)_H.*' -X pf/X.pf $ORBINIV@ $ORB@
DST2orb             orb2orb -m '(RF_(CESC|GEDE|GEPF|GESC|MASA|MOGG|PAUL|PRAD|STOL|TARC)|MN_TRI|NI_(DST2|PALA|POLC|PURA))_(H|E|S)(H|L|G|N)(Z|N|E).*'
        -r 'RF_MORT.*' -S state/DST2orb $DSTORB@ $ORB@
ARSO2orb            orb2orb -m 'SL_(CADS|CEY|GBAS|GORS|JAVS|KNDS|LJU|MOZS|ROBS|SKDS|VNDS|VOJS).*_(H|E|S)(H|L|G|N)(Z|N|E).*' -S state/ARSO2orb
        $ARSOORB@ $ORB@
ZAMG2orb            orb2orb -m 'OE_(ABTA|ARSA|DAVA|FETA|KBA|MOA|MYKA|RETA|SOKA|WTTA)_(H|E|S)(H|L|G|N)(Z|N|E).*' -S state/ZAMG2orb $ZAMGORB@ $ORB@
SI2orb              orb2orb -S state/SI2orb -m 'SI_.*_(H|E|S)(H|L|G|N)(Z|N|E).*' $SIORB@ $ORB@
orb2export          orb2orb -m
        'FV_.*|MN_TRI_H.*|NI_VINO/log|NI_(AGOR|ACOM|BALD|CGRP|CLUD|CIMO|DRE|FUSE|PRED|SABO|VARN|VINO|ZOU2)_(H|E|S)(H|L|G|N)(Z|N|E).*' -S
        state/orb2export -r '/.*|.*/pf.*' $ORB $ORBEXPORT
orbinIV_FERB2orb                orb2orb -S state/orbinIV_FERB2orb -m 'NI_FERB_.*' -X pf/Y.pf $ORBINIV $ORB
CH2orb              slink2orb -v -dc $DB -dm $DB -S state/CH2orb -pf pf/CH2orb.pf seedlink.ethz.ch:18000 $ORB
Collalto2orbinIV    slink2orb -v -dc dbmaster/EV/dbEVin -dm dbmaster/EV/dbEVin -S state/Collalto2orbinIV -pf pf/Collalto2orbinIV.pf 158.110.30.171:18000 $ORBINIV
FERB2orbinIV        slink2orb -v -dc dbmaster/NI/FERB -dm dbmaster/NI/FERB -S state/FERB2orbinIV -pf pf/FERB2orbinIV.pf crs-fe01.dyndns.org:18000 $ORBINIV
cdorb2db            cdorb2db -v -S state/cdorb2db -r 'FV_.*' $ORB $DB
orb2dbt             orb2dbt -v -state state/orb2dbt -overwrite $ORB $DB
orbdetect           orbdetect -onlypicks -out $ORB $ORB $DB
orbassoc            orbassoc -v -select /db/detection $ORB $ORB dbmaster/ttgrid
orbevproc           orbevproc  -v -state state/orbevproc $ORB@ $ORB@ $DB
orb_quake_email orb_quake_email  $ORB
orb_alert_friuli    orbptrigger  -background -select "/pf/orbmag" -state state/orbptrigger_friuli $ORB /database/AlertFriuli/alert_friuli @origin.evid@ @origin.orid@
        @origin.ml@
orb_alert_veneto orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_veneto $ORB /database/AlertVeneto/alert_veneto @origin.evid@ @origin.orid@
        @origin.ml@
orb_alert_TN        orbptrigger  -background -select "/pf/orbmag" -state state/orbptrigger_TN $ORB /database/AlertTrentino/alert_trentino @origin.evid@ @origin.orid@
        @origin.ml@
orb_alert_CRS       orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_CRS $ORB /database/AlertCRS/alert_CRS @origin.evid@ @origin.orid@
        @origin.ml@
orbtrigger_topkserver               orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_topkserver $ORB /database/topkserver/orbtrigger_topkserver
        @origin.evid@ @origin.orid@ @origin.time@ @origin.lat@ @origin.lon@ @origin.depth@ @origin.ml@ @origin.lddate@ @origin.auth@
orbtrigger_orb2db_evid              orbptrigger  -background -select "/db/origin" -state state/orbptrigger_orb2db_evid $ORB /database/evdb/orb2db_evid @origin.evid@
orbtrigger_towebpcfvg               orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_towebpcfvg $ORB /database/towebpcfvg/towebpcfvg.pl
        @origin.evid@ @origin.orid@
orbtrigger_toShakeMap               orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_toShakeMap $ORB
        /database/toShakeMap/orbtrigger_toShakeMap @origin.evid@ @origin.orid@ @origin.ml@
}
```

main OGS Antelope load averages

load averages: 1.36, 1.57, 1.60; up 167+12:31:32 17:29:41
104 processes: 101 sleeping, 1 running, 2 on cpu
CPU states: 85.9% idle, 8.9% user, 5.3% kernel, 0.0% iowait, 0.0% swap
Memory: 4096M phys mem, 64M free mem, 20G total swap, 14G free swap

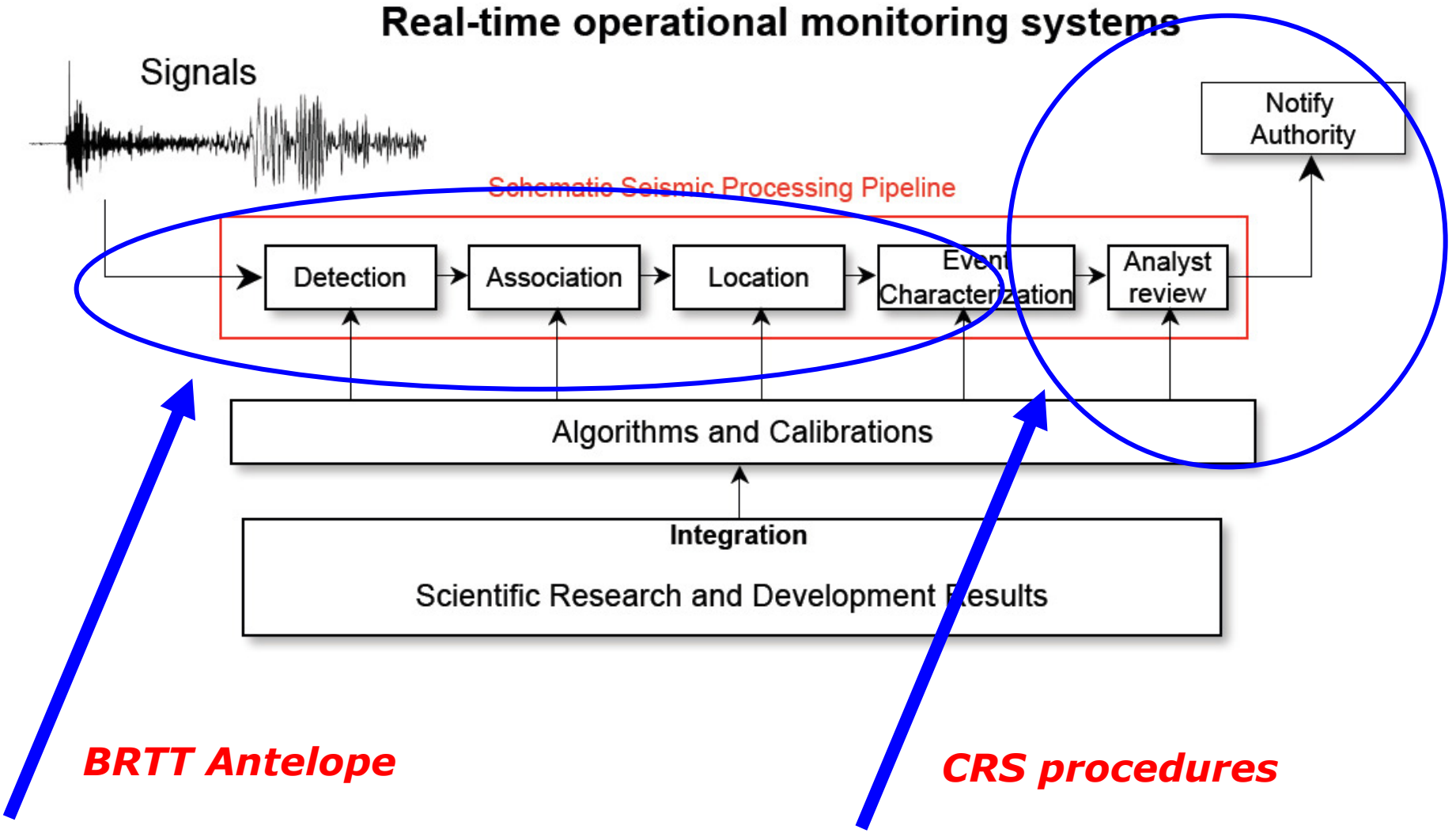
PID	USERNAME	LWP	PRI	NICE	SIZE	RES	STATE	TIME	CPU	COMMAND
4856	rt	91	41	0	1048M	625M	cpu/1	113.5H	8.04%	orbserver
5384	rt	1	59	0	191M	17M	sleep	17.0H	1.32%	orbdetect
5042	rt	59	59	0	41M	17M	run	673:29	0.96%	q3302orb
26989	rt	1	59	0	44M	26M	sleep	272:40	0.86%	cdorb2db
4868	rt	12	59	0	110M	78M	sleep	377:26	0.58%	orbserver
5398	rt	1	59	0	6216K	1744K	sleep	145:14	0.22%	orb2orb
21764	rt	1	59	0	3056K	1992K	cpu/0	0:00	0.15%	top
5277	rt	1	59	0	6232K	2104K	sleep	50:44	0.08%	orb2orb
5261	rt	1	59	0	6256K	2616K	sleep	54:47	0.07%	orb2orb
4843	rt	1	59	0	23M	11M	sleep	46:55	0.06%	perl
5251	rt	1	59	0	6248K	2032K	sleep	54:11	0.06%	orb2orb
13509	rt	1	59	0	76M	7128K	sleep	30:36	0.06%	slink2orb
5271	rt	1	59	0	6232K	1960K	sleep	47:37	0.05%	orb2orb
5040	rt	13	59	0	26M	4040K	sleep	63:03	0.05%	qt2orb
5214	rt	1	59	0	208M	34M	sleep	25:25	0.04%	slink2orb

main OGS orb sources & clients

orbserver 2/27/2013 (058) 16:32:26.699
Version 'Release 5.1-64 SunOS 5.10 2011-04-28 '
Pid 4856 @ crs-v240-b:/database (158.110.30.133), port #7000
Started Mon 2013-035 Feb 04 16:30:10 by rt, running 23 days
ring buffer last initialized Thu 2012-257 Sep 13 4:01:28
Maximum 1000.0 Mbytes packet data
Maximum 2500010 packets
Maximum 1000 sources
56 clients
519 sources
511551 opens 511495 closes 0 errors 7 rejections

Total Output rate = 2070.524 kbps
Total Input rate = 121.852 kbps
Total Output packet rate = 1263.238 pkts/s
Total Input packet rate = 203.656 pkts/s

Earthquake detection and notification

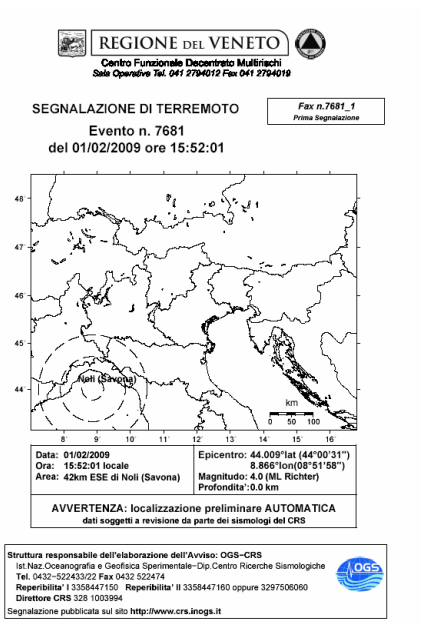


OGS adds-on for Antelope

- PickServer (using Lomax viewer)
- Comprehensive Alarm routines with re-location control
  - Output: email, fax, SMS, web
- M882orb and ORION2orb plugins
- Data archive (OASIS)
- Web Drumplot

- *ShakeMap*
- *SeisComP, RingServer (data exchange)*

Alarms


REGIONE DEL VENETO

Centro Funzionale Decentrato Multirischi

Sala Operativa Tel. 041 2794012 Fax 041 2794019

SEGNALAZIONE DI TERREMOTO

Fax n.7681_1

Prima Segnalazione

Evento n. 7681

del 01/02/2009 ore 15:52:01

Noli (Savona)

km

Data: 01/02/2009 Ora: 15:52:01 locale Area: 42km ESE di Noli (Savona)	Epicentro: 44.009°lat (44°00'31") 8.866°lon(08°51'58") Magnitudo: 4.0 (ML Richter) Profondita':0.0 km

AVVERTENZA: localizzazione preliminare AUTOMATICA

dati soggetti a revisione da parte dei sismologi del CRS

Struttura responsabile dell'elaborazione dell'Avviso: OGS-CRS

Ist.Naz.Oceanografia e Geofisica Sperimentale-Dip.Centro Ricerche Sismologiche

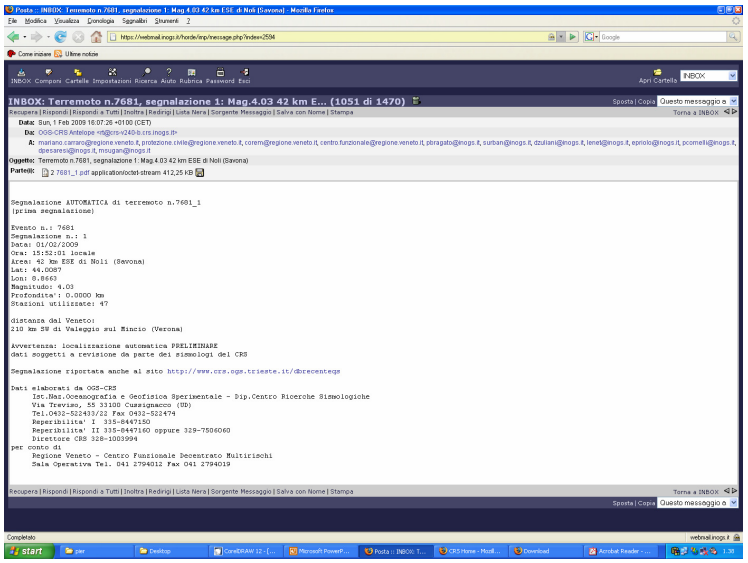
Tel. 0432-522433/22 Fax 0432 522474

Reperibilita' I 3358447150 Reperibilita' II 3358447160 oppure 3297506060

Direttore CRS 328 1003994

Segnalazione pubblicata sul sito http://www.crs.inogs.it

fax


INBOX: Terremoto n.7681, segnalazione 1: Mag.4.03 42 km E... (1051 di 1470)

Segnalazione AUTOMATICA di terremoto n.7681_1
(prima segnalazione)

Evento n.: 7681
Segnalazione n.: 1
Data: 01/02/2009
Ora: 15:52:01 locale
Area: 42 Km ESE di Noli (Savona)
Lat: 44.0087
Lon: 8.8663
Magnitudo: 4.03
Profondita': 0.0000 km
Stazioni utilizzate: 47

distanza dal Veneto:
210 km SW di Valeggio sul Mincio (Verona)

Avvertenza: localizzazione automatica PRELIMINARE
dati soggetti a revisione da parte dei sismologi del CRS

Segnalazione riportata anche al sito http://www.crs.ogs.trieste.it/dbrecentegs

Dati elaborati da OGS-CRS
Ist.Naz.Oceanografia e Geofisica Sperimentale - Dip.Centro Ricerche Sismologiche
Via Treviso, 55 33100 Cussignacco (UD)
Tel.0432-522433/22 Fax 0432-522474
Reperibilita' I 335-8447150
Reperibilita' II 335-8447160 oppure 329-7506060
Direttore CRS 328-1003994
per conto di
Regione Veneto - Centro Funzionale Decentrato Multirischi
Sala Operativa Tel. 041 2794012 Fax 041 2794019

e-mail


Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

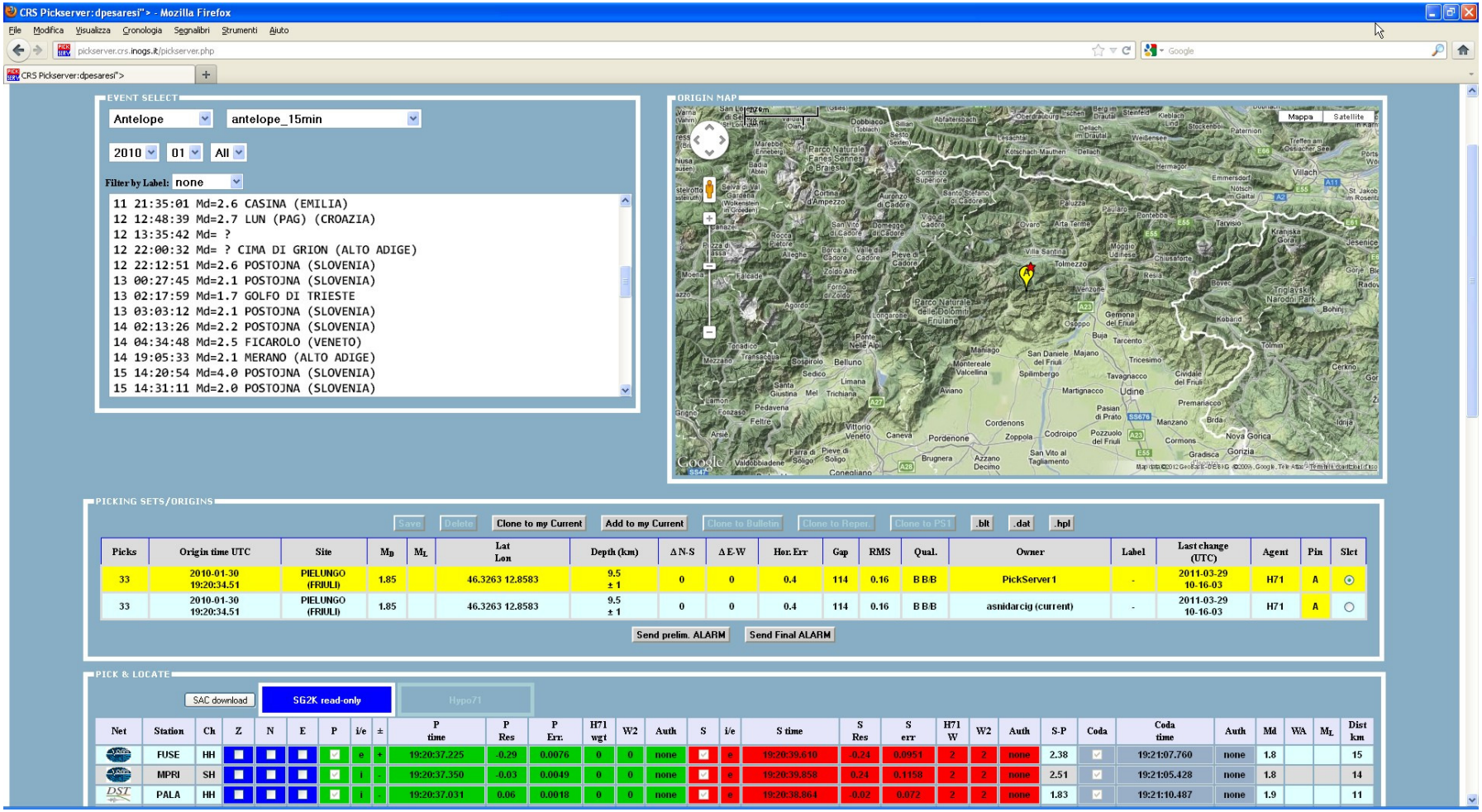
Earthquake: NORTHERN ITALY

web

sms

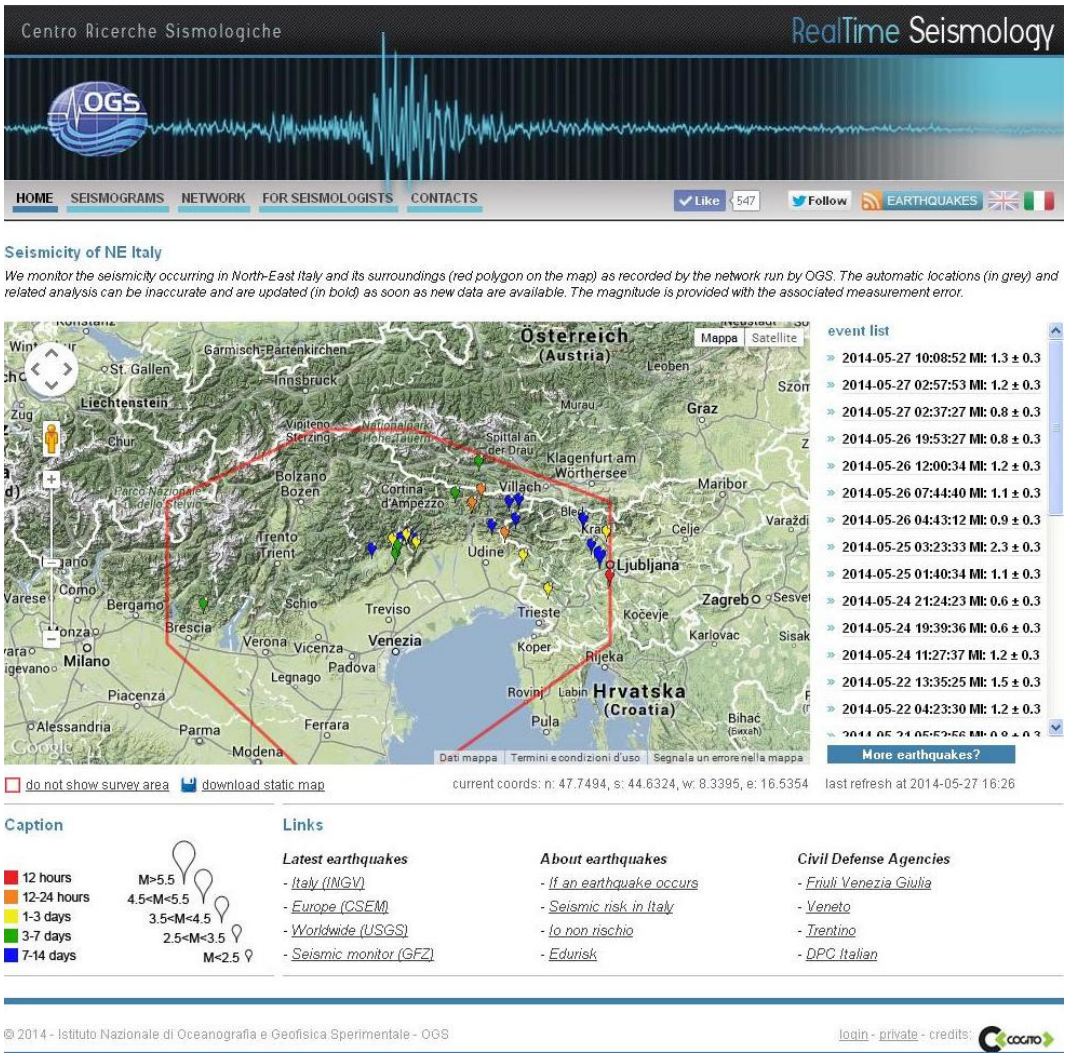
OGS-CRS Terremoto n.7681
segnalazione n.1
Mag4.03 H15:52:01
del 01/02/2009
42km ESE di Noli(Savona)
lat44.0087 lon8.8663
rep 3358447150

OGS PickServer (v. 2)

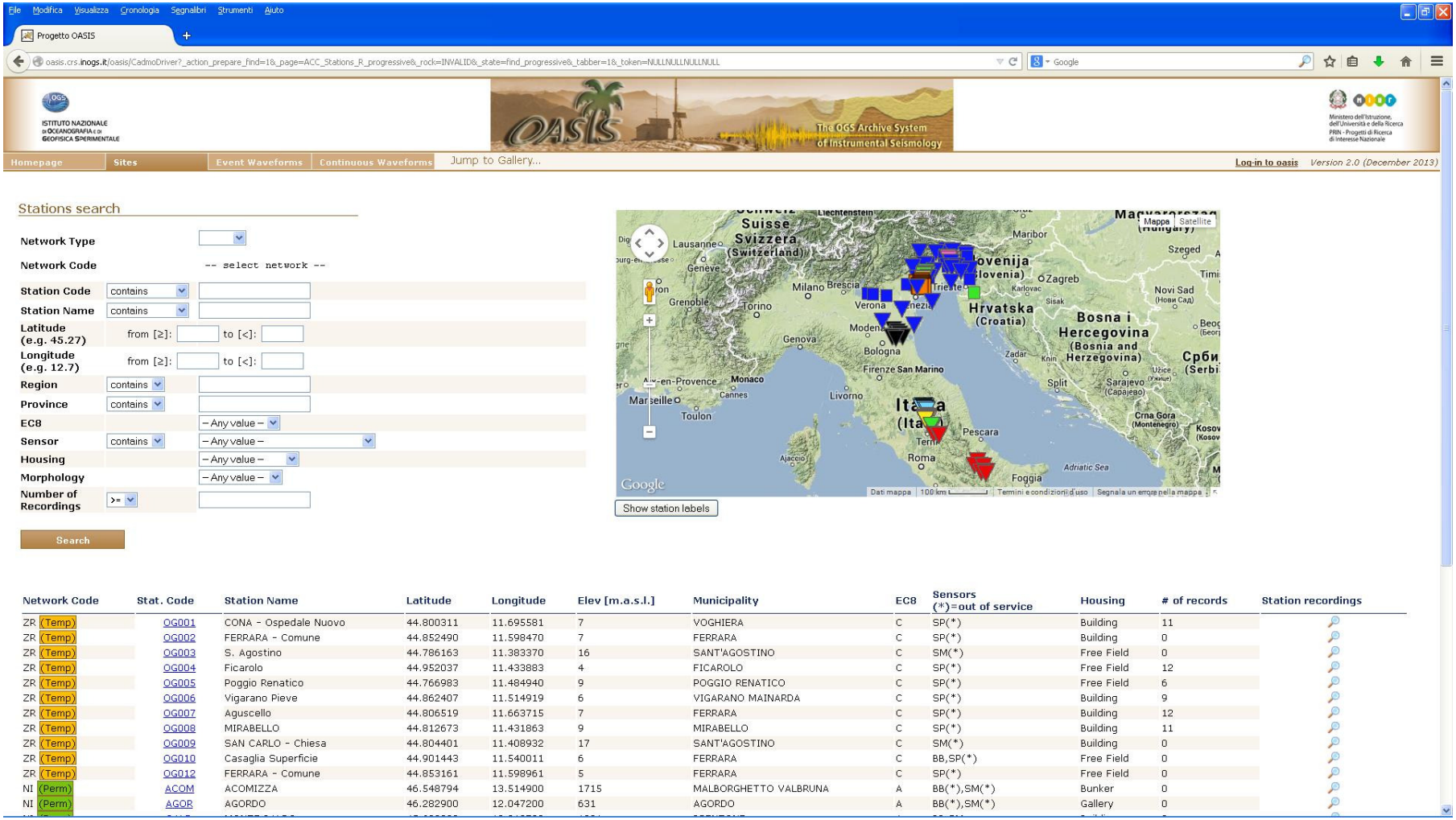


OGS Real Time Seismology:

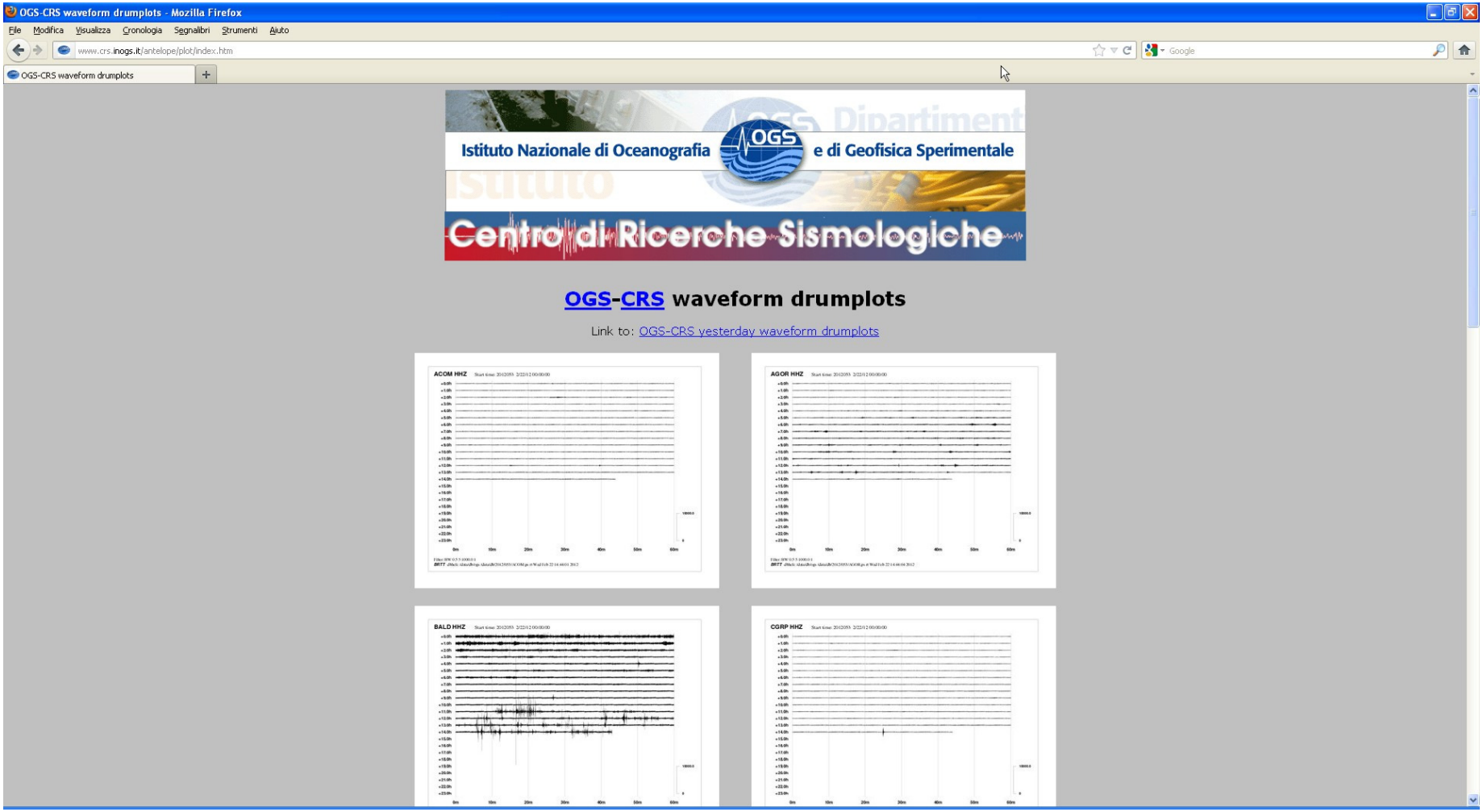
http://rts.crs.inogs.it/



OASIS OGS Archive System of Instrumental Seismology



OGS dbheli


OGS-CRS waveform drumplots - Mozilla Firefox
File Modifica Visualizza Cronologia Segnalibri Strumenti Aiuto
www.crs.inogs.it/antelope/plot/index.htm
OGS-CRS waveform drumplots
Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
Centro di Ricerche Sismologiche
OGS-CRS waveform drumplots
Link to: OGS-CRS yesterday waveform drumplots
ACOM HHZ
AGOR HHZ
BALD HHZ
CGRP HHZ

Already done (😐):

- Split event determination and graphics on PowerMAC from main acquisition on SUN cluster
  - Reliability (2 machines)
- Migration from orbampmag to orbevproc
- Migration from orb2db to cdorb2db + db2msd
- orbdetect tuning
  - BB continuous, SP trigger, Local/teleseismic bandwidth, S phases
- Antelope migration to 5.2-64

Still work in progress (☹):

- orbassoc tuning (grid, windows, station weighting and grouping, etc.)
- Migration core Antelope (SUN cluster) from 5.1-64 to 5.2-64 (need OS patch)
- Migration from cdorb2db + db2msd to orbwf
- Implement orbxchange with neighbors

The OGS Antelope Real-Time Team

Marco Mucciarelli
CRS Director
mmucciarelli@inogs.it

Pier Luigi Bragato
“I-do-everything”
pbragato@inogs.it

The OGS Antelope Real-Time Team

(Damiano Pesaresi
Architecture,
Archive
dpesaresi@inogs.it)

Paolo Di Bartolomeo
PickServer,
Web display
pdibartolomeo@inogs.it

The OGS Antelope Real-Time Team

(Denis Sandron
Magnitudo,
Catalogue
dsandron@inogs.it)

Luca Moratto
ShakeMaps,
RT configuration
lmoratto@inogs.it

34th GENERAL ASSEMBLY OF THE EUROPEAN SEISMOLOGICAL COMMISSION

Istanbul August 24-29, 2014

Session N. 1: "Improving seismic networks performances: from site selection to data integration "

The number and quality of seismic stations and networks in Europe continually improves, nevertheless there is always scope to optimize their performance. In this session we welcome contributions from all aspects of seismic network installation, operation and management. This includes site selection; equipment testing and installation; planning and implementing communication paths; policies for redundancy in data acquisition, processing and archiving; and integration of different datasets including GPS and OBS.

THANKS!

dpesaresi@inogs.it
+39-0432-522433

Damiano Pesaresi, Pier Luigi Bragato, Marco Mucciarelli, Angela Saraò, Paolo Di Bartolomeo, Giorgio Durì, Paolo Bernardi, Michele Bertoni, Elvio Del Negro, Denis Sandron, Luca Moratto
and all the **OGS-CRS** team!