

# RAN recent and future development

Luisa Filippi

Dipartimento della Protezione Civile

*Antelope users group meeting*

*Ljubljana, Slovenia, 7-9 May 2018*

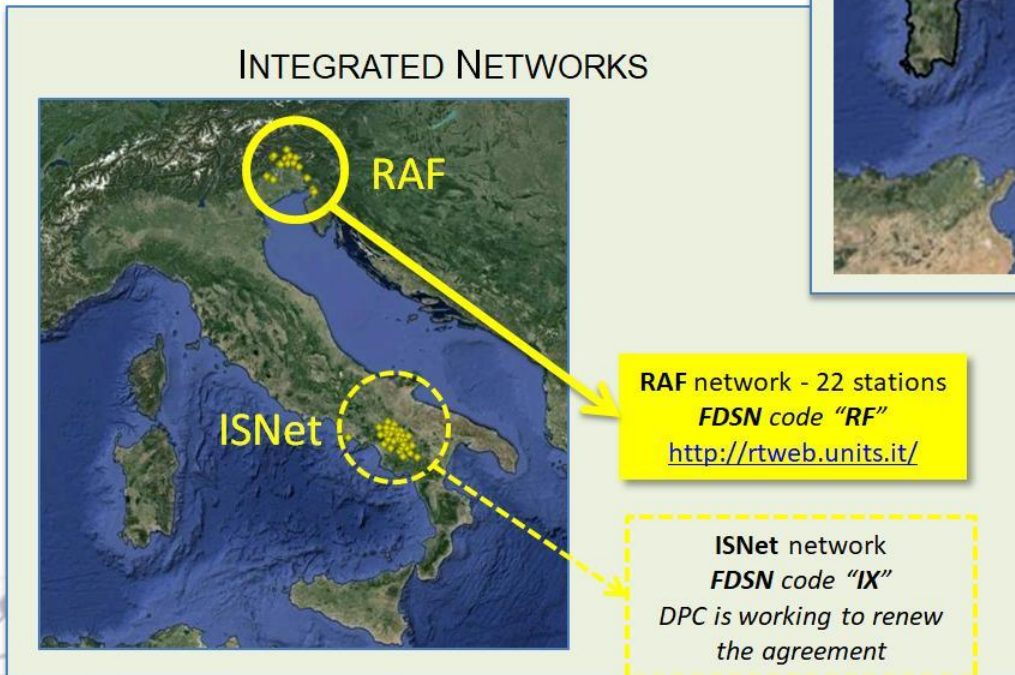
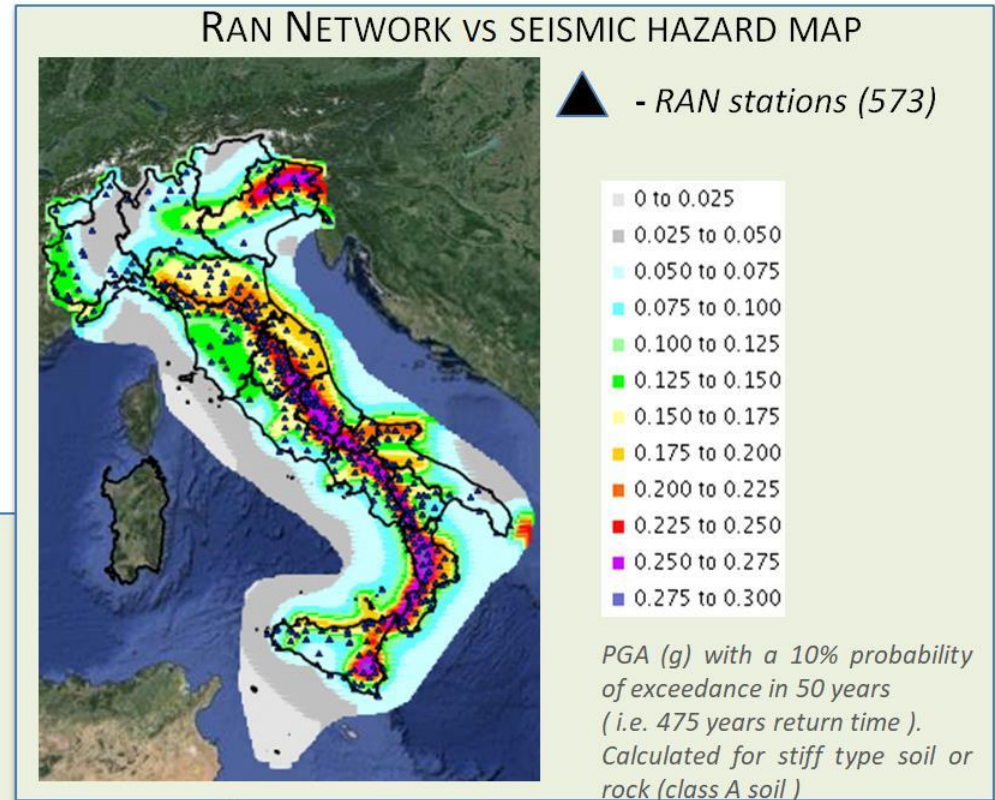
- IMPROVEMENT OF DATA SECURITY AND DATA CENTER OPERATIONAL CONTINUITY
- CURRENT STATE IN RAN – OSS NETWORKS INTEGRATION
- IMPROVING DATA SHARING



# IMPROVEMENT OF DATA SECURITY AND DATA CENTER OPERATIONAL CONTINUITY



**RAN** (FDSN code **IT**) includes 19 stations of regione Calabria and 3 stations of regione Veneto (ARPAV) maintained by DPC.



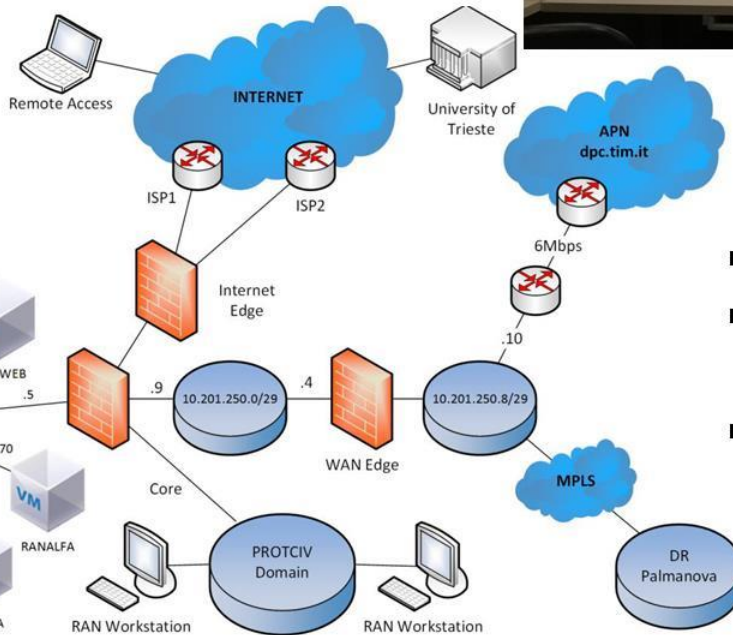
**RAN** data center collects strong motion data also from **RAF** and **ISNet** networks



- at DPC headquarter in Rome
- fully virtualized to accomplish the Operational Continuity Plan required by law
- embedded in DPC infrastructure
- Antelope ver. 5.7

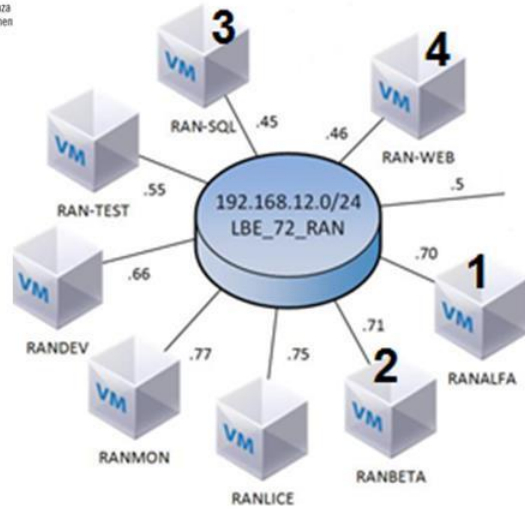



**CAED System Upgrade for DPC**  
**System & Software Configuration**



- Dedicated 2G/3G APN
- Data exchange (import & export) with University of Trieste
- Disaster Recovery in Palmanova (FVG)

## 1. RANALFA ANTELOPE DATA ACQUISITION



Antelope 5.7 2018-122 10:4

File Edit View Refresh

System is up

Load Average  
1min 9.63  
5min 7.06  
15min 6.55

Cpu Usage (16 cpus)  
2270 processes

Memory Usage  
ram swap  
64259 Mb 4092 Mb

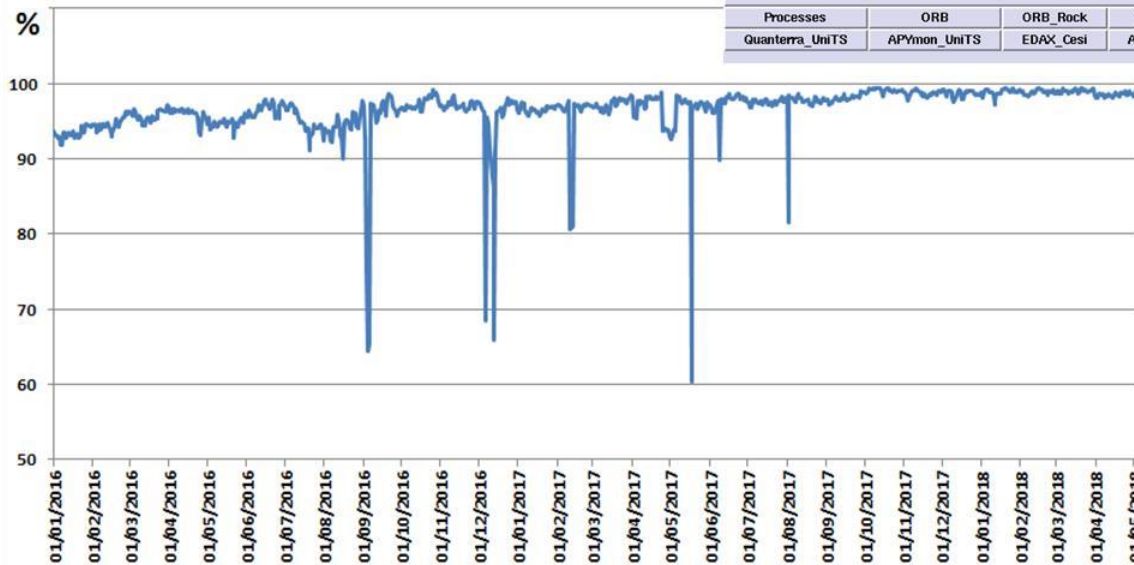
Disk Usage  
root waveforms tmp

Orb Ring Buffer Status  
pkts/s 14 connection  
In 326.982  
Out 960.830

Task	Pid	cpu	cpu	rss	rss	To Orb	To Orb	From Orb	From Orb	Latency	Latency
rtexec	4314	0.00	20.00	14.9	10000						
orbserver	7780	7.80	20.00	8445.9	10000						
orbserver_altus	10209	0.60	20.00	1033.4	10000						
orbserver_rock	12446	6.30	20.00	1060.1	10000						
orbserver_stat	14638	0.00	20.00	100.6	10000						
apy2orb	48987	0.90	20.00	9.1	10000						
altus2orb	47565	18.50	20.00	62.6	10000						
rock2orb	2710	15.20	20.00	66.1	10000	0.0 bps	1000	0.0 bps	1000	0 seconds	150
orb2orb	23274	0.10	20.00	6.0	10000	3.7 Kbps	1000	0.0 bps	1000	446.000 milliseconds	150
orbaddcalib	21146	5.00	20.00	8.2	10000	314.3 Kbps	1000	0.0 bps	1000	2.116 seconds	150
orb2db	25858	2.90	20.00	16.4	10000	0.0 bps	1000	327.0 Kbps	1000	2.116 seconds	150
orb2datlog	33481	0.00	20.00	4.1	10000	5.2 Kbps	1000	0.0 bps	1000	398.000 milliseconds	150
orb2pfstlog	37606	0.00	20.00	4.0	10000	3.7 Kbps	1000	0.0 bps	1000	2.116 seconds	150
orb2logs	38605	0.00	20.00	4.5	10000	0.0 bps	1000	5.2 Kbps	1000	398.000 milliseconds	150
status_etna_stati	39248	0.00	20.00	2.6	10000						
verify_status_sta	39736	0.00	20.00	7.8	10000						

Cron Job Status patches sysreport cleanlogs rtoutage funzionalitaRAN rtbdclean funzionalita\_DPC datareport archive\_evt\_rock affiliation FunzionalitaWEB

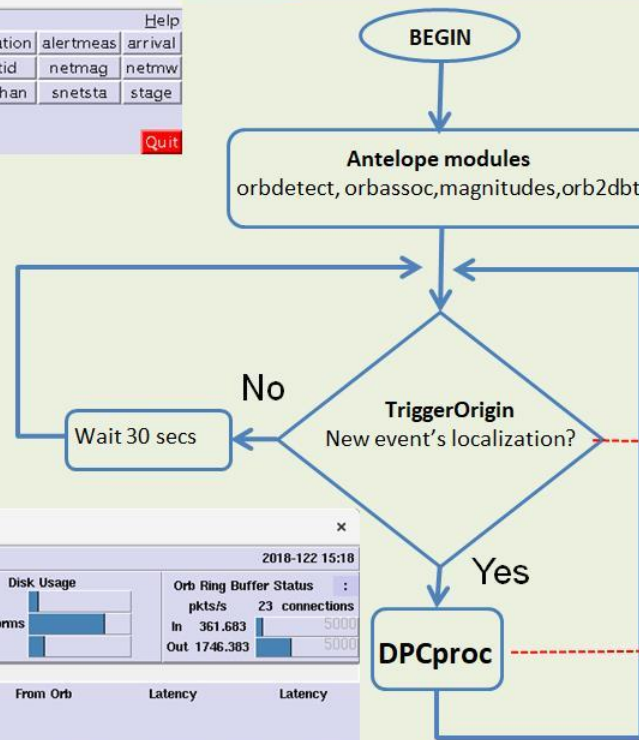
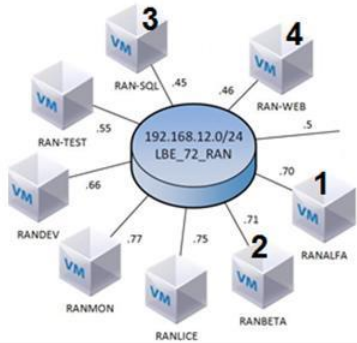
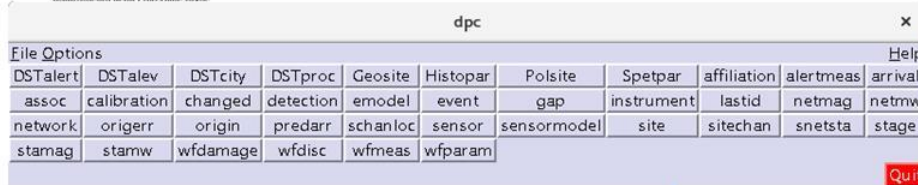
Processes	ORB	ORB_Rock	ORB_Altus	ORB_Data	Rock	Altus	APYmonGPRS	Rock_UnITS	Altus_UnITS
Quanterra_UnITS	APYmon_UnITS	EDAX_Cesi	APYmon_Cesi						



Network functionality (%)  
Low levels are associated to DPC infrastructure troubles



## 2. RANBETA ANTELOPE DATA PROCESSING



Antelope modules orbdetect, orbassoc, magnitudes and orb2dbt are always running waiting for locating a new event

TriggerOrigin program is always running and every 30 secs check for a new origin. In case of a new origin is present starts the procedure DPCproc.

The core part of DPCproc is dbmw software module, implemented by UNITS, that calculate several parameters of seismic event and recorded waveforms

RAN Data Processing

Antelope 5.7 2018-122 15:18

System is up

Load Average: 1min 2.55, 5min 2.36, 15min 2.50

Cpu Usage (16 cpus): 1870 processes

Memory Usage: ram 64259 Mb, swap 4092 Mb

Disk Usage: root, waveforms, tmp

Orb Ring Buffer Status: In 361.683, Out 1746.383

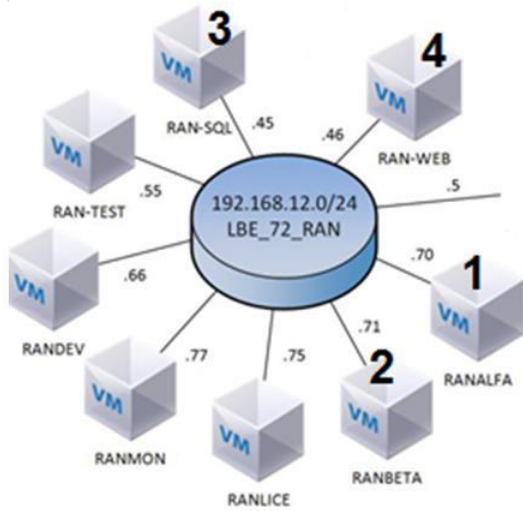
Task	Pid	cpu	cpu	rss	rss	To Orb	To Orb	From Orb	From Orb	Latency	Latency
rtexec	2972	0.00	15.00	7.7	10000						
orbserver	5225	13.80	15.00	4319.9	10000						
RANacq	7709	2.40	15.00	3.6	10000	312.5 Kbps	1000	0.0 bps	1000	1.979 seconds	20000
SYSCOMacq	10098	0.00	15.00	3.5	10000	1.9 Kbps	1000	0.0 bps	1000	5.809 seconds	20000
UNITSacq	12369	0.40	15.00	3.6	10000	47.0 Kbps	1000	0.0 bps	1000	1.979 seconds	20000
CESIacq	14665	0.00	15.00	7.5	10000	0.0 bps	1000	0.0 bps	1000	2:06 hours	20000
ISNETacq											
orbdetect	16730	3.90	15.00	113.0	10000	0.0 bps	1000	0.0 bps	1000	20.410 seconds	20000
orbassoc	16830	0.30	15.00	1757.1	10000	0.0 bps	1000	0.0 bps	1000	4:15 hours	20000
magnitudes	16961	0.20	15.00	87.0	10000	0.0 bps	1000	0.0 bps	1000	4:35 minutes	20000
orbwfmeas	17042	0.20	15.00	23.4	10000	0.0 bps	1000	3.0 Kbps	1000	1.979 seconds	20000
TriggerOrigin	23222	1.50	15.00	8.7	10000						
orb2wf	17601	8.60	15.00	94.3	10000	0.0 bps	1000	361.3 Kbps	1000	1.979 seconds	20000
orb2db	17689	2.90	15.00	89.4	10000	0.0 bps	1000	361.3 Kbps	1000	1.979 seconds	20000
orb2dbt	17779	3.20	15.00	1953.2	10000	0.0 bps	1000	405.5 Kbps	1000	7.546 seconds	20000
INGV2db	25392	0.40	15.00	27.8	10000						
dborigin2orb	25417	0.00	15.00	4.1	10000	0.0 bps	1000	0.0 bps	1000	4:35 minutes	20000

Cron Job Status: patches, sysreport, SyncMysql, EventArchive, compress, dbwfreopen, rtdbreopen, datareport, rtdbclean, cleanlogs

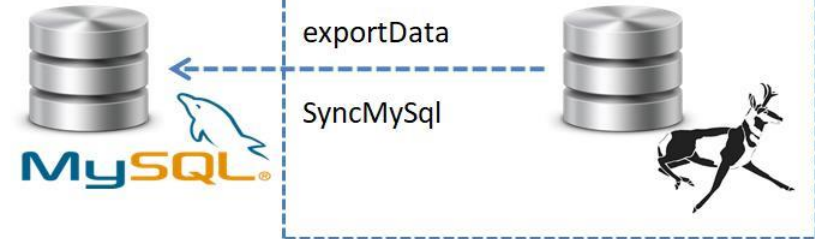
Network Operation: Processes, ORB\_Status, ORB\_Data, ORB\_Data2, DB\_Data, Event\_Map, Qt\_Events, Grid\_Map



## 3. RAN-SQL RAN WEB DATABASE



## 2. RANBETA



## 4. RAN-WEB RAN WEB SITE

RAN live (restricted access)

RAN download (public access)



http://ran.protezionecivile.it/IT/live.php

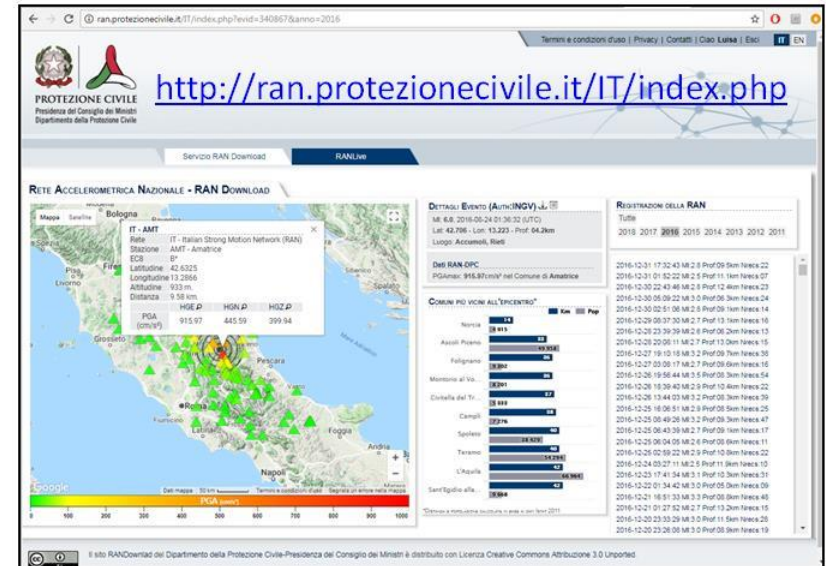
RETE ACCELEROMETRICA NAZIONALE - RANLIVE

Dettagli Evento (AmiciINGV) L. 11  
M: 2.3 - 2016-05-02 15:32:59 (UTC)  
Lat: 43.834 - Lon: 13.838 - Prof: 89.1km  
Luogo: Pieve Torina, Macerata

REgistrazioni NELLA RAN (Ultimi 20 Eventi)

Time	M	Lat	Lon	Prof	Stato
2016-05-02 15:44:53	M: 1.9	43.834	13.838	89.1	Stato
2016-05-02 15:32:59	M: 2.3	43.834	13.838	89.1	Stato
2016-05-02 15:30:08	M: 2.3	43.834	13.838	89.1	Stato
2016-05-02 15:28:11	M: 1.5	43.834	13.838	89.1	Stato
2016-05-02 15:26:17	M: 2.5	43.834	13.838	89.1	Stato
2016-05-02 15:24:30	M: 2.3	43.834	13.838	89.1	Stato
2016-05-02 15:22:51	M: 1.4	43.834	13.838	89.1	Stato
2016-05-02 15:21:59	M: 1.4	43.834	13.838	89.1	Stato
2016-05-02 15:20:24	M: 1.4	43.834	13.838	89.1	Stato
2016-05-02 15:17:11	M: 2.0	43.834	13.838	89.1	Stato
2016-05-02 15:15:27	M: 1.5	43.834	13.838	89.1	Stato
2016-05-02 15:14:01	M: 1.9	43.834	13.838	89.1	Stato
2016-05-02 15:11:44	M: 1.9	43.834	13.838	89.1	Stato
2016-05-02 15:09:56	M: 1.8	43.834	13.838	89.1	Stato
2016-05-02 15:07:02	M: 1.8	43.834	13.838	89.1	Stato
2016-04-30 20:17:15	M: 2.0	43.834	13.838	89.1	Stato
2016-04-30 20:15:27	M: 2.0	43.834	13.838	89.1	Stato
2016-04-30 20:13:41	M: 1.7	43.834	13.838	89.1	Stato
2016-04-30 20:11:45	M: 1.8	43.834	13.838	89.1	Stato
2016-04-30 20:09:56	M: 1.8	43.834	13.838	89.1	Stato
2016-04-30 20:08:09	M: 2.0	43.834	13.838	89.1	Stato
2016-04-30 20:06:25	M: 2.0	43.834	13.838	89.1	Stato
2016-04-30 20:04:30	M: 1.5	43.834	13.838	89.1	Stato

0 0 27 31  
Giorni Ore Minuti Secondi



http://ran.protezionecivile.it/IT/index.php

RETE ACCELEROMETRICA NAZIONALE - RAN DOWNLOAD

Dettagli Evento (AmiciINGV) L. 11  
M: 6.8 - 2016-05-24 01:36:32 (UTC)  
Lat: 42.786 - Lon: 13.223 - Prof: 64.2km  
Luogo: Accaino, Bari

REgistrazioni DELLA RAN

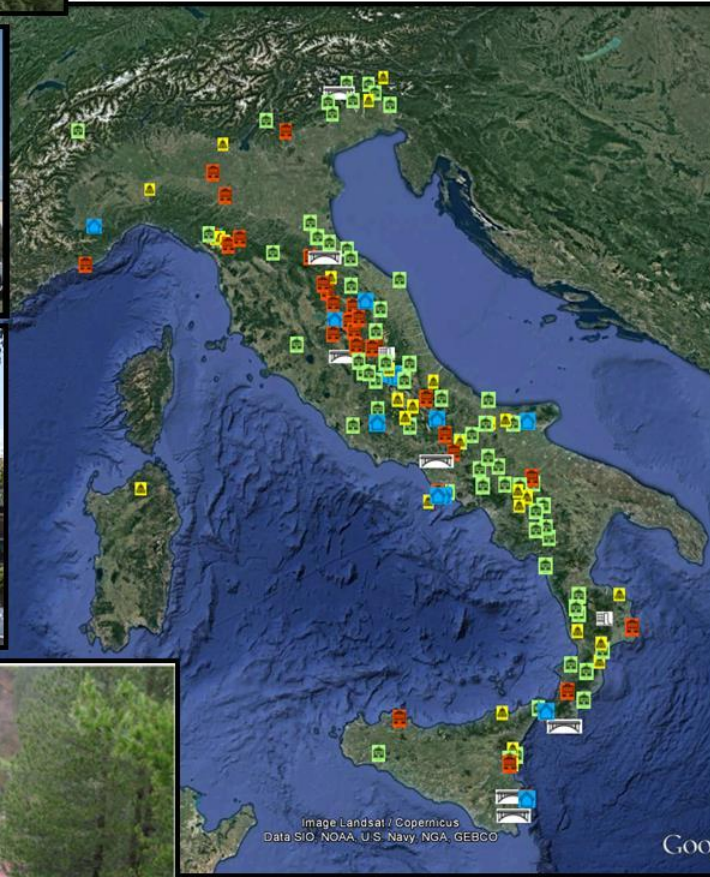
Time	M	Lat	Lon	Prof	Stato
2016-12-31 17:32:43	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:31:02	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:29:21	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:27:40	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:26:00	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:24:19	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:22:38	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:20:57	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:19:16	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:17:35	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:15:54	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:14:13	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:12:32	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:10:51	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:09:10	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:07:29	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:05:48	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:04:07	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:02:26	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:00:45	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 17:00:04	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 16:58:23	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 16:56:42	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 16:55:01	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 16:53:20	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 16:51:39	M: 2.8	42.786	13.223	64.2	Stato
2016-12-31 16:50:00	M: 2.8	42.786	13.223	64.2	Stato









# CURRENT STATE IN RAN – OSS NETWORKS INTEGRATION



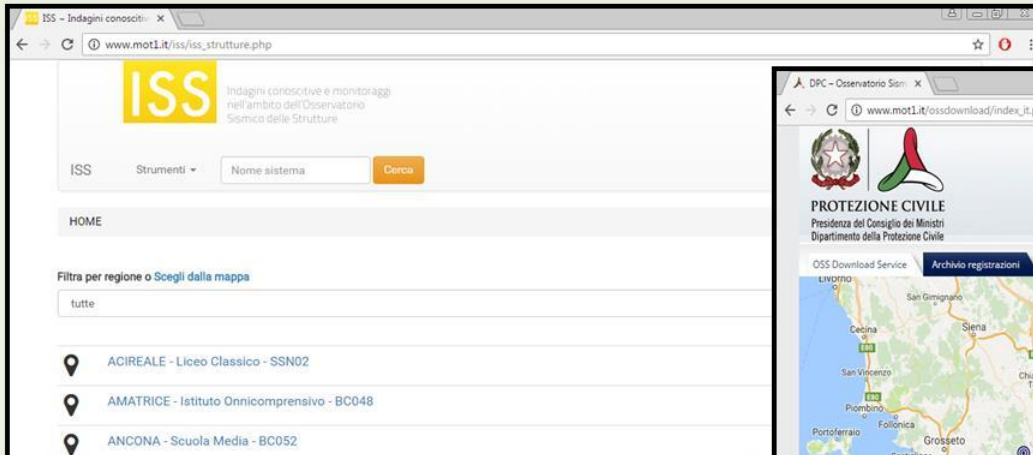
# OSS NETWORK



	STRUCTURES	162
	BRIDGE	7
	HOSPITAL	30
	SCHOOL	70
	CITY HALL	29
	OTHER	21
	DAM	5

ISS [http://www.mot1.it/iss/iss\\_strutture.php](http://www.mot1.it/iss/iss_strutture.php)

OSS download  
<http://www.mot1.it/osdownload>



ISS - Indagini conoscitive e monitoraggio nell'ambito dell'Osservatorio Sismica delle Strutture

ISS Strumenti Nome sistema Cerca

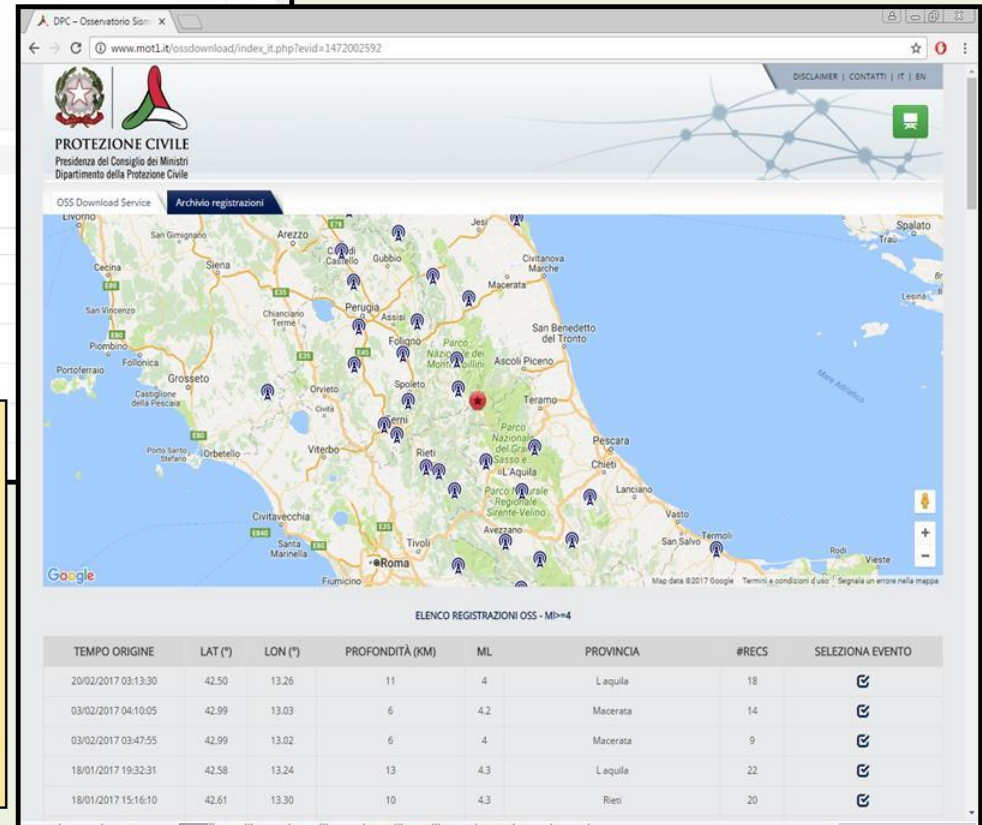
HOME

Filtra per regione o Scegli dalla mappa

tutte

- ACIREALE - Liceo Classico - SSN02
- AMATRICE - Istituto Onnicomprensivo - BC048
- ANCONA - Scuola Media - BC052

- Documentation on the structure (design documents, geological report, structural assessment)
- Results of geometric reliefs and non-destructive surveys
- Results of experimental modal analysis
- Numerical models (linear, non-linear)
- Strong motion waveforms (associated to monitored structure)



DPC - Osservatorio Sismi

PROTEZIONE CIVILE  
Presidenza del Consiglio dei Ministri  
Dipartimento della Protezione Civile

OSS Download Service Archivio registrazioni

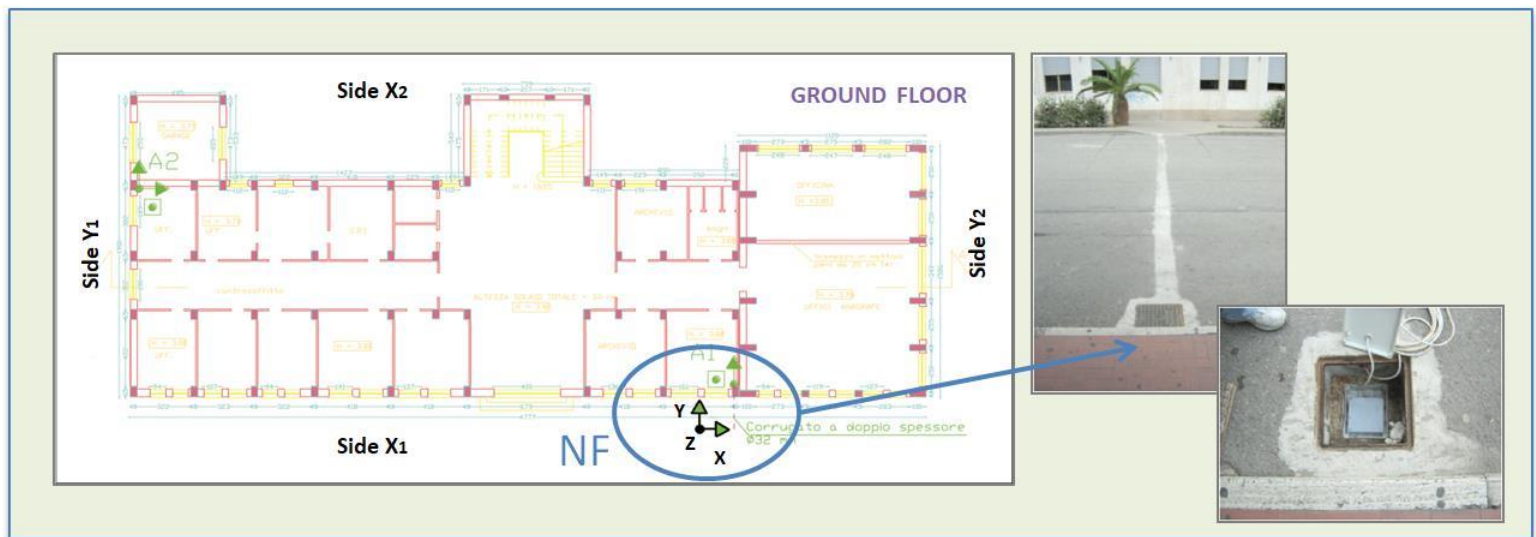
Map showing the location of monitored structures in the Lazio region, Italy.

ELENCO REGISTRAZIONI OSS - MB=>4

TEMPO ORIGINE	LAT (°)	LON (°)	PROFONDITÀ (KM)	ML	PROVINCIA	#RECS	SELEZIONA EVENTO
20/02/2017 03:13:30	42.50	13.26	11	4	Laquila	18	
03/02/2017 04:10:05	42.99	13.03	6	4.2	Macerata	14	
03/02/2017 03:47:55	42.99	13.02	6	4	Macerata	9	
18/01/2017 19:32:31	42.58	13.24	13	4.3	Laquila	22	
18/01/2017 15:16:10	42.61	13.30	10	4.3	Rieti	20	



**SOV** - Soverato *Town hall* building  
(monitored with 19 sensors)



The “near field” (NF) 3-component sensors of OSS monitoring systems are installed in a similar condition to many RAN stations, that are close to or at the basement of buildings

*AMT - Amatrice (Free field )*



*RQT - Arquata del Tronto (inside ENEL's building)*



*NOR - Norcia (at building's basement)*



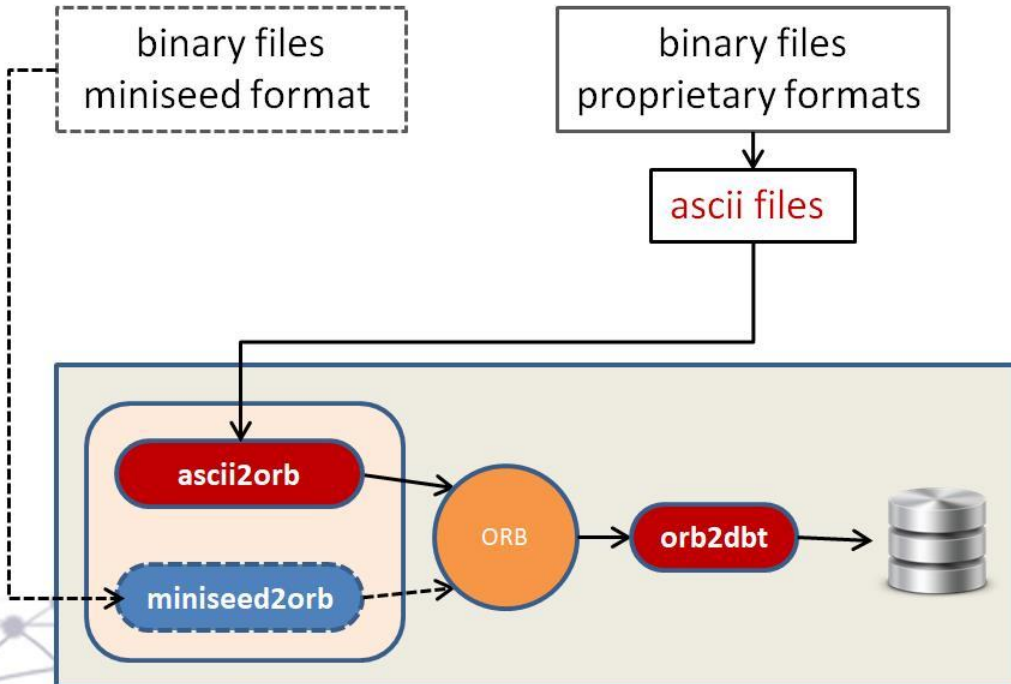
*VRP - Vairano Patenora (close to building)*





The OSS has a data center separated from RAN data center.

The OSS strong motion instruments are provided by several companies the original data from modern instruments are in miniseed format but they are mainly in binary proprietary format. The data in binary proprietary format are also provided in ascii, in a format read by ascii2orb program.



ascii file

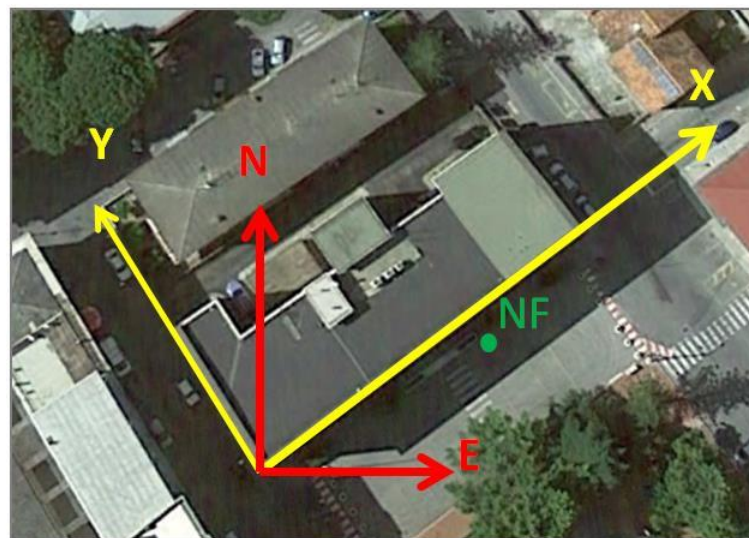
```

SERIAL=4010          # IDENTIFICATIVO DI SERIE DATALOGGER
CHANNEL=NF-Y        # IDENTIFICATIVO CANALE OSS
TIME=2015/11/17 7:13:09.735  # TEMPO PRIMO CAMPIONE
NSAMPLE=18000       # NUMERO DI CAMPIONI
SAMPLING= 200       # FREQUENZA DI CAMPIONAMENTO
DYNAMIC=24          # DINAMICA 16,18,24,..
SEGTYPE=A           # TIPO SENSORE: A=ACC. V=VELOC.
VPP=10              # FONDO SCALA PICCO PICCO. +/-5v = 10v
SENSIBILITY=1.015   # COSTANTE DI TRASDUZIONE V/g
GAIN=1              # GUADAGNO
USER1=              # COMMENTI 64 CARATTERI X ANTELOPE
USER2=              # COMMENTI 64 CARATTERI X ANTELOPE
INFO1=              # ULTERIORI INFORMAZIONI
INFO2=

-1532               # DATI IN COUNT
-1538
.....
.....
SERIAL=4010          # IDENTIFICATIVO DI SERIE DATALOGGER
CHANNEL=NF-X        # IDENTIFICATIVO CANALE OSS
.....
.....
SERIAL=4010          # IDENTIFICATIVO DI SERIE DATALOGGER
CHANNEL=NF-Z        # IDENTIFICATIVO CANALE OSS
.....
.....
  
```



- More than 60 NF sensors of OSS network are already acquired in Antelope
- For these sensors the dbmaster is completed
- The dbmw software has been modified by UNITS to elaborate OSS data together with RAN data, including the rotation of OSS components.  
OSS network use X, Y as local coordinate system, while RAN network use geographic coordinates lat N, lon E



# IMPROVING DATA SHARING



A seedlink server is ready for sharing data in streaming

It will be available to the public shortly on

<http://ran.protezionecivile.it/>

Thank you

