



Antelope: Earthquake and Volcano Monitoring in Costa Rica

C. Garita and B. Burgoa
OVSICORI-UNA

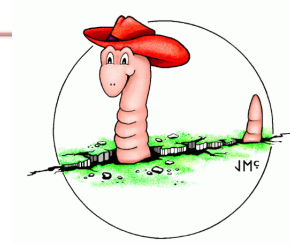
Fairbanks, Alaska
August 17th, 2016



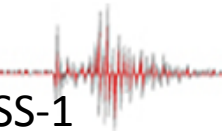
- Since 1984
- 30 Workers
- Earthquake and Volcano Monitoring



Acquisition



Ranger SS-1
 Reftek



Antelope Adquisicion 5.6

Antelope 5.6 2016-202 17:24

System is up

Load Average: 1min 0.85, 5min 0.83, 15min 0.82

Cpu Usage (6 cpus): 732 processes

Memory Usage: ram 2573 MB, swap 6192 MB

Disk Usage: root

Orb Ring Buffer Status: :ovs pkts/s 12 connections

In: 78.603, Out: 398.915

Task	Pid	cpu	cpu	rss	rss	To Orb	To Orb	From Orb	From Orb	Latency	Latency
rtexec	1439	0.00	10.00	11.0	1000						
orbserver	1455	2.10	10.00	580.9	1000						
orbserverCMD	1468	0.00	10.00	6.4	1000						
orbserverSTATUS	1490	0.00	10.00	22.5	1000						
orbserverIMP	1515	0.90	10.00	573.2	1000						
orbserverEXP	1546	0.70	10.00	210.5	1000						
q3302orbA	1580	0.60	10.00	21.8	1000						
q3302orbB	2571	0.70	10.00	24.1	1000						
q3302orbC	3462	1.00	10.00	25.1	1000						
qJTS2orb	4124	0.10	10.00	12.4	1000						
ew2orb	4842	0.10	10.00	5.2	1000						
ewref2orb	5387	0.30	10.00	5.2	1000						
<i>ctbto2orb</i>											
<i>ofts2orb</i>											
slinkNAM	5555	0.10	10.00	2.8	1000						
SlinkApollo	16530	0.10	10.00	2.8	1000						
Slink2orb-DMC	5708	0.00	10.00	2.8	1000						
<i>Slink2orb-REF</i>											
Slink2orb-SIS	16834	0.00	10.00	2.8	1000						
IMP2orb	5847	0.30	10.00	2.8	1000						
orb2EXP	5947	0.20	10.00	2.8	1000						
orb2ew	22024	1.20	10.00	6.2	1000						
<i>orb2M</i>											
<i>orb2alt</i>											
ringserver	6291	0.60	10.00	968.0	1000						

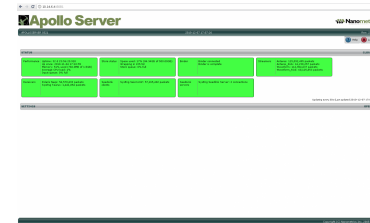
Cron Job Status: patches, cleanlogs, sc3todb, sysreport

Network Operation

processes	ORB_Clients	ORB_Sources	ORB_IMP	ORB_Data	ORB_Data24	ORB_Latency
ORBIMP_Sources	STATUS_Sources	DB_data	Quanterra	Event_Map	Grid_Map	tkorblag



Global and
 Regional data

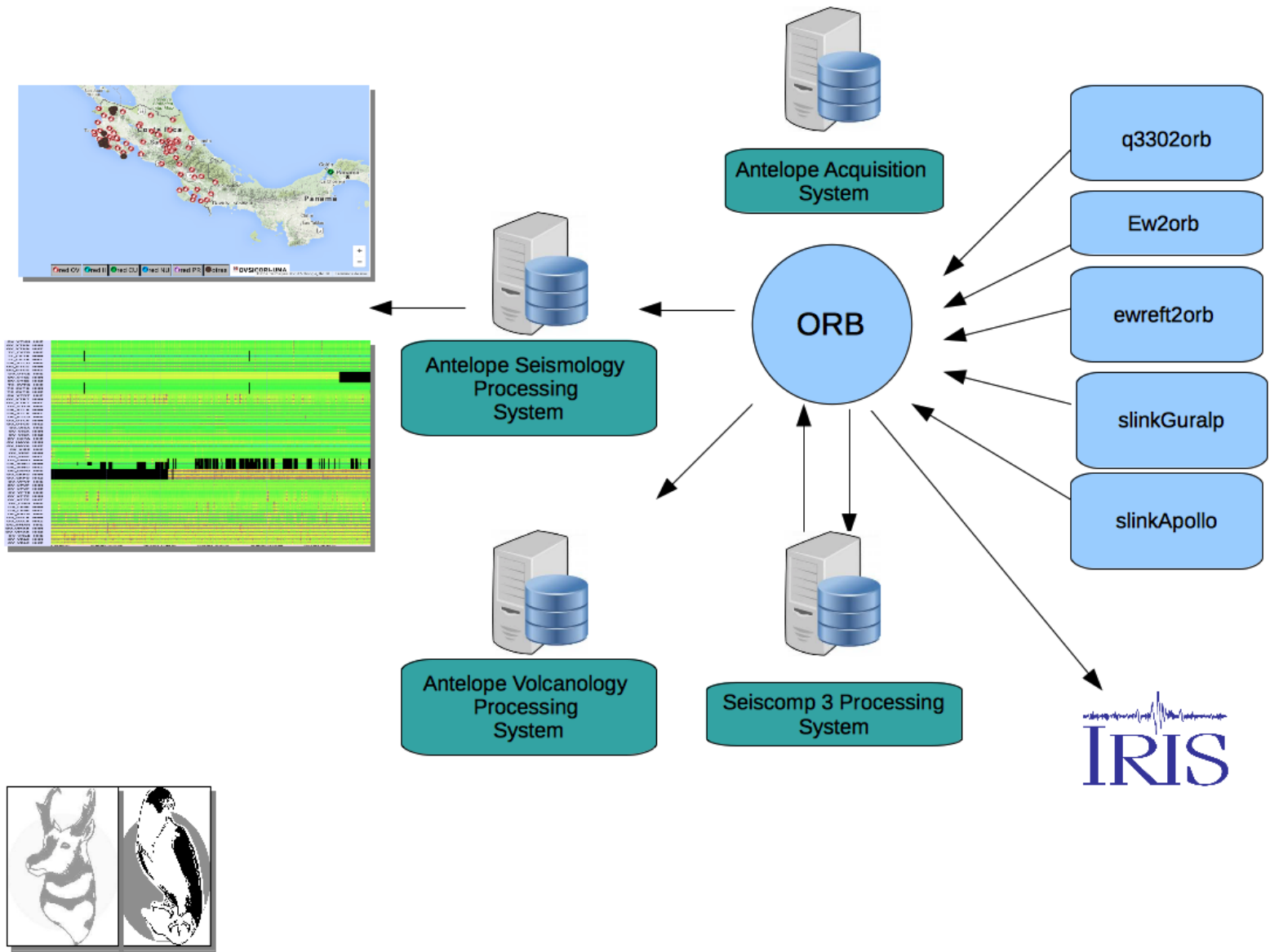


Nanometrics



NAM Guralp



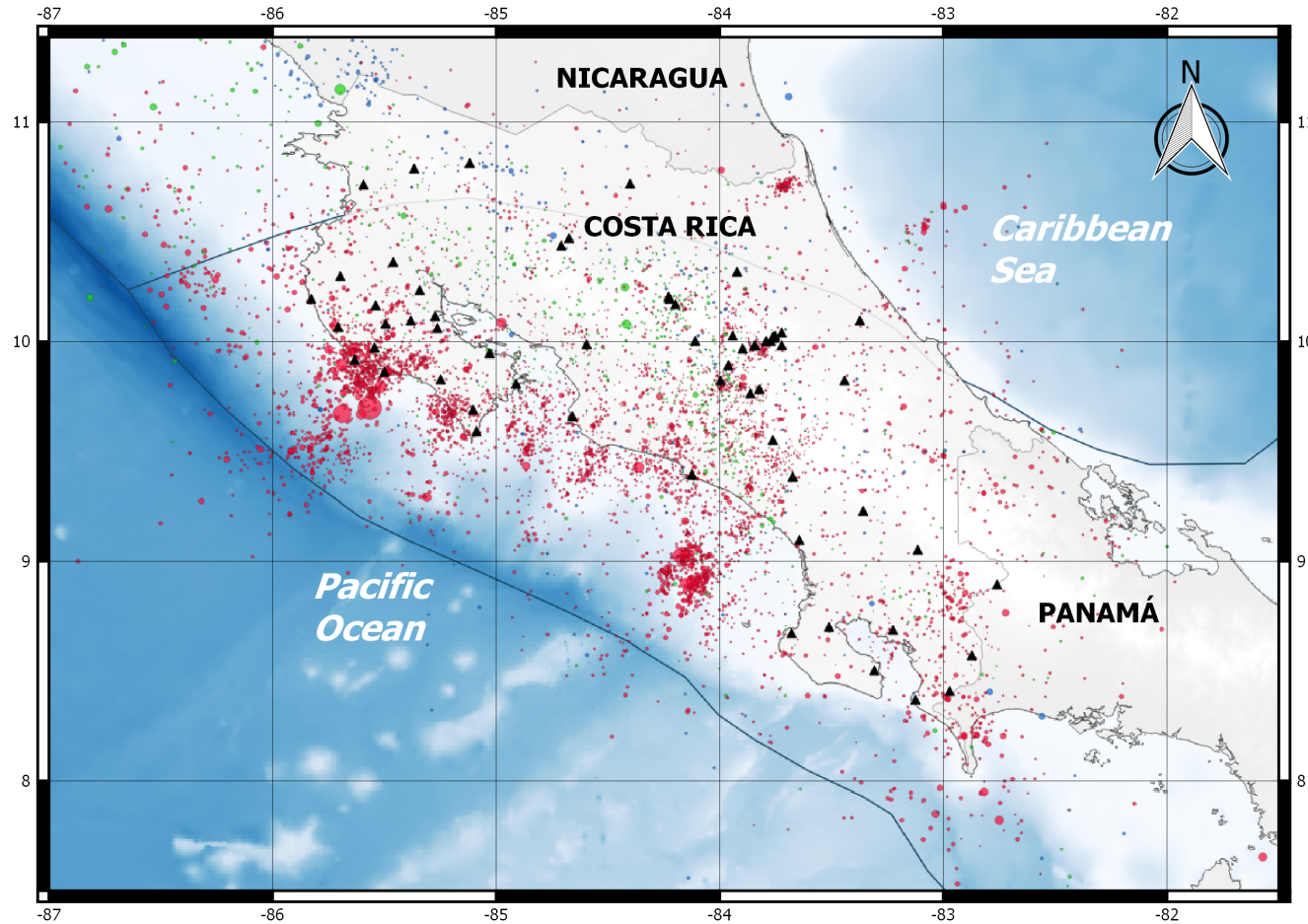


OVSICORI-UNA Seismic Network and Seismicity in Costa Rica



- OVSICORI-UNA operates and maintains a broadband, strong motion and short-period seismic network of about 65 seismic stations which are streaming the data in near real-time to the datacenter.
- A group of seismic stations are used mainly to register the seismic activity of the volcanoes in Costa Rica. Currently, the most seismic-monitored volcanoes are the Irazú and Turrialba ones.
- There will be new seismic deployments of seismic stations in order to improve seismic monitoring and the geospatial distribution control the EQ location.

Current seismic stations (black triangles) and the earthquakes located during the year 2012.



Automatic Earthquake Location and Disemination



- We use ANTELOPE and SeisComP3 seismic software to process the seismic data automatically in order to obtain automatic solutions in near real-time.
- We have a basic program to cast automatically possible volcano eruption in progress based on RMS amplitude using two seismic stations.
- We provide information to the public for both seismic and volcano activity as soon as the automatic systems cast their results.
- Since the automatic systems are not perfect or at least precise as they are when there is human intervention, it is necessary to have basic algorithm to check the quality or validate the results automatically.



Automatic Earthquake Location and Dissemination



Earthquakes

Validation

- Read the configuration file
- Check if the automatic EQ solution meets basic conditions established by the users.

Filters

- The automatic solutions must have:
 - A maximum RMS
 - A minimum Acimutal Coverage
 - Minimum number of Stations

Reporting

- To the public when the auto-solutions pass the filters. They are reported via:
 - Email
 - SMS
 - Social Networks

Volcano Eruptions – Turrialba Volcano

Evaluation

- Quantify the RMS for a seismic station which is close to the volcano.
- Check if the RMS value is over the minimum threshold for about 3 minutes.
- Compare the RMS values with another station to discard fake reports for regional and teleseismic events.

Reporting

- An SMS is cast to the scientific and technical staff of OVSICORI as well as stakeholders.





Thank you!

