

Integration of SeisComp Quality Control Data and Datalogger State of Health information in Zabbix



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INTRODUCTION

IGEPN runs 150 stations across Ecuador, using SeisComp for data collection and quality control (QC). Dataloggers like Reftek and Quanterra also provide State of Health (SOH) metrics. We use Zabbix software to monitor station statuses, alert for issues, and preempt problems using QC and SOH.

METHODS/DATA

We developed a Python module to link SeisComp and Zabbix, transmitting QC data, and another to extract and send SOH information from Reftek to Zabbix. In Zabbix, we crafted a template featuring items, graphs, triggers, and alerts to monitor the 150 stations.

START

RESULTS

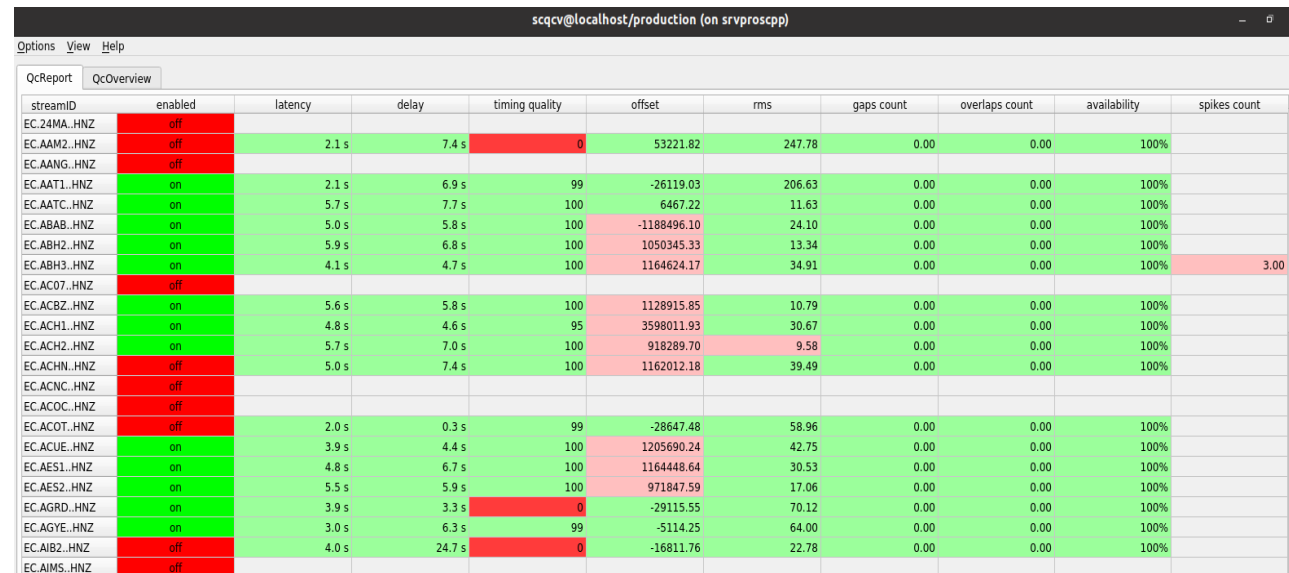
The module SCZABBIX has been working at IGEPN since August 2020. It has stored around 100 GB of QC data.

CONCLUSION

The main graphs used to monitor and troubleshoot are `sc_ping_availability` and `sc_ping_response` both useful to check if a station has connectivity issues. New Zabbix trend functions are valuable to trigger long-term alerts.

Geophysical Institute in Ecuador uses SeisComP for acquisition of the waveforms provided by the National Seismometer and Accelerometer Network. Everyday around 150 stations transmit their data to Centro Terras located at IGEPN building.

SeisComP has several modules like SCQC, SCQCV, QCLOG, etc. that allow the operator to check the quality of the waveforms acquired, nevertheless the module's interfaces could be difficult to use and not very interactive.



streamID	enabled	latency	delay	timing quality	offset	rms	gaps count	overlaps count	availability	spikes count
EC.24MA..HNZ	off									
EC.AAM2..HNZ	off	2.1 s	7.4 s	0	53221.82	247.78	0.00	0.00	100%	
EC.AANG..HNZ	off									
EC.AAT1..HNZ	on	2.1 s	6.9 s	99	-26119.03	206.63	0.00	0.00	100%	
EC.AATC..HNZ	on	5.7 s	7.7 s	100	6467.22	11.63	0.00	0.00	100%	
EC.ABAB..HNZ	on	5.0 s	5.8 s	100	-1188496.10	24.10	0.00	0.00	100%	
EC.ABH2..HNZ	on	5.9 s	6.8 s	100	1050345.33	13.34	0.00	0.00	100%	
EC.ABH3..HNZ	on	4.1 s	4.7 s	100	1164624.17	34.91	0.00	0.00	100%	3.00
EC.AC07..HNZ	off									
EC.ACBZ..HNZ	on	5.6 s	5.8 s	100	1128915.85	10.79	0.00	0.00	100%	
EC.ACH1..HNZ	on	4.8 s	4.6 s	95	3598011.93	30.67	0.00	0.00	100%	
EC.ACH2..HNZ	on	5.7 s	7.0 s	100	918289.70	9.58	0.00	0.00	100%	
EC.ACHN..HNZ	off	5.0 s	7.4 s	100	1162012.18	39.49	0.00	0.00	100%	
EC.ACNC..HNZ	off									
EC.ACOC..HNZ	off									
EC.ACOT..HNZ	off	2.0 s	0.3 s	99	-28647.48	58.96	0.00	0.00	100%	
EC.ACUE..HNZ	on	3.9 s	4.4 s	100	1205690.24	42.75	0.00	0.00	100%	
EC.AES1..HNZ	on	4.8 s	6.7 s	100	1164448.64	30.53	0.00	0.00	100%	
EC.AES2..HNZ	on	5.5 s	5.9 s	100	971847.59	17.06	0.00	0.00	100%	
EC.AGRD..HNZ	on	3.9 s	3.3 s	0	-29115.55	70.12	0.00	0.00	100%	
EC.AGYE..HNZ	on	3.0 s	6.3 s	99	-5114.25	64.00	0.00	0.00	100%	
EC.AIB2..HNZ	off	4.0 s	24.7 s	0	-16811.76	22.78	0.00	0.00	100%	
EC.AIMS..HNZ	off									

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- Enhance quality control data accessibility.
- Use quality control data to automatically identify problems with the stations.
- Take advantage of the features available in Zabbix to perform quality control on the seismic station's waveforms.
- Make the code open-source and available in the following GitHub repositories:
 - SCZABBIX: <https://gitlab.com/wacero/sczabbix.git>
 - SOH_ZABBIX: https://gitlab.com/wacero/soh_zabbix



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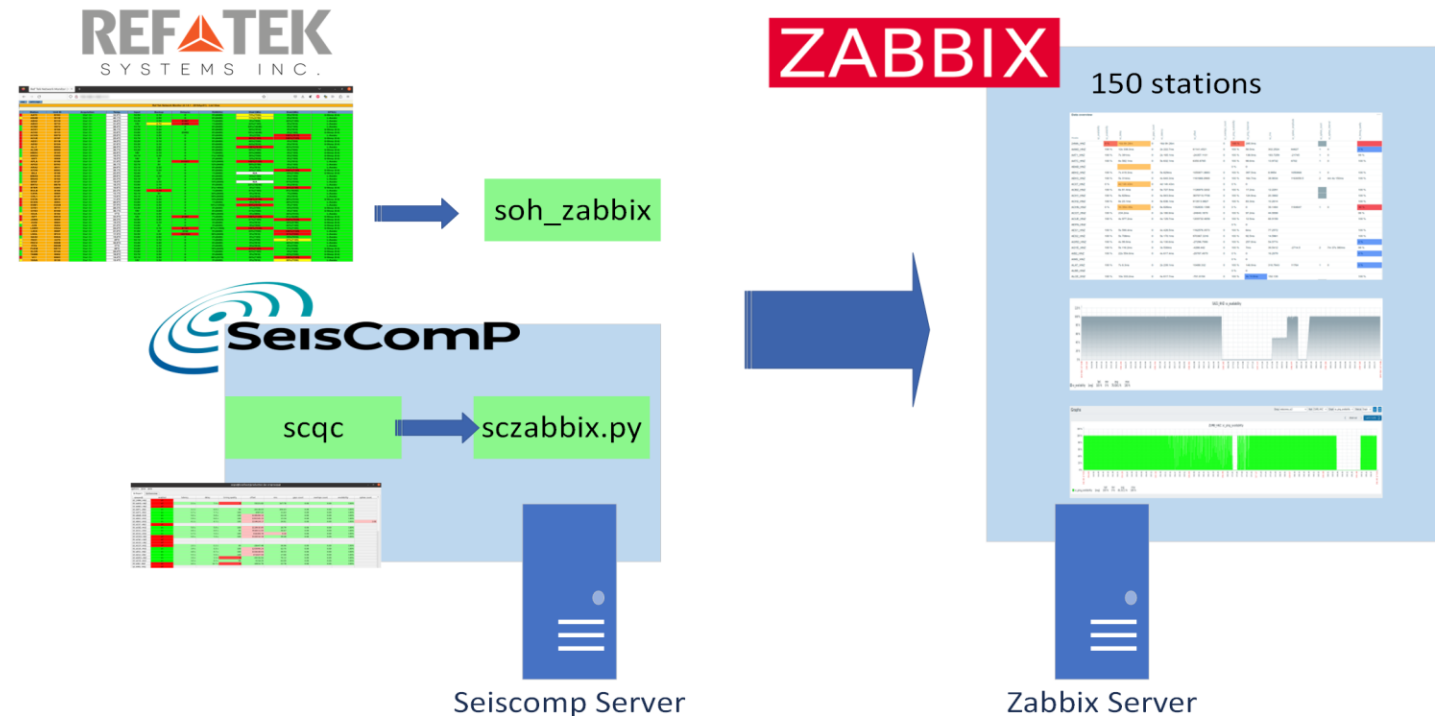
We used Python to create a module, `sczabbix.py`, that connects to SeisComP message system, capture QC messages and send them to Zabbix.

Another module, `soh_zabbix.py`, extract SOH information from Reftek SOH web page and also send this information to Zabbix.

We created a Zabbix template with items, graphs, triggers and alerts.

This template was used to create 150 hosts (stations).

Zabbix API allowed to automate this process.



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The module SCZABBIX has been working at IGEPN since august 2020. It has stored around 125 GB of QC data.

The status of all IG stations can be efficiently evaluated through Zabbix's comprehensive overview dashboard.

The screenshot shows the ZABBIX monitoring dashboard. The 'Data overview' section displays a table of hosts and their various metrics. The 'Problems' section shows a list of active issues with their details.

Hosts	sc_availability	sc_delay	sc_gaps_count	sc_latency	sc_offset	sc_overlaps_count	sc_ping_availability	sc_ping_response	sc_rms	sc_spikes_amplitude	sc_spikes_count	sc_spikes_interval	sc_timing_quality
24MA_HNZ							100 %	175.8ms					0 %
AAM2_HNZ	100 %	7s 555ms	0	2s 166.8ms	52711.1806	0	100 %	100.2ms	251.3102	54089	1	0	99 %
AAT1_HNZ	100 %	6s 939.1ms	0	2s 223.8ms	-25373.0778	0	100 %	223.4ms	195.4955	-24650	1	0	100 %
AATC_HNZ	100 %	6s 935.4ms	0	5s 708.6ms	6435.8753	0	100 %	154ms	15.6748				100 %
ABAB_HNZ							100 %	78.1ms					
ABH2_HNZ	100 %	7s 50.8ms	0	5s 731.5ms	1049187.8115	0	100 %	773.3ms	9.5152	1051922	3	1m 37s 815ms	100 %
ABH3_HNZ	100 %	5s 401.3ms	0	4s 816.3ms	1162598.1146	0	100 %	695.9ms	29.8955	1164108	1	0	100 %
AC07_HNZ							0 %	0					
ACBZ_HNZ	100 %	4s 558.8ms	0	4s 428.3ms	1128642.3423	0	100 %	25.2ms	19.7933				100 %
ACH1_HNZ	100 %	5s 104.9ms	0	5s 199.5ms	3675719.7706	0	100 %	438.1ms	20.3902				100 %
ACH2_HNZ	100 %	6s 912ms	0	5s 723.3ms	913513.9827	0	100 %	663.1ms	10.2014	919792	1	0	100 %
ACHN_HNZ	100 %	8s 112.8ms	0	4s 881.3ms	1161726.342	0	100 %	339.7ms	42.8624				100 %
ACOT_HNZ	100 %	242.8ms	0	2s 156.4ms	-28233.317	0	100 %	88.7ms	57.5231				99 %

Time	Info	Host	Problem	Severity	Duration	Ack
16:56:09		PAS1_HHZ	sc_availability_ping	No	11m 38s	No
16:49:14		APLA_HNZ	sc_ping_response	No	18m 34s	No
16:37:20		ASDO_HNZ	sc_delay	No	30m 28s	No
16:37:11		PECV_SHZ	sc_timing_quality	No	30m 37s	No
16:37:06		CUSW_HHZ	sc_delay	No	30m 42s	No
16:37:02		CAB1_HHZ	sc_spikes_count	No	30m 46s	No
16:27:39		GGPC_HHZ	sc_spikes_count	No	40m 9s	No
16:00						
15:19:33		TAMB_SHZ	sc_spikes_count	No	1h 48m 15s	No
15:00						
14:49:14		SAG1_HHZ	sc_spikes_count	No	2h 18m 34s	No
14:00						
12:36:01		CHSH_HHZ	sc_spikes_count	No	4h 31m 47s	No
12:02:26		ARAZ_SHZ	sc_spikes_count	No	5h 5m 22s	No
12:00						
10:37:50		APLP_HNZ	sc_availability_ping	No	6h 29m 58s	No



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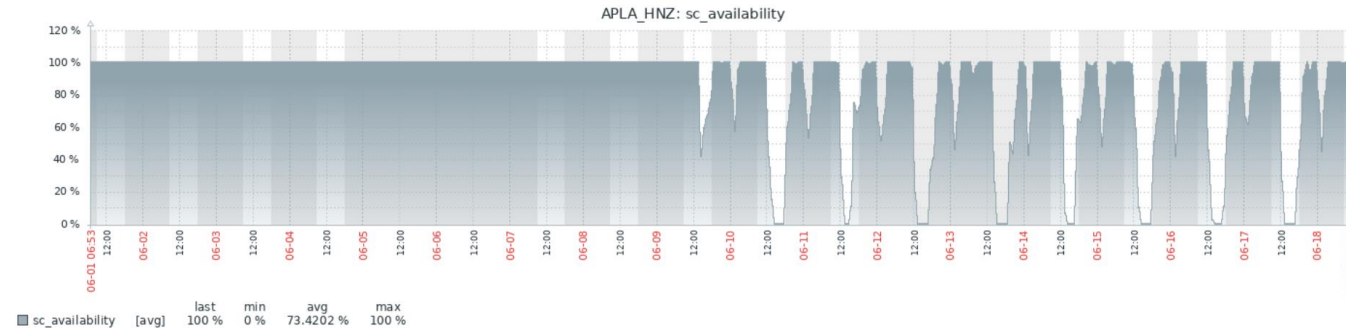
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The main graphs and triggers used to monitor and troubleshoot stations are:

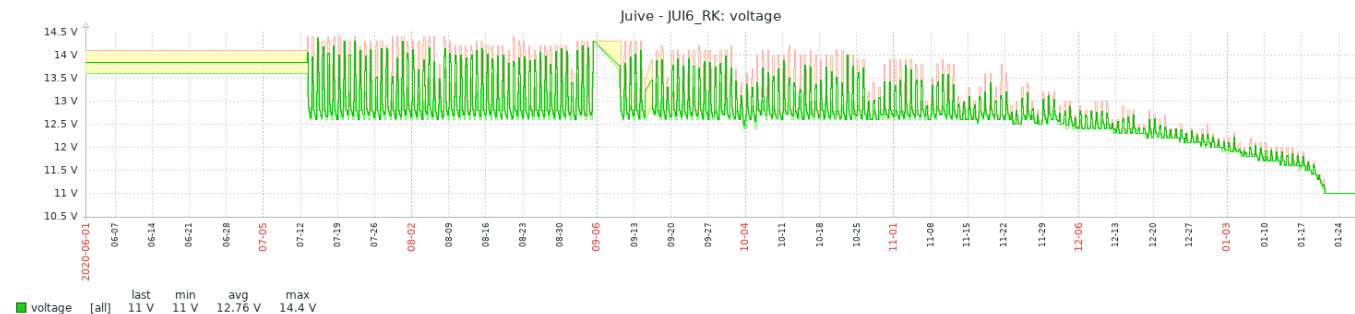
sc_availability:
 completeness of the data.



sc_ping_availability and sc_ping_response: useful to check if a station has connectivity issues.

sc_timing_quality: if this value is different that 100% over a long period of time, it may indicate problems with the station GPS, as it has been the case with GURALP dataloggers.

- Zabbix trend functions allow the creation of triggers and alerts based on long-term analysis.



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- Source code of the SCZABBIX module, <https://gitlab.com/wacero/sczabbix>
- Source code of the SOH_ZABBIX: https://gitlab.com/wacero/soh_zabbix
- SeisComP documentation, <https://www.seiscomp.de/doc/>
- Zabbix web page, <https://www.zabbix.com/>
- SCQC module documentation, <https://www.seiscomp.de/doc/apps/scqc.html>



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