

# Seismic data management in NZ – trying to cater for volcano requirements

Steven Sherburn, Pasan Herath, Jerome Salichon  
EOS-NTU volcano-seismic data workshop, November 2025

# GeoNet

- Programme in Earth Sciences New Zealand (ESNZ)
- Monitor four perils, and run GNSS network



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- 2025-26 budget - NZD 33 mill (USD 19 mill)
  - About 65 people (core)
  - 2026-27 - 12% funding decrease, then stable

# We collect all types of volcano data

GNSS

InSAR

Water  
chemistry

DOAS  
SO<sub>2</sub>

Temperature

Water  
level

Seismic  
hypocentres

Gas  
chemistry

MultiGas

Flow  
rate

Rainfall

RSAM

SSAM

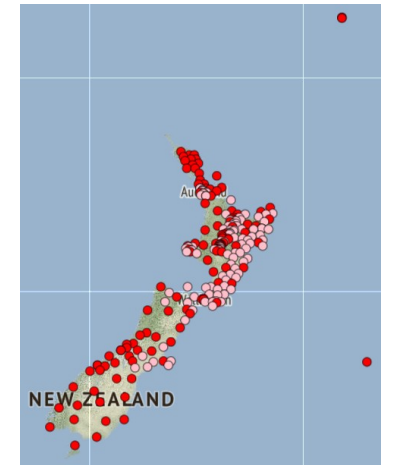
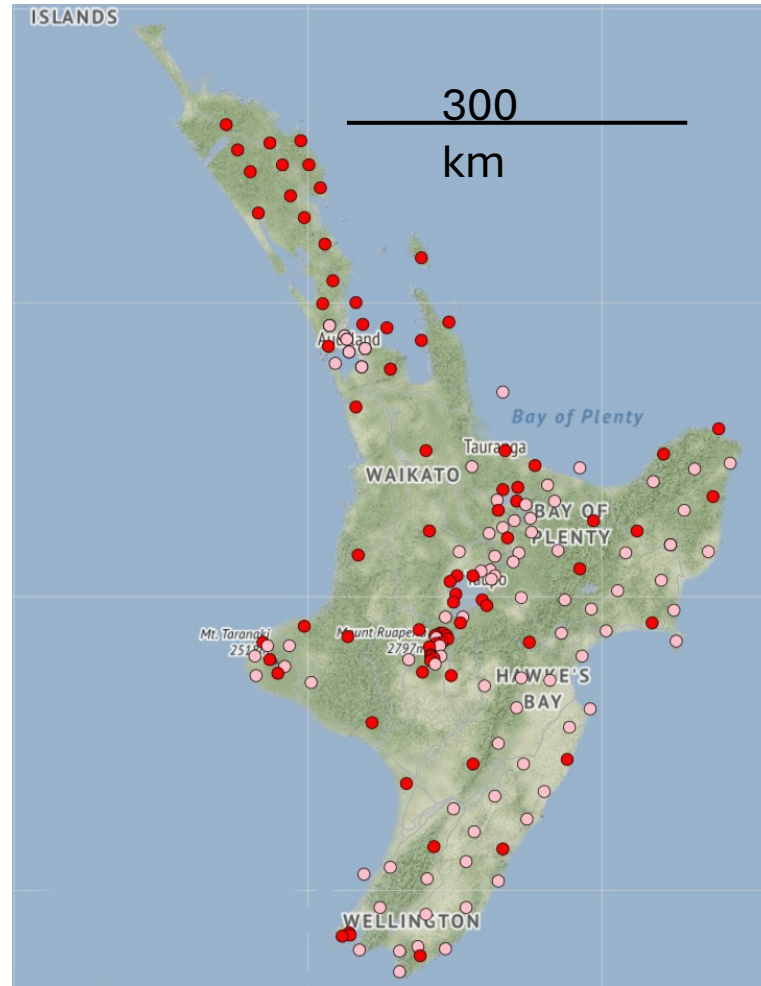
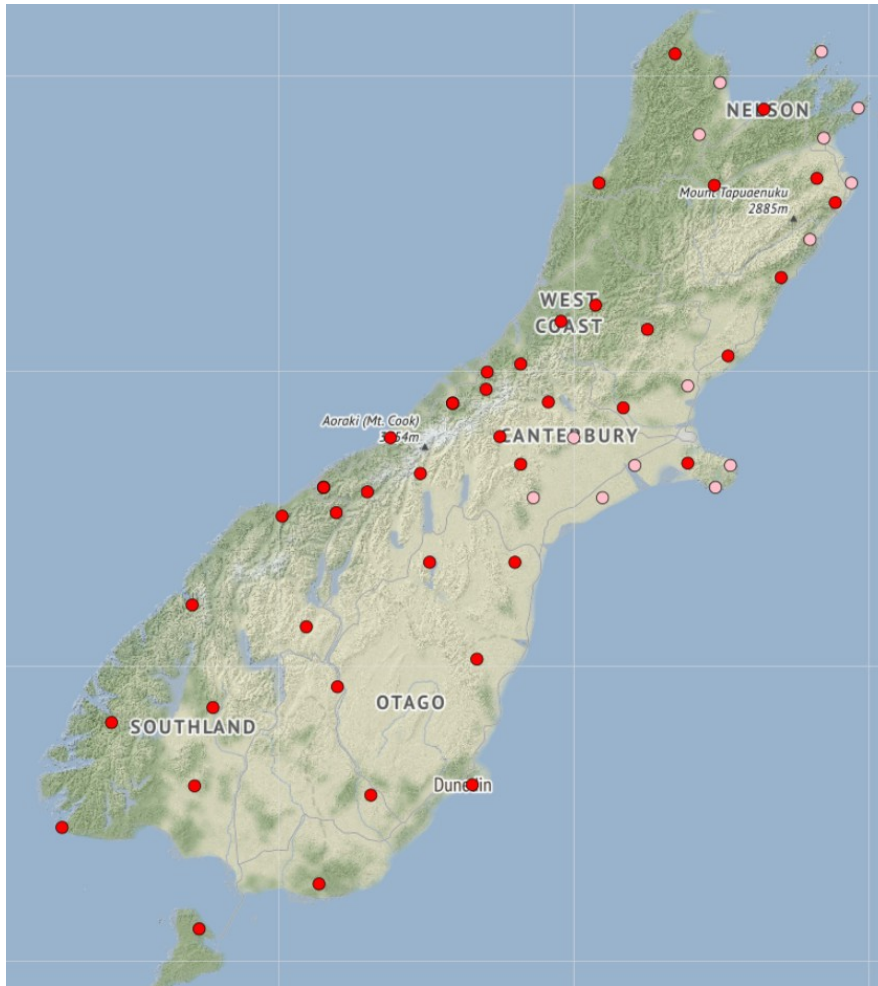
Gas  
emission  
rates

Photo

Video


Observations

# Seismic network

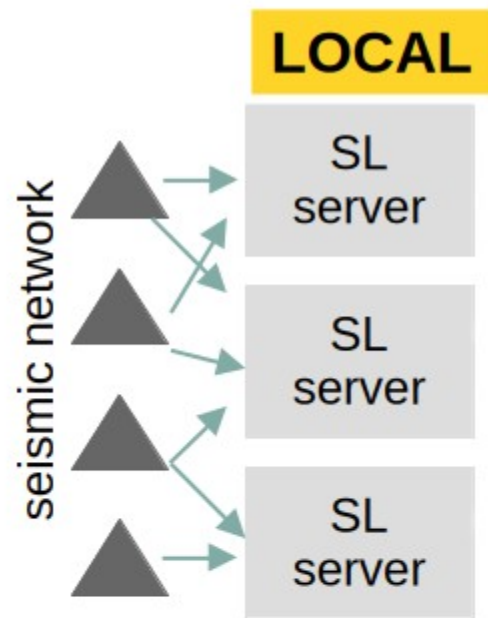


weak motion  
stations  
~225

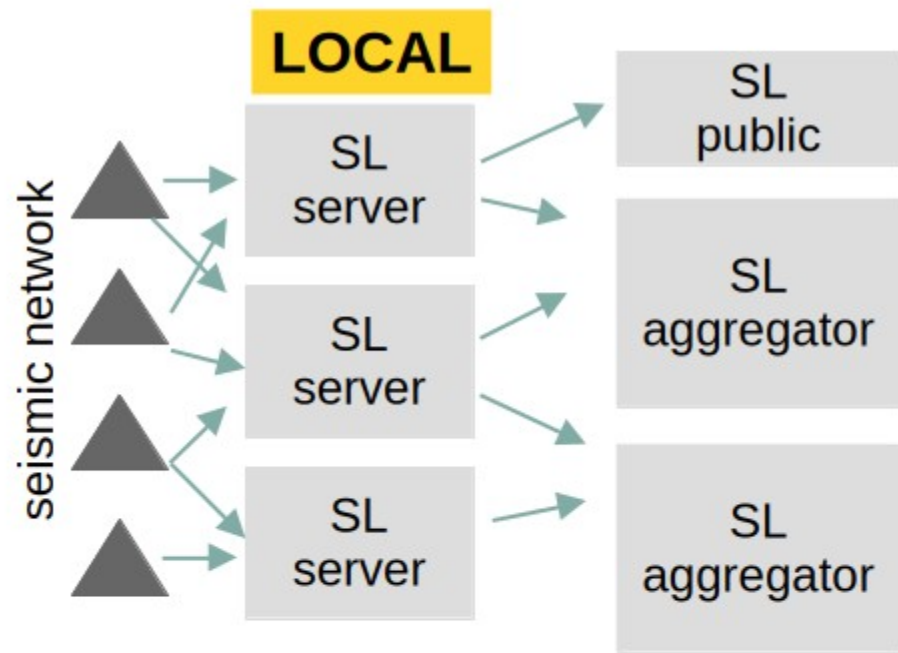
seismic network



SeedLink (SL) = data transport mechanism  
Miniseed = data at rest format

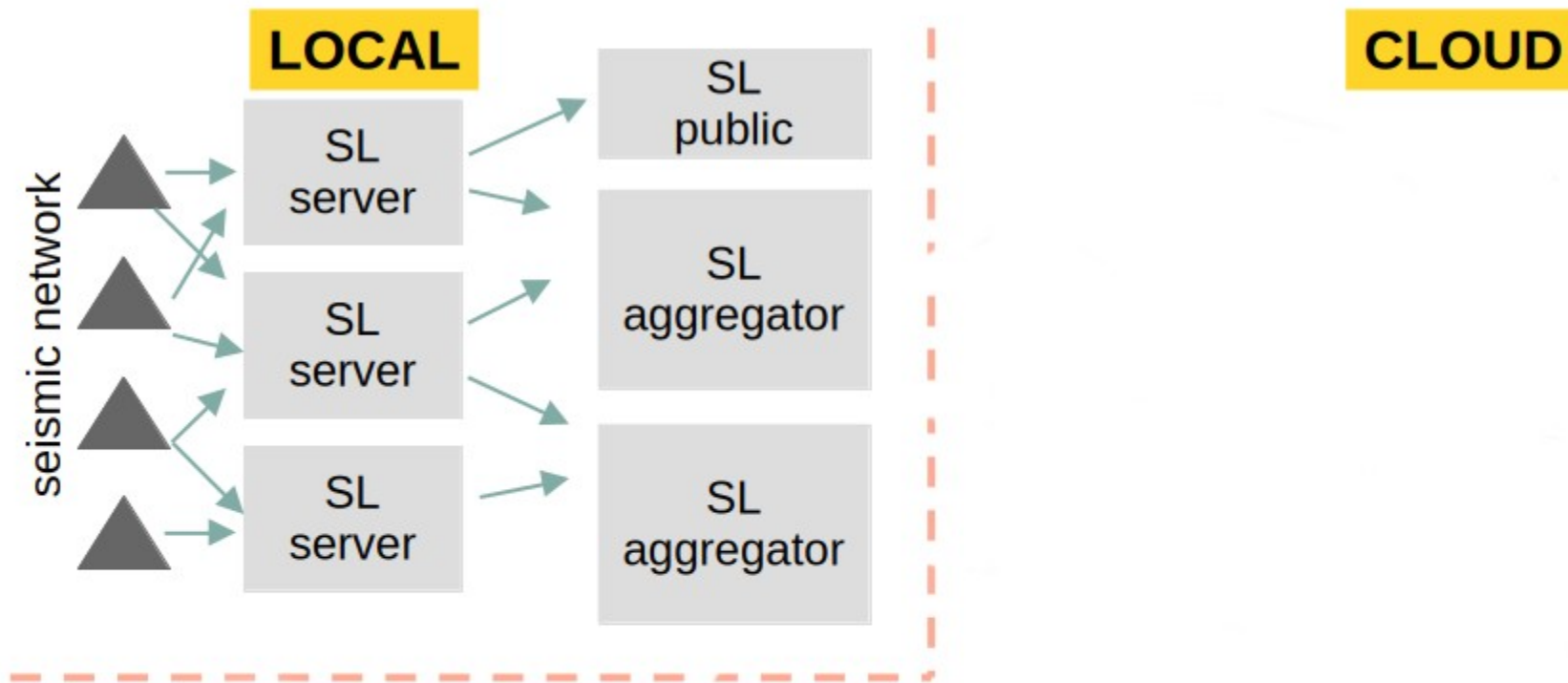


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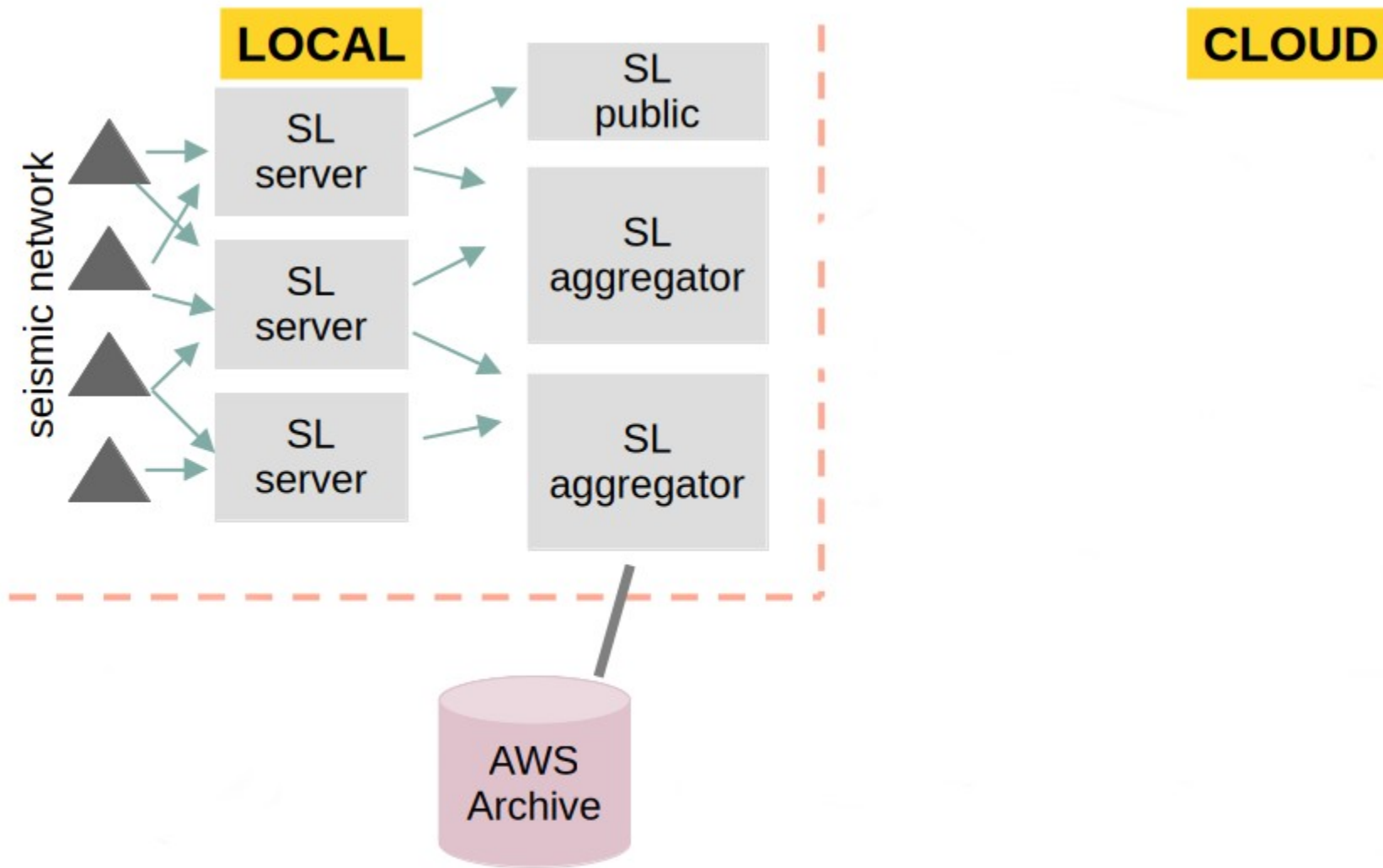


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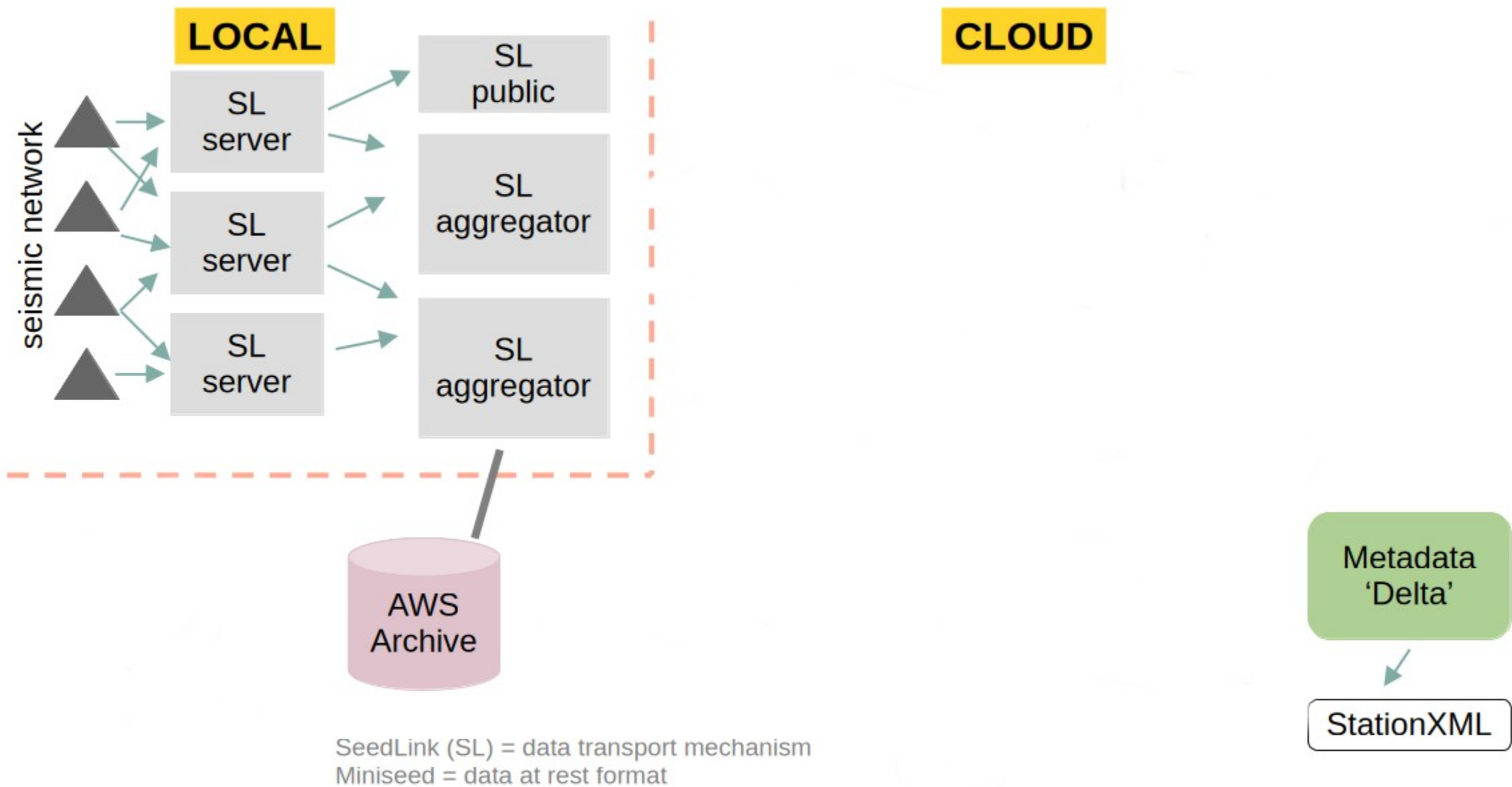


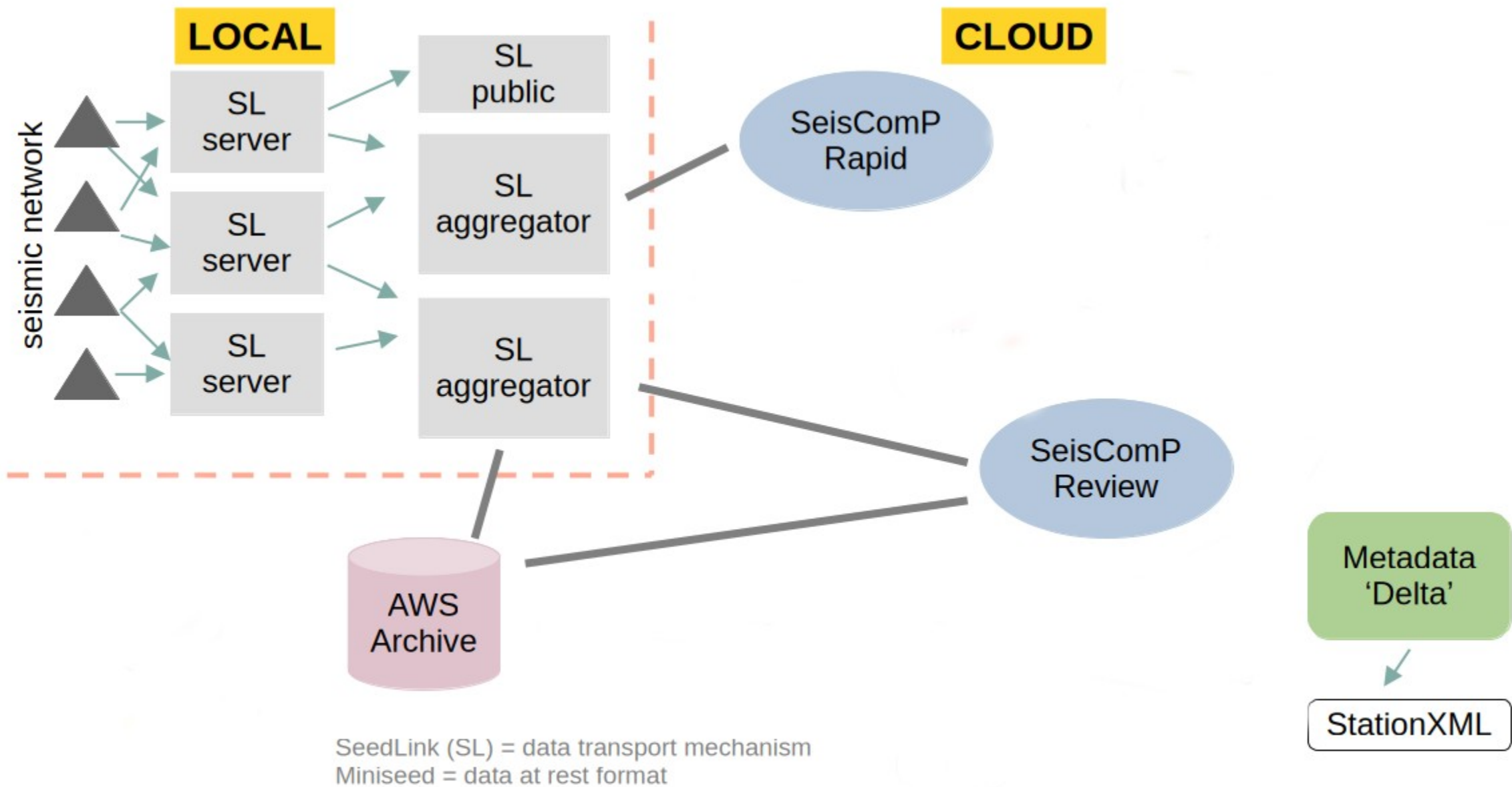


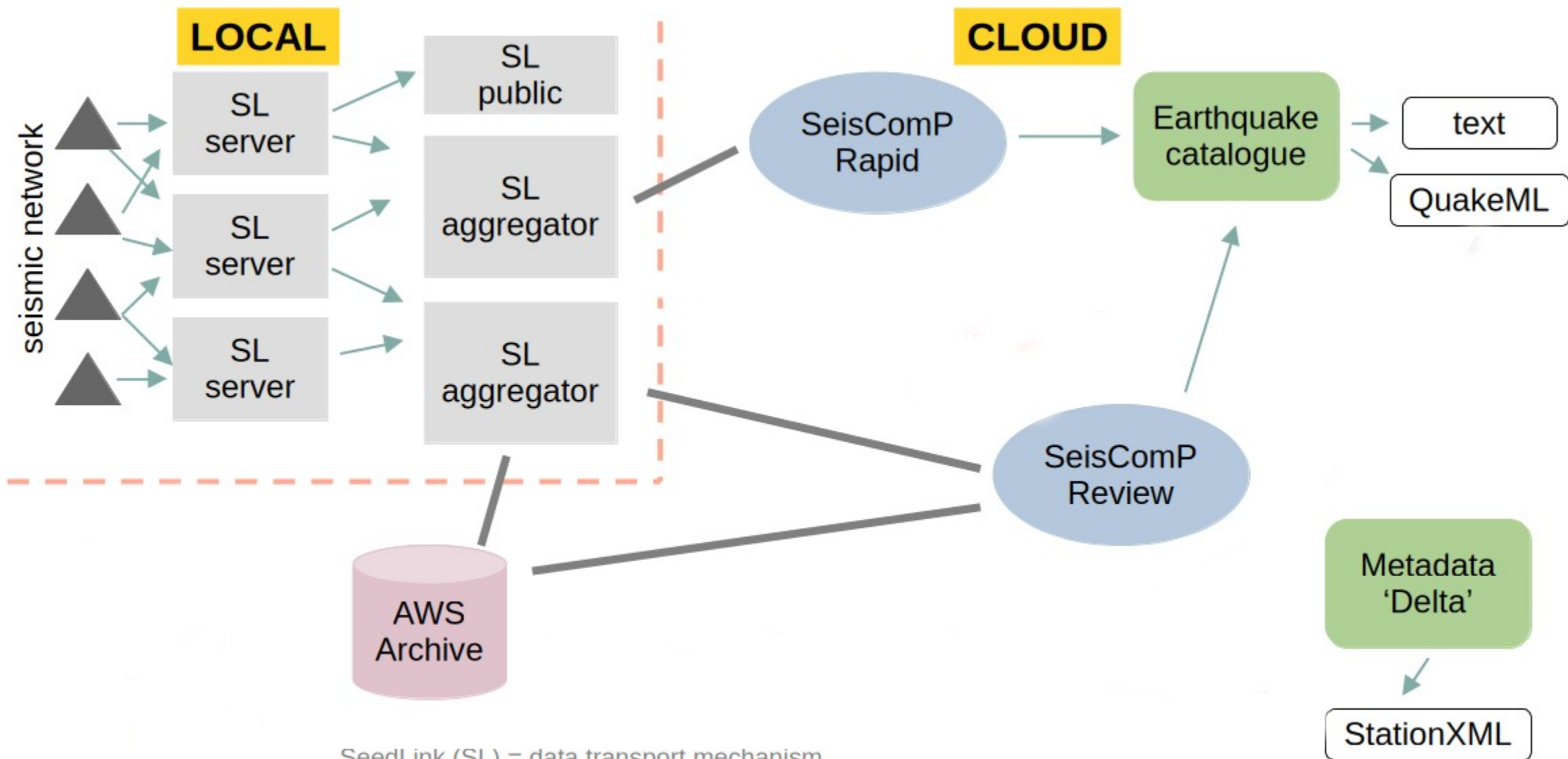
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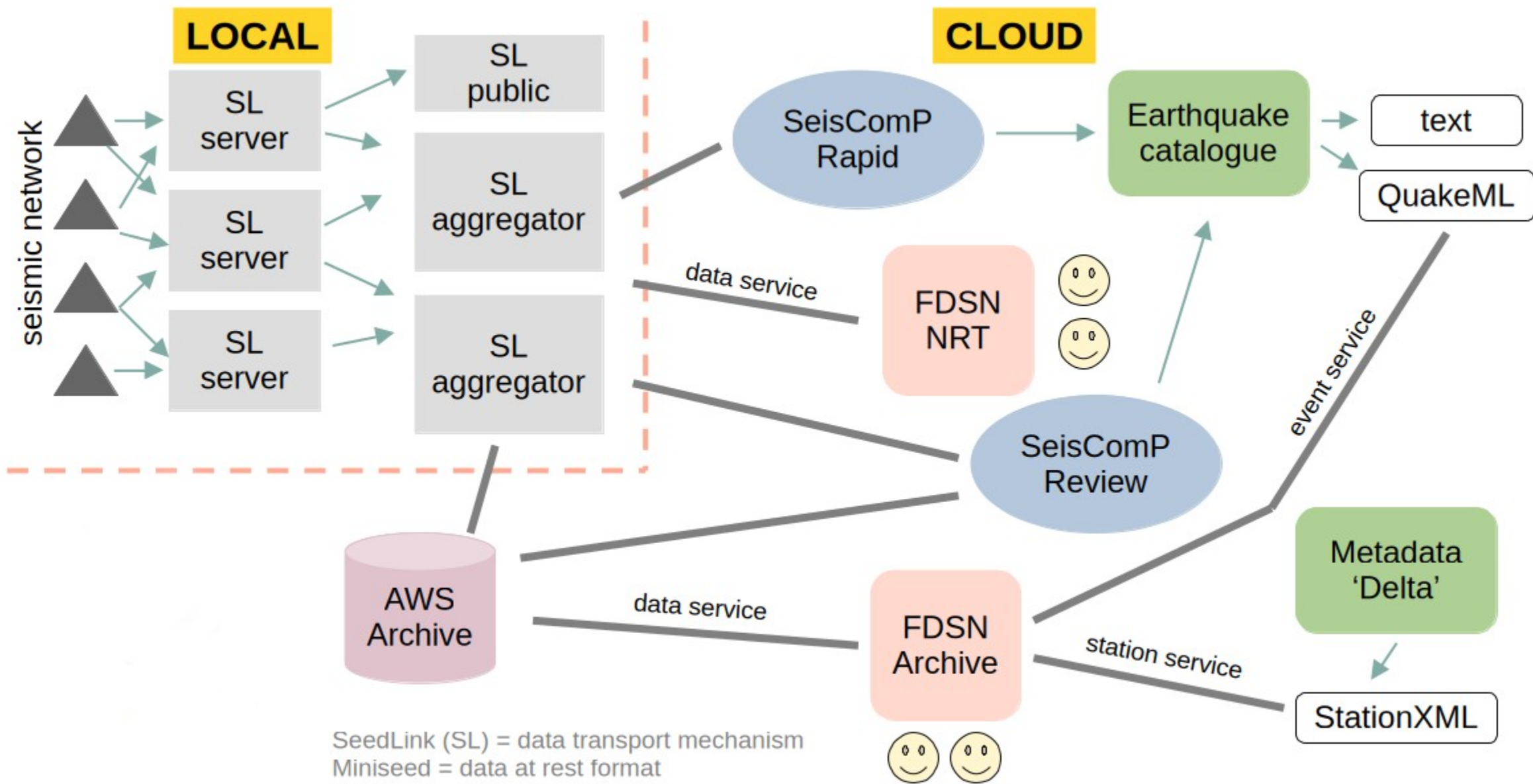
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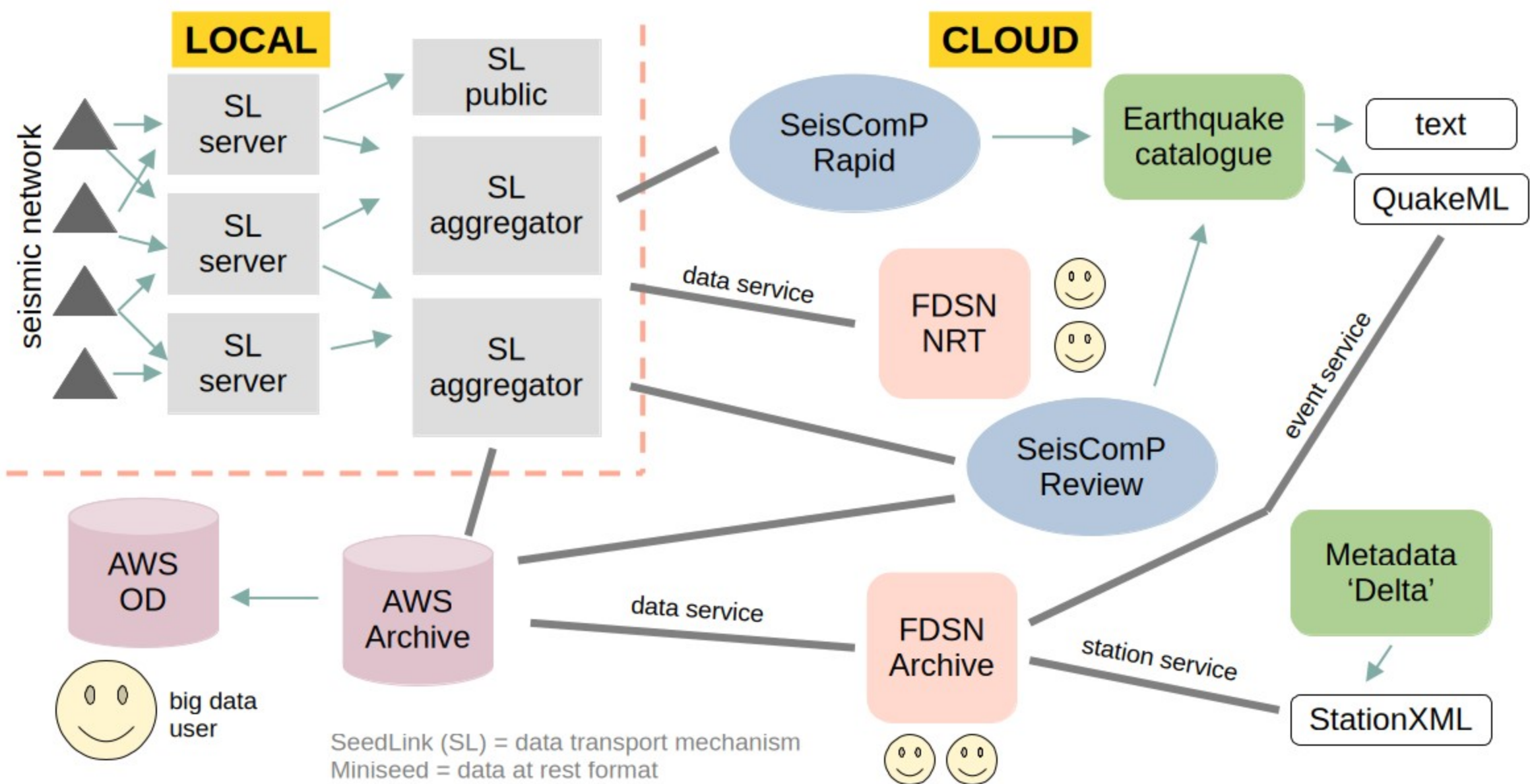












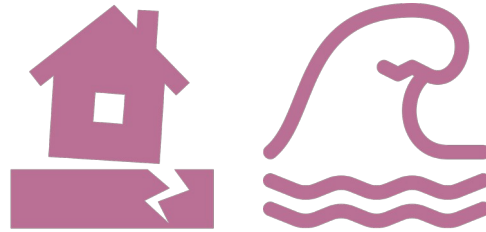
# Our seismic analysis system

- SeisComP ver 6.7
  - Acquisition, processing, interactive analysis



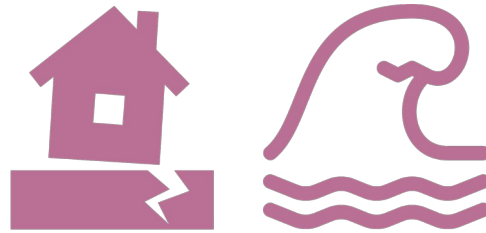
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- Earthquake catalogue about 20,000 earthquakes located each year




# Seismic metadata

- Public GitHub repository, all purpose instrument network database
  - <https://github.com/GeoNet/delta> - CSV files
  - Single source of truth for SeisComP and other applications

## DELTA

Meta information for the GeoNet sensor network, please cite as <https://doi.org/10.21420/0VY2-C144>.

 Delta configuration management passing

### network

Geographical and equipment grouping meta data.

- see [further details about the network files](#)

```
sites.csv:MAVZ,11,-39.2679133,175.5616533,2624.1,,NZGD2000,...
```

```
sites.csv:MAVZ,30,-39.2679133,175.5616533,2624.1,,WGS84,...
```

```
stations.csv:MAVZ,CH,Matarangi,-39.2679133,175.5616533,2624.1,...
```

### environment

# FDSN webservice data access

- For most users

FDSN  
NRT

- near real-time, delay 1-5 mins
- data for last 8 days

FDSN  
Archive

- archive, emphasise data completeness
- newest data 7 days old

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- Data service – miniseed
- Event service – QuakeML or text
- Station service – FDSN StationXML or text

# Other data access



- AWS Open Data, for bulk access - AWS pay data access costs

```
aws s3 --no-sign-request cp s3://geonet-open-data/waveforms/miniseed/2025/2025.001/MAVZ.NZ/2025.001.MAVZ.11-HHZ.NZ.D .
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- ObsPy FDSN client, [service.geonet.org.nz](https://service.geonet.org.nz) = GEONET
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- Public seedlink server – for monitoring agencies only



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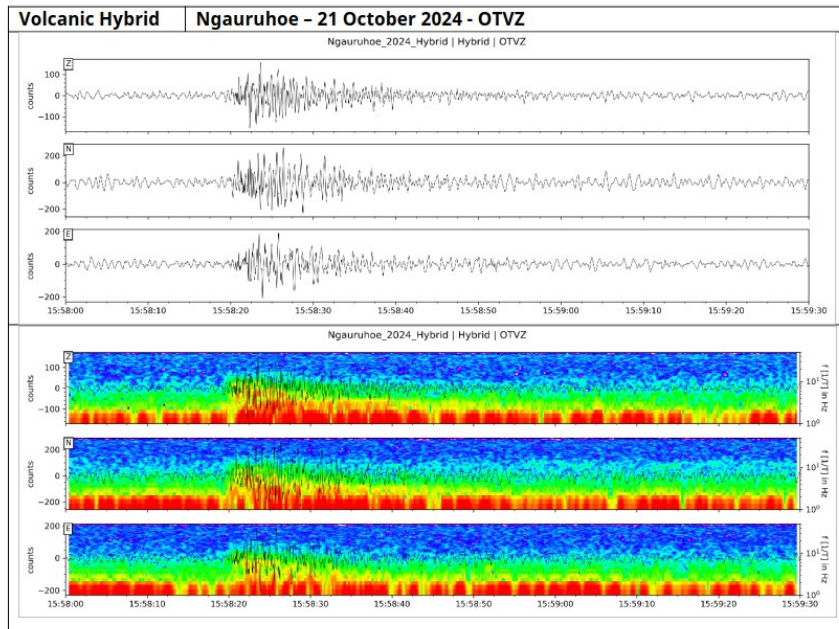
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  - 10 station threshold – associate picks to an event
  - Configuration – scautopick, scanloc, cc-detection, hypodd, etc
- Event types – now available

# Volcanic event types in SeisComP

## 5.4 Volcanic hybrid

- Discrete seismic signal of volcanic origin. Has an identifiable start and end.
- Waveform resembles a tectonic (or volcano-tectonic) earthquake with a volcanic long-period earthquake superimposed on the later part of the signal.
- The initial part of the waveform has a volcano-tectonic-like frequency content and the later part that of a volcanic long-period event.
- No acoustic-infrasound signal present.

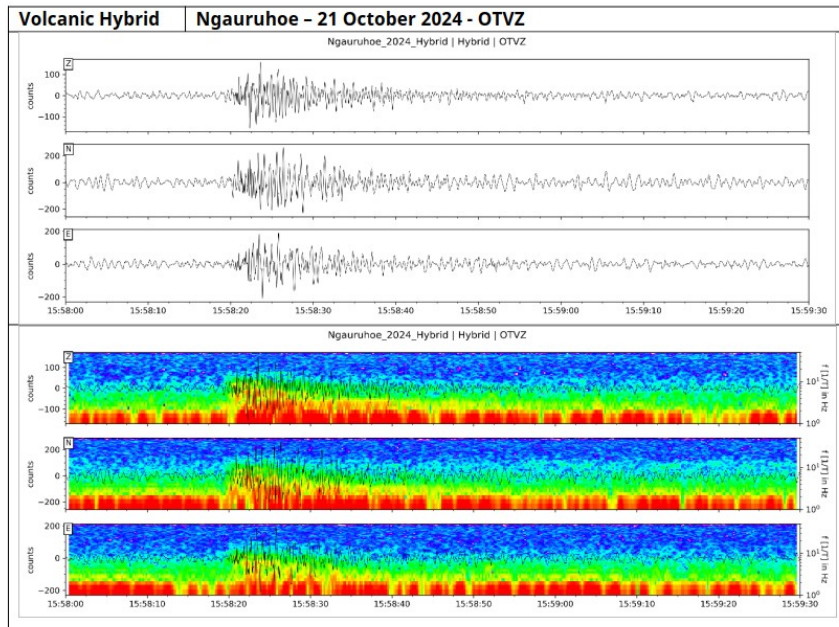


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- Volcanic hybrid
- Volcanic tremor
- Tremor pulse
- Volcano-tectonic
- Volcano rockfall
- Lahar
- Pyroclastic flow
- Eruption

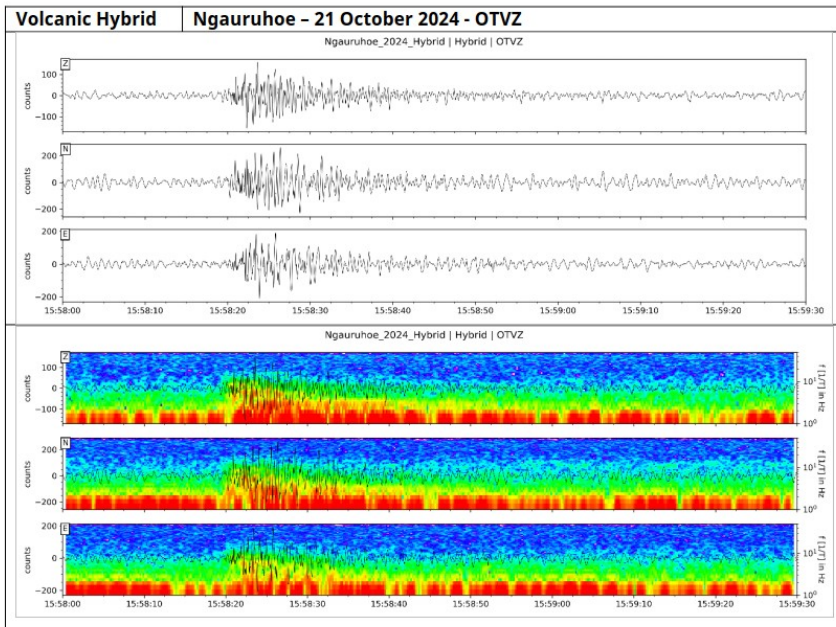


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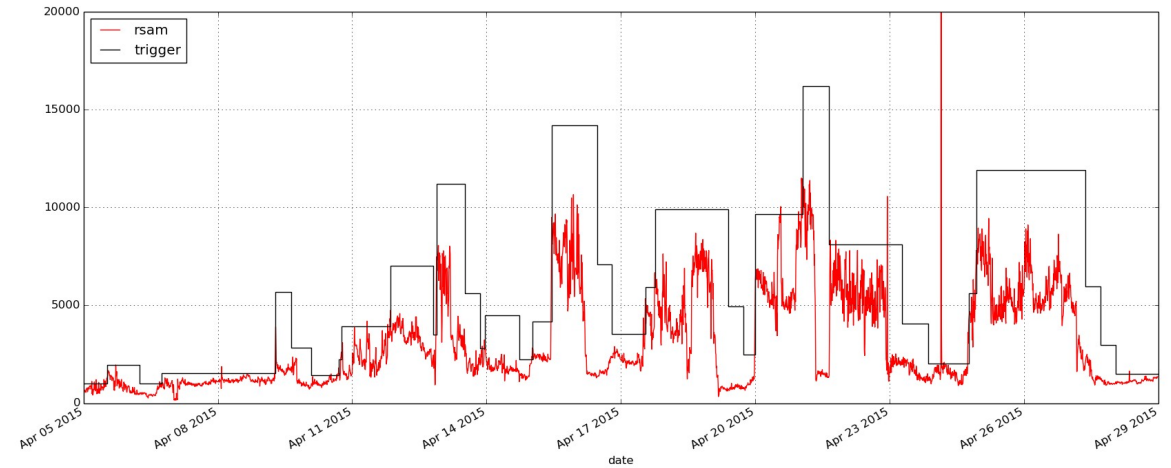
- QuakeSearch
- FDSN event service
- NOT QuakeML = “other”



# RSAM

Alerting

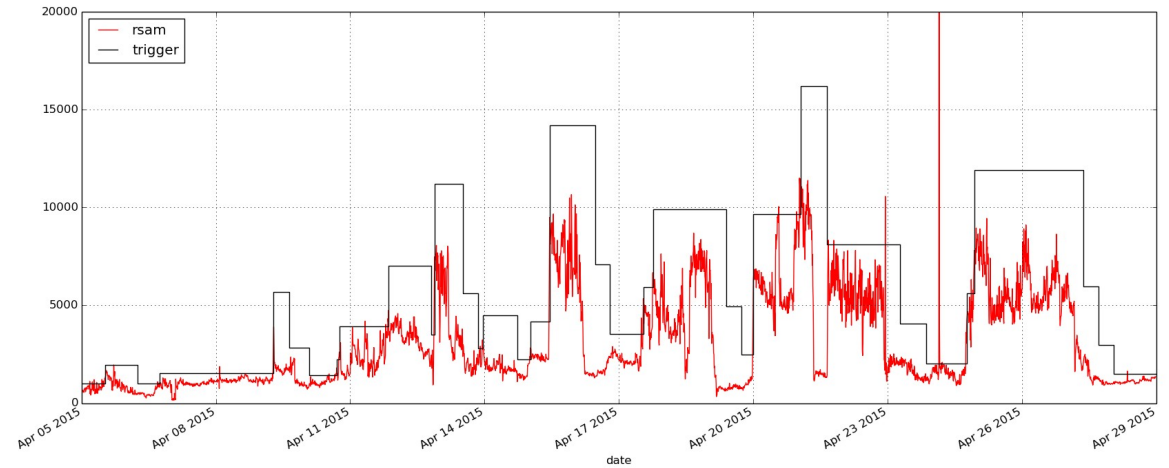
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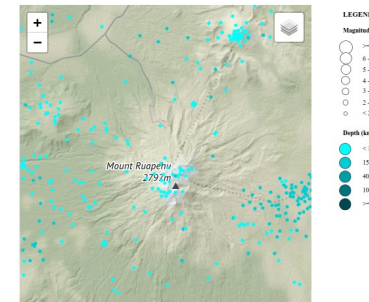
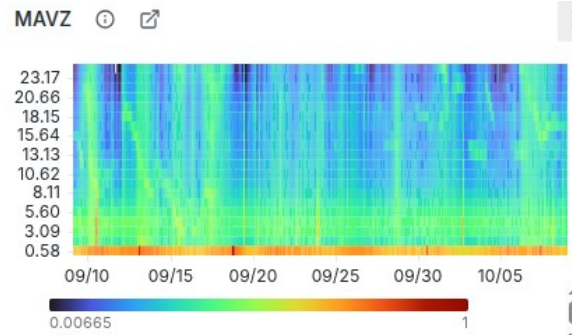
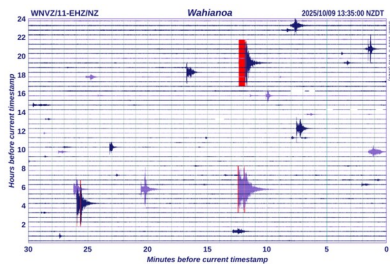
- Graphing and analysis – different application
- Internal API
- No 24/7 support
- Data not publicly available

# On-call volcanologist – VDO (Volcano Duty Officer)

- NGMC (24/7) escalates to VDO

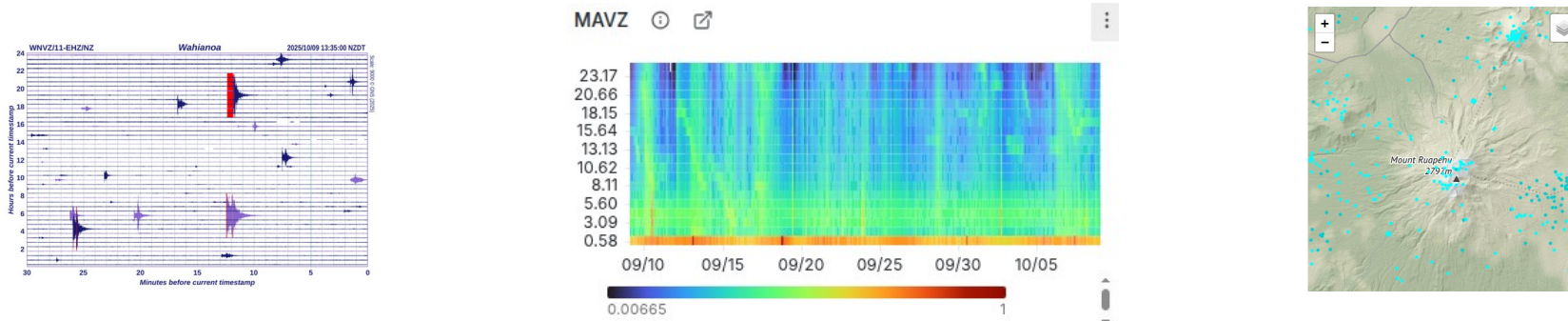
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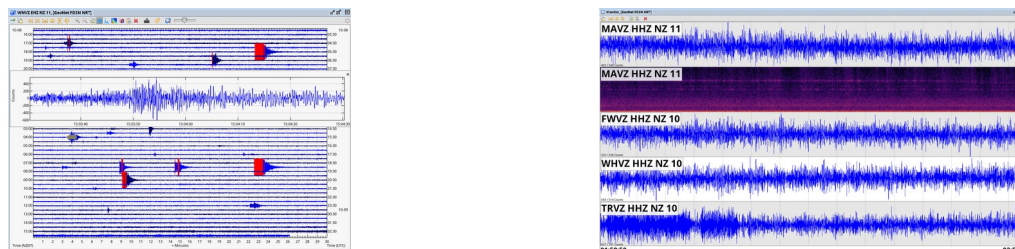


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- Swarm for response – eruption confirm/deny



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- SeisComP sandbox environments for testing
  - Isolated testing space
- Volcano/region specific versions
- Configurations and modules not used in Rapid or Review
- Test VORTEX as an alternative to Swarm





# An ideal future

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- RSAM publicly available

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- SeisComP versions configured for each volcano or region
- RSAM publicly available
- Able to quickly adapt to changes and unrest

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- But standardisation can be difficult, standards can be slow to adapt
- Volcano data are complex and varied
- Volcano earthquakes are different from tectonic earthquakes
- GeoNet systems require compromise, balancing needs of four perils + GNSS
- Our robust, secure systems can be slow to adapt to changing needs