GFZ POTSDAM

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Outline of the Self-Organising Seismic Early Warning Information Network

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Introduction

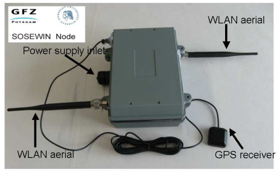
The Self-Organising Seismic Early Warning Information Network (SOSEWIN) is being developed as part of the SAFER (Seismic eArly warning For EuRope) and EDIM (Earthquake Disaster Information systems for the Marmara Sea region, Turkey) projects.

The SOSEWIN is characterised by

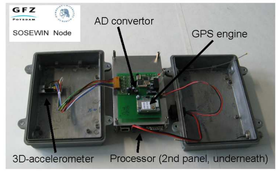
- The sensors or Sensing Nodes (SN) being comprised of low-cost components;
- The reduced sensitivity of the cheaper SN is compensated by the network's density;
- The network is decentralised and is arranged into clusters, each headed by a Leading Node (LN);
- It is self organising and is able to continuously adapt to changing circumstances (e.g. nodes added or removed, local communications breakdown etc.);
- The SN can also measure other (e.g. environmental) parameters.

A long-term aim is for the SN to evolve into units purchasable by the general public, while at the same time still being included in a public early warning system.

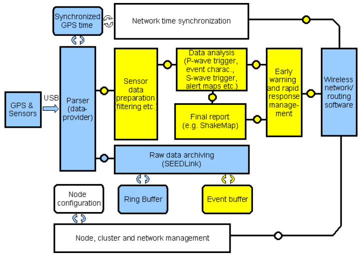
Sensing Nodes



A SOSEWIN sensing node unit.



Internal view of a sensing node.

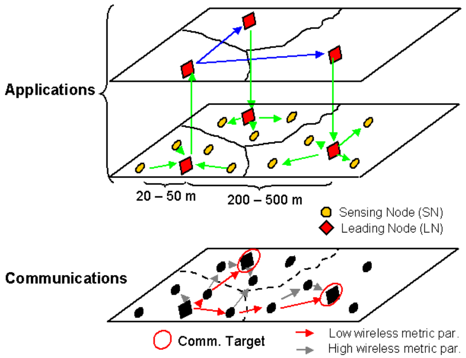


Blue: development fully or almost completed.
Yellow: development in progress.
White: still needs to be developed.

- 4-channel AD convertor for the input.
- 3-component accelerometers and an environmental sensor.
- GPS for location and timing.
- WLAN communications cards and antennas.
- Internal processor 266 MHz.
- Data storage on a flash card (currently 1 Gbyte).

Network organisation

The clustering is defined to maintain optimal communications, with geometrical and seismological considerations secondary. The network is controlled as a series of layers.

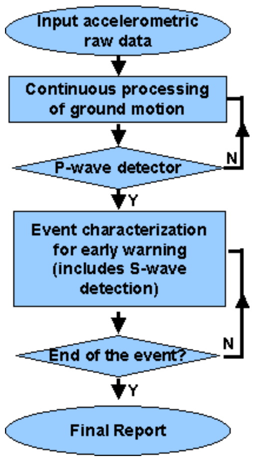


- **Applications** In the lower layer, the SN within a cluster communicate status information, ground motion parameters and triggers to their LN. The higher layer regulates the alarming distribution among the LN.
- **Communications** In this layer the LN communicate with each other and other destinations (e.g. external data centres).

Communications follows the Optimized Link State Routing protocols, a proactive protocol where every node has an image of the complete network.

Seismological processing

Each sensing node undertakes its own seismological processing, using reliable, rapid, yet computationally inexpensive methods.



- Filtering of the 3-component accelerometric data (4th order Butterworth recursive filter).
- Integrating the accelerometric data to velocity and displacement.
- Event detection using the STA/LTA method. This aims to detect the first P waves, using the vertical component.
- Event characterisation, making use of
  - Predominant period,
  - Cumulative absolute velocity,
  - Arias intensity.
  - Detection of S-waves by applying the STA/LTA trigger to the horizontal components.
  - Issuing of alert maps (future work).
- Peak ground motion for the USGS tool ShakeMap.