



Smart Seismic Hardware: New Strategies for networking

Hanna Peters and Philip Hill

Güralp Systems Limited, Aldermaston, United Kingdom

Limitations in communication infrastructures and seismic instrumentation causes difficulties for network operators to install an efficient and accurate seismic network capable of handling the requirements of Earthquake Early Warning Systems (EWS)

Güralp have developed a range of 'smart' seismic hardware which offers a simple interface with advanced on-board processing. The Güralp Minimus digitiser can issue triggered event details and alerts with ultra-low-latency, averaging just 40-60ms delay time (latency) from system triggering to issuing an alert. Güralp Data Interchange, (GDI) is a packetized data transmission protocol used by Güralp hardware which allows seismic waveforms to be transmitted sample by sample, as they are acquired by the instrumentation. To reduce latency, GDI adapts the size of the data packets it sends to suit the bandwidth available in the network. This means that transmission time is absolutely minimised, well suited for EEW networks.

Configurable voting technology within a seismic network can eliminate false positives. Using Güralp's latest technology, individual stations within the network can be assigned as 'masters' and others as 'slaves'. The slave stations send triggered data packets to the master stations for a decision on an action. Each station can be assigned a score representing the importance of the data from that station. The master station consults this score when making a decision of action. The action could be the issuing as an alarm, or transmission of the triggered event data. This approach allows networks to be scalable and robust by increased network redundancy.

If an event is identified the Minimus can use Common Alert Protocol (CAP) to distribute the event data. CAP is the XML based data format used for exchanging and describing public warnings and emergencies. When trigger conditions are met the Minimus can send a signed UDP packet to a configured CAP receiver which can then send the alert via SMS, e-mail or CAP forwarding. The forwarding CAP message can be sent to multiple destinations. This allows for a hierarchical approach where the single station (or network) parameters can be streamed to another Minimus, or data centre, or both, so that there is no one single point of failure.