

Sources of Latency and Associated Design Trade-offs in Earthquake Early Warning Systems

Peter Devanney, David Easton, Ashley Faloon, and Christopher Cordahi
Nanometrics Inc, Marketing, Kanata, Canada (dianamartinez@nanometrics.ca)

Low latency is a key contributor to the success of an Earthquake Early Warning (EEW) system. There are several points where latency is introduced between the instant in time that a digitizer produces a set of samples across its analog sensor channel inputs and the point at which the corresponding data reaches its destination for EEW analysis outside the instrumentation and networking domains. Typically long distances separate data sources from the location at which analysis is performed. These points of latency arise out of software, mathematical, and networking as well as physical constraints imposed upon the digitizer and associated communication systems. System designs must account for tradeoffs between latency and resource (CPU) utilization, which has an effect on power consumption, and communication network bandwidth. Designers of seismological instrumentation used for EEW deployments must keep these trade-offs in mind and make careful implementation choices to minimize delay. System integrators and network operators must be fully aware of latency and its contributors in order to make the right configuration choices when commissioning EEW systems to ensure the lowest possible latency without compromising the accuracy of the early warning data product.