

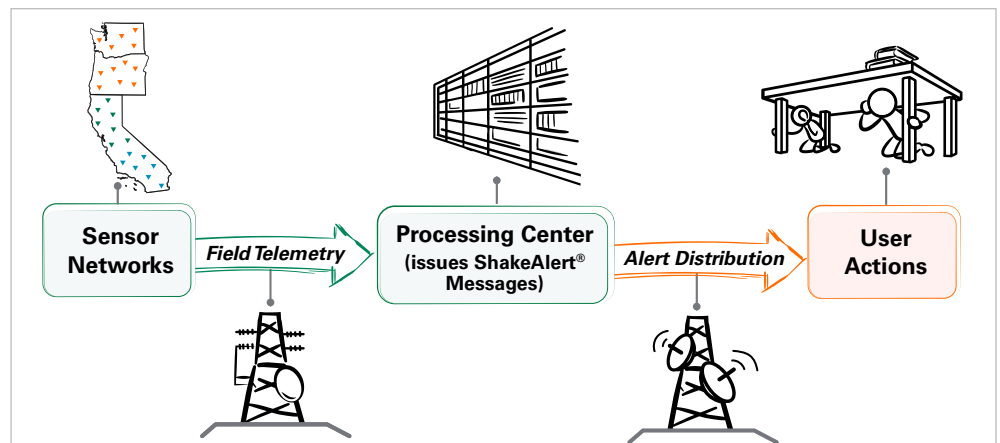
FAQ: The ShakeAlert[®] Seismic Network and Its Collaborators

The **ShakeAlert[®] Earthquake Early Warning system¹**, operated by the U.S. Geological Survey (USGS), quickly detects significant earthquakes, estimates the shaking, and issues ShakeAlert Messages to Technical Partners. Then, Technical Partners, which have a license agreement with the USGS, use this information to produce and deliver alerts that rapidly reach people and trigger automated actions to protect vital systems and infrastructure, potentially seconds before shaking arrives at their location.

• How does the ShakeAlert[®] system detect earthquakes?


When an earthquake occurs, seismic waves radiate from the epicenter like ripples on a pond. These waves (primary or P-waves, secondary or S-waves, and surface waves) carry the energy released from the earthquake, travel across the surface of the Earth, and shake the ground. The ShakeAlert seismic network detects earthquakes quickly, so a ShakeAlert Message can be issued to Technical Partners, which then deliver alerts to people and systems automatically. The goal is for these ShakeAlert-powered alerts to reach people and vital systems before shaking arrives at their location.

ShakeAlert is not earthquake prediction. Rather, it detects an earthquake that has already started and estimates magnitude and intensity, so alerts can be delivered to prompt people to take protective action and to trigger automated actions to mitigate damage to vital systems.



• What is the ShakeAlert seismic network?

The ShakeAlert system takes a network approach to earthquake detection and alerting. This network uses more than 1,000 seismic sensors distributed over a wide area where earthquakes are likely to occur on the West Coast of the United States (with nearly 1,700 anticipated on network build-out). Data from individual sensors across large regions are combined to maximize accuracy and alerting time during moderate-to-large earthquakes.

 **To learn more about how ShakeAlert detects earthquakes, see FAQ: ShakeAlert Basics**

¹When referring to “system” vs “System,” lowercase “s” refers to the USGS part of the operation (sensors and processing centers), and uppercase “S” refers to the USGS part and the alert delivery Technical Partners (i.e., the entire System).

• Why does ShakeAlert use a sensor network to detect earthquakes?

ShakeAlert uses a large network of seismic sensors to detect earthquakes, rather than stand-alone, site-based sensors at individual locations. Using this dense, connected sensor network to detect seismic waves has several advantages; it provides greater accuracy, yields a higher level of readiness, may offer more warning time, and leverages existing investment.

Provides Greater Accuracy

Only a distributed network of sensors is capable of characterizing large, complex earthquakes as they evolve. Sensors send data to four redundant central data processing sites at the University of Washington (UW), University of California-Berkeley (UC-Berkeley), and USGS Earthquake Science Center facilities in Pasadena, CA, and Menlo Park, CA. There, earthquakes are detected and ground motion signals are analyzed. ShakeAlert Messages are issued from the processing centers at UW, USGS Pasadena, and USGS Menlo Park (Mountain View).

The network approach requires four stations to detect the earthquake before ShakeAlert Messages can be issued; this makes the system less prone to errors, such as false alerts. As data are recorded and analyzed from more sensors, estimates of intensity and the extent of shaking will become more accurate.

Yields a Higher Level of Readiness

The network approach is constantly exercised and tested by detecting small earthquakes daily and providing data for other earthquake tools. This helps the network maintain a high level of readiness for detecting larger earthquakes.

May Offer More Warning Time

For most earthquakes, the network approach provides more warning time than a single-station approach. Still, this may only be seconds to tens of seconds of warning.

Leverages Existing Investment

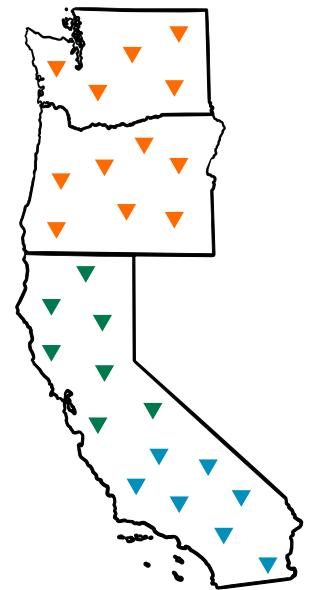
The ShakeAlert system leverages the existing investment in earthquake sensors and technical expertise in West Coast states.

• Who are ShakeAlert seismic network collaborators?

Regional seismic networks on the West Coast contribute to and collaborate with ShakeAlert. In Oregon and Washington, ShakeAlert is supported by the [Pacific Northwest Seismic Network](#) (PNSN), which is a partnership between the USGS, the University of Washington, and the University of Oregon.

In California, ShakeAlert is supported by the [California Integrated Seismic Network](#) (CISN), which is a partnership between the USGS, the [California Governor's Office of Emergency Services](#) (Cal OES), the [California Geological Survey](#), and academic institutions, including the [California Institute of Technology Seismological Laboratory](#) and the [UC Berkeley Seismological Laboratory](#).

The USGS also has data sharing agreements with Mexico and Canada. Data from these countries are used by ShakeAlert for alerting in the United States only. The USGS manages the resulting ShakeAlert system, but the continued expansion and sustained value of ShakeAlert depends on the collaborative support of public, private, philanthropic, and academic partners.

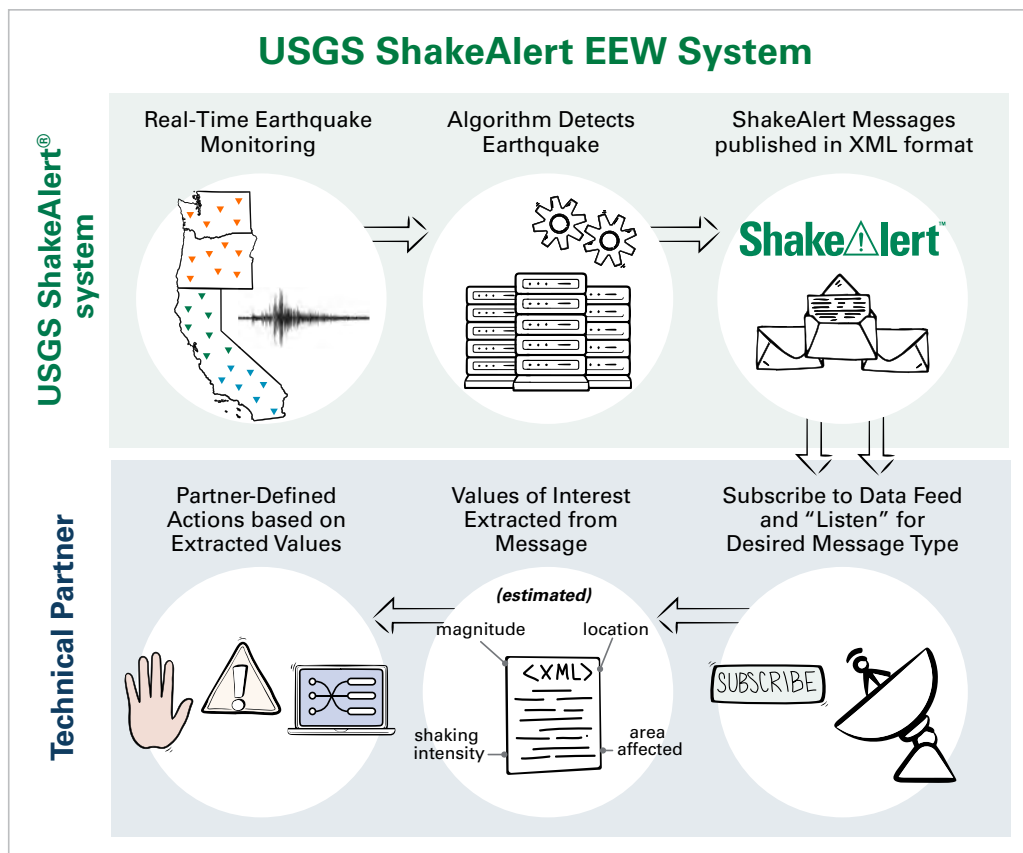


• What is the role of Technical Partners in the ShakeAlert EEW System?

Technical Partners are integral to the ShakeAlert EEW System because they are responsible for delivering ShakeAlert-powered alerts to people and critical systems. Technical Partners span multiple industries and sectors, and include private for-profit companies, public entities, and nonprofits that can benefit from becoming part of the ShakeAlert System.

While Technical Partners provide mechanisms or services for alert delivery, ShakeAlert also offers formal agreements for others who are exploring what it would take to become a Technical Partner (i.e., Evaluation Partners) or who are working with the USGS to develop education and training resources (i.e., Communication, Education, and Outreach [CEO] Partners). Evaluation Partners and CEO Partners do not issue alerts to end-users.

The flow chart diagram shown here depicts the roles of both the USGS and its Technical Partners in the ShakeAlert EEW System.



• Who are end-users?

An end-user could be a person, a computer, or another device that receives ShakeAlert-powered alerts from Technical Partners. End-users include individuals who receive alerts directly, as well as organizations that work with a ShakeAlert License to Operate (LtO) Technical Partner that delivers the alert to trigger an automated "machine-to-machine" action. Examples of these automated actions vary by industry and environment and may include closing valves, stopping heavy rotating equipment, controlling emergency generators, and slowing trains, among many others.

REFERENCES AND RESOURCES

Pacific Northwest Seismic Network (PNSN)
<https://pnsn.org/>

California Integrated Seismic Network (CISN)
<https://www.cisn.org/>

Quick Start Guide for Prospective Technical Partners:
https://www.shakealert.org/wp-content/uploads/2020/07/Quickstart_Guide_for_Prospective_Technical_Partners_20200724.pdf