ShakeAlert: Providing Warning about the Big One

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University of Oregon
Outline

1. ShakeAlert:
   • What is it and when will it be available?

2. Current Efforts
   • Station buildout
   • Partnerships

3. Rollout Plan
   • Pilot Projects
   • Communication, Education, and Outreach (CEO)
ShakeAlert – What is it?

- ShakeAlert is the name of the West Coast Earthquake Early Warning System (EEW)
- Developed by Caltech, UC Berkeley, University of Washington, University of Oregon
- Based on faster/earlier P-wave detection of events
- Provides seconds to minutes of warning before strong shaking arrives
- System supported primarily by USGS
- Initial support & funding for EEW sought by Private, Public, Foundations (GBMF already funded $6M)
- In the PNW, Pacific Northwest Seismic Network (PNSN) maintains and operates infrastructure (UW/UO)
Applications

Valuable seconds to tens of seconds warning for...

- **People**
  - move to safety
    - *drop, cover, hold-on*
  - mental preparation

- **Things**
  - automated controls
  - slow, stop transportation
  - isolate sensitive systems and processes

- **Situation awareness**
  - Real-time operational picture
  - Take actions before infrastructure is affected
The Path to ShakeAlert

Development Phases:

I. 2006-2009 – R&D, network upgrades
II. 2009-2012 – operationalize, more upgrades
III. 2012-2015 – Demo to Production Prototype
   - PNW: Demo System Live 2/15
IV. 2015-2018 – continued improvement, testing
   - PNW: Production Prototype, summer 2016
   - Target station density in Metro L.A. and Bay Area
   - Pilot applications
V. 2018 – limited public roll-out
VI. ? - Full Public Operation (depends on funding)
ShakeAlert: Major System Components

Sensor Networks → Field telemetry → Processing
Alert Creation → Alert Delivery → User Actions

System
Station Buildout

- 1,600 stations planned
- ~650 currently contributing
- Priority on metro areas (CA)
- Permits & NEPA on public lands are challenging
State and Local Partners

- **State of Oregon ($670K)**: Purchased 30 high-quality sensors at 15 sites from NSF.

- **ODOT/UO/UW**: Intergovernmental agreement that allows PNSN (UO/UW) to operate on ODOT property and utilize ODOT telemetry.

- **DOGAMI** has requested that PNSN develop a prioritized list of sites and costs that could be instrumented with funds from DOGAMI’s strong motion program.

- **EWEB** and UO have signed a letter of intent to sponsor interagency cooperation.

- **NERO** the Network for Education and Research in Oregon, is a statewide network that provides service to higher education institutions, K12, local and state government, municipalities, and non-profit groups.
DOGAMI Strong Motion Instrument Program
State of Oregon 2014 Structural Specialty Code Amendments Subsection 1613.7; 6 stories/60k ft² OR 10 stories+

Green: Current EEW stations (2016)
Yellow: Plan for EEW
Magenta: Proposed DOGAMI-funded sites (2017-2018)
ShakeAlert Roll-out Plan

Roll-out Steps

• **Pilots** - selected fault tolerant use
• **Automated Actions** - wider industrial use, transportation
• **Limited people alerts** - groups who can be trained
• **Expanded people alerts** in public venues (w/ no advance training)
• **Geographically limited public alerts** (where network is dense)
• **Full public alerts!** Via all available pathways

• **Encourage responsible use of alerts**
• **Pace applications with system capabilities**
ShakeAlert Joint Committee for Communication, Education, and Outreach (JCCEO)

Chair
Robert de Groot

Vice Chair
Jennifer Strauss

State Geological Surveys
Appointed by State Geologist

California
Cindy Pridmore

Washington
Tim Walsh

Oregon
Ali Ryan Hansen
Ian Madin

Offices of Emergency Management

Cal OES
Kate Long
Sharon Blankenheim

Washington EMD
Maximilian Dixon
Brian Terbush

Oregon OEM
Althea Rizzo

USGS Office Communications Western Region
Justin Pressfield
Donyelle Davis

Universities

UC Berkeley
Jennifer Strauss

Caltech
Margaret Vinci

U Washington
William Steele

U Oregon
Leland O’Driscoll

USGS SAFRR* Project
Erin Burkett

*Science Application for Risk Reduction
ShakeAlert Communication, Education & Outreach (CEO)

• Joint Committee for Communication, Education, and Outreach (CA, WA, OR, BC)

• User workshops in Seattle, Berkeley, and Pasadena (Sept. ‘16)

• Coordinating
  • Beta & pilot user relations
  • Social science R&D
  • Development of alert content: messages, sounds, signals
  • Pre-event education and training
ShakeAlert Pilot Projects

Pilot Project Criteria

- No public alerting
- Users must be trained
- Actions only within pilot organization
- Must be tolerant of errors
- No potential for injury, damage or loss
- Limited to areas with effective alerts
- Must be testable
- Must not duplicate other pilot projects
- Must commit organizational resources to complete and sustain the project
- Should be potential for broader application

Pilot Process

1. Develop pilot idea
2. Identify pilot user
3. Identify pilot partners
4. Discuss with local ShakeAlert POC
5. Fill out pilot application
6. Get project approval
7. Sign license agreements or TAA
8. Do the implementation
9. Evaluate success
# ShakeAlert Pilot Implementation Partners as of 1/17

<table>
<thead>
<tr>
<th>Sector</th>
<th>Current or Candidate CRADA/TAAPilot</th>
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<tbody>
<tr>
<td>Financial</td>
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<tr>
<td>Electric Utility</td>
<td>Eugene Water and Electric Board (P), PG&amp;E (N), Southern CA Edison (S)</td>
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<td>Gas Utility</td>
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<td>Water Utility</td>
<td>Eugene Water and Electric Board (P)</td>
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<td>Pipelines, transmission lines</td>
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<td>Telecommunications</td>
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<td>Emergency Mgmt.</td>
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<td>Public Safety (Fire, police, EMS)</td>
<td>FireDispatch (N)</td>
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<td>Hospital / Medical Service</td>
<td>Northridge Hospital (S)</td>
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<tr>
<td>Education/Research</td>
<td>LA Unified School District (S), University of Southern California (S), Jet Propulsion Lab (S), Santa Monica College (S)</td>
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<td>Transportation</td>
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<td>BART (N), LA Metro (S)</td>
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<td>Industrial/Commercial/Manufacturing</td>
<td>Spectrum Chemical (S)</td>
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<td>Insurance</td>
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<td>Ports, airports</td>
<td>LAX (S)</td>
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<td>Information Technology (IT)</td>
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<td>Automated controls</td>
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<td>Mass Media</td>
<td>NBC Universal (S), iHeart Media (S)</td>
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<td>Entertainment Venues</td>
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<tr>
<td>Residential*</td>
<td>Regatta Seaside HOA (S)</td>
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*Sector added by Bob

**Partner Type:**
- CRADA = Red font
- TAA = Blue font
- Pilot = Black font

**Region:**
- S = Southern California (LPOC*: Margaret Vinci)
- N = Northern California (LPOC: Jennifer Strauss)
- P = Pacific Northwest (LPOC: William Steele)

National (USGS) Contact: Robert de Groot

*LPOC = Local Point of Contact

**Status:**
- *Italic text = Partner Candidate*
- Regular text = Approved Partner
What’s needed to bring ShakeAlert to our state?

• Local support of states, counties, cities, businesses
• Engagement of technical users, policy-makers, public
• New funding
• Seismic network infrastructure upgrades
  • Denser, faster, more reliable stations and telemetry
• ShakeAlert servers, USGS operated (authority and liability)
• Alert distribution pathways
• CEO – Communication, Education, & Outreach
Multi-Hazards Monitoring: Next Generation System

Landslide
Douglas County, OR

Earthquake & Tsunami
Japan

Forest Fire
Sunriver, OR

The telemetry backbone of PNSN can be repurposed to track other hazards