Earthquake Monitoring and Reporting through the Advanced National Seismic System

Briefing for the Natural Hazards Caucus
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Earthquake Losses:

- Earthquakes pose the highest, single-event financial risk of any natural hazard.

- Northridge, California, M 6.8 event of 1994 caused an estimated $40 billion in losses.

- Kobe, Japan, M 6.8 event of 1995 caused over $100 billion in direct losses, estimated over $300 billion total losses.

- FEMA estimates annual earthquake losses now $5.6 billion.
What can an advanced earthquake monitoring system do?

• Provide rapid notification of earthquake occurrences and effects to speed emergency response and recovery.

• Promote mitigation through application of earthquake hazard assessments and data in building codes, structure design, and civic planning.

• Provide data for basic and applied research on earthquake effects and to improve hazard assessments.

• Improve public education and awareness.

All of these activities rely on improved monitoring data...
The Advanced National Seismic System

• An integrated national monitoring system
• A focus on the areas of highest risk
  – 26 urban areas slated for dense instrumentation
• A commitment to rapid delivery of earthquake information to critical users and the public
• A strategy to gather critically needed data on earthquake effects on structures
• A system built through close partnerships with States and local jurisdictions

- 6000 strong motion sensors in 26 at-risk areas
- 50% of these instruments in buildings and structures
- 1000 new or upgraded regional stations
- 50 new national backbone stations
The Building Blocks of the ANSS

- National Earthquake Information Center
  - NEIC, Golden, Colorado

- National Seismic Network
  - (“ANSS Backbone”)

- 15 Regional Seismic Networks
  - and data centers at Fairbanks, Seattle, Menlo Park CA, Pasadena CA, Reno. Salt Lake, Memphis, Weston MA

- National Strong Motion Network
ANSS Costs: Capitalization $172M, Operations $43M/yr
ANSS Accomplishments

- Over 600 new earthquake sensors installed; National and Regional Network Upgrades begun.

- *ShakeMap* capability implemented in Los Angeles, San Francisco, Seattle, Salt Lake and Anchorage

- Real-time products and integrated communications, data analysis, and reporting under development

- Management and technical plans completed; National and regional structures in place and working.
ANSS Products: *ShakeMap*

rapid mapping of strong ground shaking
grew out of the Northridge earthquake experience

Provides a rapid indication of probable areas of earthquake damage
ANSS Backbone: Estimated Detection Capability

Simulated future detection capabilities with 22 planned ANSS backbone stations added
Structural Array in Atwood Building, Anchorage

Instrumentation monitors for drift, translation, torsion, and rocking
ANSS Performance Goals

Through the modernization, expansion, and integration of earthquake monitoring and notification nationwide the completed ANSS will:

- Provide an accurate assessment of the severity and distribution of strong ground shaking in high-risk urban areas at risk within 10 minutes.

- Acquire the seismic data necessary to improve earthquake hazards assessments and improved earthquake resistant construction and performance based design.

- Provide a few tens of seconds warning of imminent strong ground shaking in urban areas.
Modern networks can give detailed picture of seismic shaking in urban areas and possibly give tens seconds warning of imminent ground shaking.
## Continued Expansion of the System

### Timeline

<table>
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<tr>
<th>Planning Stage</th>
<th>Proof of Concept Phase</th>
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- Requirements Developmt.
  - ANSS Mgmt. Plan
  - Tech. Specs. I
  - Proj Mgmt Development (Ex30)
  - EA Devel.
  - Urban SM: LA
  - Urban SM: SF
  - Urban SM: SEA
  - Urban SM: SLC
  - Urban SM: Anchorage
- Teton net.
- Backbone Network DME in 49 States
- NEIC 24x7 Operation
- Initial Building Instr. (Calif, Alaska)
- Guidel. Dev.
- RFP & Proc.
- Install X Structures
- Hydra Development Work
- NEIC Upgrades
- System C&A, Recert.
- Subsystem C&A
- Develop System Tools (EIDS, INV, SNW, etc.)
- Data Archive
- Eng Data Ctr
- Product Ctr

### Expectations
- Expect completion of system development phase in 2007
- Expected 2007 funding will cover only O&M of the existing system and small expansion in the number of instrumented structures
- Over 20 urban areas remain to be instrumented for ShakeMap, and the 4 of 5 instrumented cities need additional sensors
- Event reporting will be at minimum performance standards in most areas of the country
- Early warning requires considerable new investment
Recent Earthquake Activity

Latest Earthquakes - Last 7 Days

World (Magnitude 2.5+)
Thu Feb 02 22:17:17 UTC

USA (Magnitude 1+)
Thu Feb 02 22:02:38 UTC

World Lists Magnitude 2.5/4+ | 5+
Last EQ in World

USA Lists Magnitude 1+ | 3+
Last EQ in USA