Oregon Real-time GNSS Network
Critical Infrastructure for Emergency Response
Oregon Real-time GNSS Network:
Critical Infrastructure
For
Emergency Response
March 1964 Alaska 9.2 magnitude subduction mega quake
Background ORGN

Oregon Department of Transportation
ORGN Overview

A Cooperative Network getting data from many sources

- 100 stations total (96% GPS and GLONASS)
- 41 station are ODOT Owned and Operated
- 59 Stations from partners
  - Plate Boundary Observatory (PBO)
  - Washington State Reference Network (WSRN)
  - Counties
  - Cities
  - Private Business
Oregon Resilience Plan Earthquake Scenario
Simulated Cascadia M 9 Earthquake and Tsunami
Damage Potential

### Damage Potential

- **Very Light**: Felt outdoors, sleepers wakened; liquids disturbed or spilled; small unstable objects upset; doors swing, pictures move.
- **Light**: Felt by all; windows crack; dishes, glassware, books fall off shelves; pictures fall off walls; furniture moved; weak plaster, adobe buildings and poorly built masonry cracked.
- **Moderate**: Difficult to stand or walk; furniture broken; damage to poorly built masonry buildings; weak chimneys break; plaster, loose bricks, cornices, unbraced parapets and porches fall; some cracks in better masonry buildings.
- **Moderate/Heavy**: Steering of cars affected; extensive damage to unreinforced masonry buildings, including partial collapse; fall of some masonry walls; twisting and falling of chimneys and monuments; unsecured wood frame houses move on foundation.
- **Heavy**: General panic; serious damage to collapse in old masonry buildings; wood frame structures rack and shift off foundations if unsecured; underground pipes broken.
- **Very Heavy**: Poorly built structures destroyed with their foundations; bridges and well-built wooden structures heavily damaged and in need of replacement.
Examples of ORGN Sites

Seaside

Seal Rock

Tillamook

Roseburg

Florence
Pacific Northwest Geodetic Array
Central Washington University

What are we currently doing?
SOPAC
READI Network Wester U.S.

READI network in Western U.S. – Utilizing 600+ real-time high-rate GPS stations spanning areas of high seismic and tsunami risk

- Cascadia Subduction Zone – Mw 9.0 earthquake & tsunami similar to 2011 Japan events
- San Francisco Bay Area – Increasing risk of large earthquake on Hayward fault
- Southern San Andreas fault – overdue for large earthquake

Real-Time Earthquake Analysis for Disaster Mitigation network (READI):
~600 GPS stations, a NASA driven project
- Super set of GPS networks maintained by (sorted according to largest to smallest number of stations):
  - UNAVCO/PBO
  - CWU/PANGA
  - USGS/Pasadena-SCIGN & Menlo Park
  - UC Berkeley/BARD
  - Scripps Institution of Oceanography/SCIGN
  - California Department of Transportation/CVSRN

http://sopac.ucsd.edu/projects/realtime/READI/
Steps Needed to Prepare the ORGN for Emergency Response

- Power
- Communications
- Back Up Servers for Operating Software
- Quick Mobilization to Repair ORGN Sites
- Structural Monitoring

The ORGN provides active geodetic control stations that can be monitored for movement and readjusted quickly, as opposed to conventional passive control that will take years to replace once displaced or destroyed.
Typical ORGN GPS Sensor Cabinet

- Battery Charger
- GPS Sensor
- Internet Cable
- Lightning Protector
- Battery
- GPS Antenna Cable
Rebuilding?

1. Check on ORGN Bases Stations
   - Operational
   - Stability

2. Compute and publish coordinates ORGN stations (Temporary CORS)
   - GNSS Base Radio Operations
   - Drone and Scanner use
   - Provide data for post process

3. With communication reestablished, ORGN network RTK will become available again.
   - Communication with ORGN base stations
   - Communication with ORGN users (Rovers)
Why LiDAR?

Post-accident analysis – North Bend, OR
Why LiDAR?

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Why LiDAR?

- Post-accident analysis – North Bend, OR
Questions?
The beach at Bandon, Oregon

Oregon Real-time GPS Network
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