NEES

University of California, Los Angeles

Field Testing & Monitoring of Structural Performance

NSF NEES Awardee Meeting **February 23-24, 2001**

Project Team

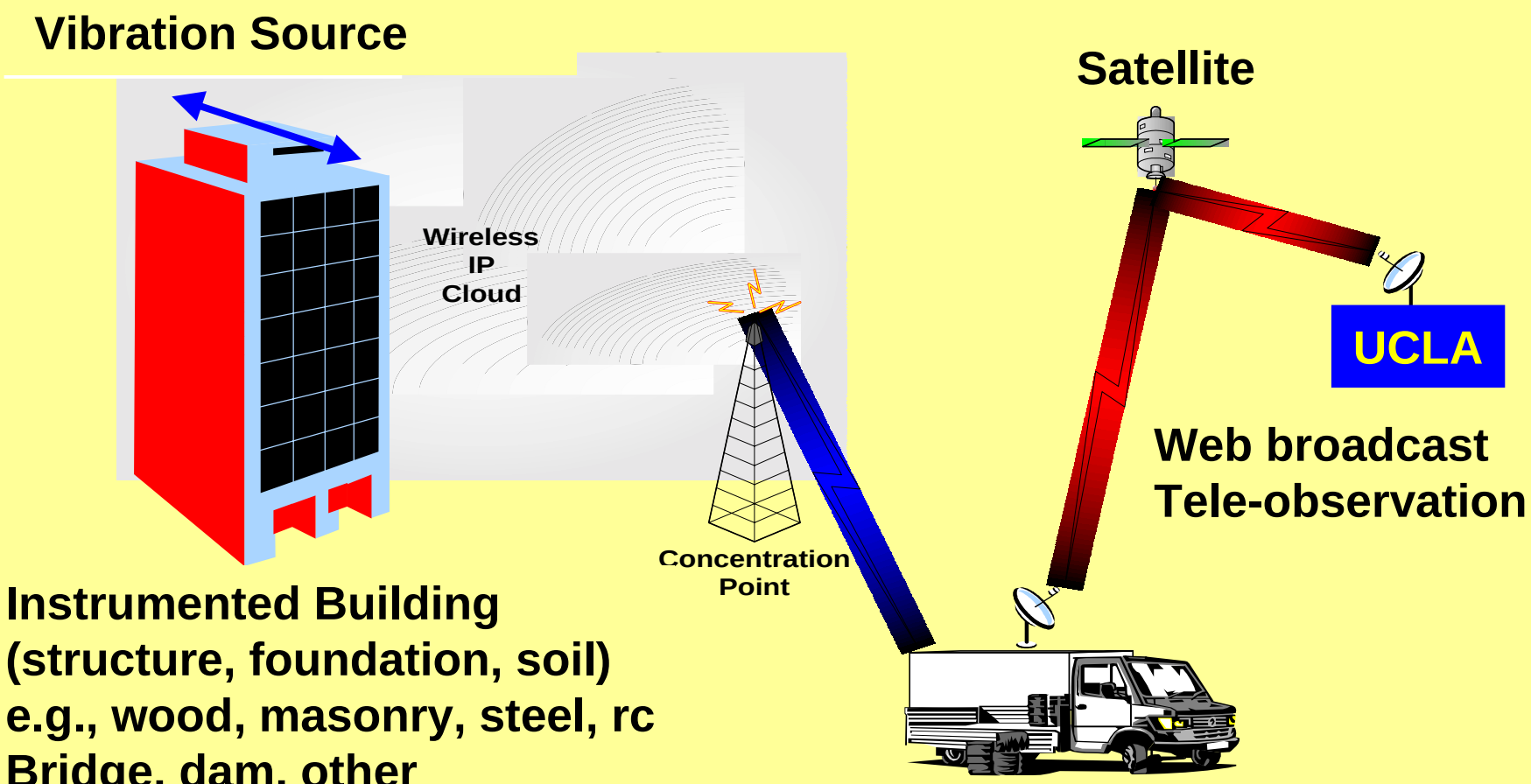
UCLA Project Participants

• John W. Wallace	PI	Structures
• Joel P. Conte	Co-PI	Structures
• Deborah Estrin	Co-PI	Information Systems
• Patrick J. Fox	Co-PI	Soils
• Jon P. Stewart	Co-PI	Soils

Structural Engineering TEchnology Laboratories (SETEL)

UCLA UC Irvine UCSD Caltech USC

Project Overview



Equipment Overview

- **Vibration Equipment**
  - Eccentric mass shakers (3)
    - 0 to 4.2 hz Peak Force of 20 kips (1)
    - 0 to 25 hz Peak Force of 100 kips (2)
    - Independent or synchronized (higher modes, torsion)
  - Linear inertial shaker (1)
    - Arbitrary force histories with peak force of 5 kips
- **Sensors (~150)**
  - Accelerometers (structure and soil vibrations)
  - Potentiometers, LVDT's, Fiber Optics, Strain gauges
- **Wireless Data Acquisition (~150 channels)**
- **Cone Penetration Rig**
  - Subsurface characterization & installation of geo sensors

Test Scenarios – Forced Vibration

- **"Low-Level" Forced-Vibration Testing**
  - **New or Existing (occupied) buildings**
    - **Bare structure vs building with partitions/cladding**
  - **Instrumentation**
    - **Structure, foundation, "free-field"**
- **Destructive testing**
  - **Buildings to be demolished, test structures**
  - **Detailed nonlinear response history data**
- **Assess response of complete system**
    - **Global & local responses (dense instrumentation)**
    - **Interactions, boundary conditions**

Test Scenarios – Post Earthquake

- Establish database of structures
- Establish cooperative agreements with owners
  - Assistance from Advisory Committees
  - Cooperation with research teams from other areas
- Collect pre-earthquake “reference” data
  - Develop instrumentation layout, connections, etc to allow for rapid deployment following an earthquake
  - Baseline data for modeling & damage detection (elastic properties)
- Aftershock Monitoring
  - Damage Identification (changes in properties)
  - Modeling studies (inelastic response, SFSI)

Timeline & Integration Highlights

- **Year 1 & beginning of Year 2**
  - Cone Penetration Rig, Eccentric Shakers
  - Integration issues, Mobile trailer design
  - Pilot studies for wireless data acquisition/control
  - Linear inertial shaker (start of Year 2)
- **Years 2 & 3**
  - Expanded pilot studies (laboratory and campus)
  - Develop (geo) and purchase of sensors
  - Bulk purchases & System integration
  - Web based documentation and training
- **Year 4**
  - Complete purchases and system integration
  - Field pilot studies & Satellite transmission system

Networking and Challenges

- **Addressing Networking Issues**
  - **Project team includes CS/Info. systems expertise**
  - **Use of pilot studies (laboratory, campus, field)**
  - **Cooperation with the SETEL Universities to establish pilot programs for "outside" users as well as to develop common education/training experiences**
- **Common Challenges for NEES Equipment Awardees**
  - **Rapid Advances/New Technologies**
  - **Equipment Integration/Compatibility Issues /Simulation Platform**
  - **Test protocols/Safety/Teleparticipation/Data Sharing**
  - **System Integrator/Consortium Development/User Fees**