Title
Developments on the CENS Structural Health Monitoring Front

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**Developments on the CENS Structural Health Monitoring Front**


**Introduction:** Structural Health Monitoring (SHM) Systems

**SHM:** Process of assessing state of health/damage of instrumented structures from their measurements

**Objectives:** To improve scientific understanding of the dynamic behavior of large structures as well as safety and reliability of infrastructure by damage detection and rapid post-event assessment

**Requirements:** Rapid Deployment, low power, robust DAS & sensors, damage detection algorithms

**Two distinct but related systems:** SHMnet & ShakeNet

### SHMnet: Instrumentation Requirements for Permanent Deployments

**System Components**
- Probabilistic post-event assessment based on fragility functions
- New sensor for direct measurement of IDR

**Instrumentation Specifications**
- SHMnet leverages partnerships with SMIPs (CSMIP, ANSS, and LA-DBS) for building access and instrumentation requirements
- Building instrumentation specifications of major SMIPs are not-uniform and are based on experience
- A quantitative basis for key specifications is established by analyzing signal errors associated with DAQ processes (resolution, sample rate, time-synchronization) and sensitivity analyses of engineering quantities

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### ShakeNet: Rapid Post Event Deployments and Real-Time Analyses

**System Components**
- Portable, low-power vibration sensor network
- Multi-tier wireless sensing system
- Rapid deployment enables aftershock monitoring
- System identification & damage detection

**Weld Fracture Detection**
- Preliminary experiment at UCSD on March 8, 2007
- Accelerometer installed near plastic hinge of moment-frame connection
- CENS CDCC box used to collect vibration data
- High frequency range data

**Test Deployments**
- Mote sensors and stargate backbone
- CENS Tenet multi-tier software
- Deployment time: 2.5 hours
- Reliability: 100% data reception
- Planned: alongside existing wired networks (e.g., Factor Building)