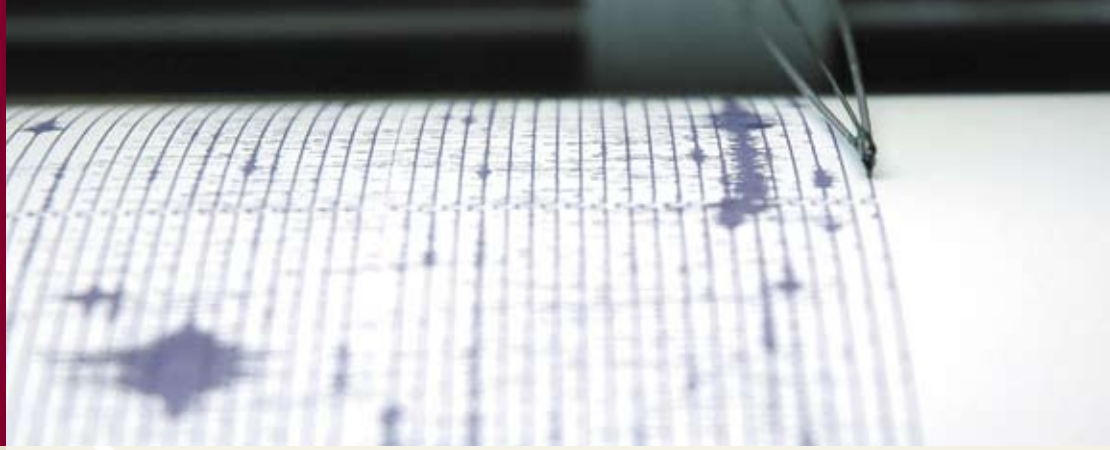
Application of a Real Time Structural Health Monitoring (SHM) System for Buildings



Powerful benefits of real time SHM:

- Enhances understanding of a building's health through continuous monitoring and analysis
- Provides a basis for rapid decision making regarding building safety and the possible need for evacuation following an extreme event
- Improves emergency response by identifying potential failure locations
- Allows more rapid identification of hidden structural damage
- Supplies building performance information needed to more rapidly return a facility to operation

SFSI Test Structure: Garner Valley Array, CA

The Garner Valley Array is located in a seismically active part of Southern California and is a thoroughly characterized strong-motion monitoring site with surface accelerometers, borehole pore pressure transducers and accelerometers, and an extensively instrumented Soil Foundation Structure Interaction (SFSI) test facility consisting of a medium-scale, reconfigurable, steel-frame structure constructed on a massive concrete slab (shown below).

> Digitexx is the leading real time solution that monitors multiple locations, analyzes and responds immediately, and archives and distributes centralized data.

In 2004, Digitexx designed and installed a custom monitoring system for the SFSI test facility that records and collects data from a variety of different sensor types including: acceleration, rotational velocity, displacement, pore water pressure and foundation pressure. The 32-channel system provides continuous, real-time remote monitoring and triggered local recording. Since its installation, the system has successfully recorded many small earthquakes, ambient/microtremor data and forced vibration data.

The Digitexx monitoring system has helped researchers at the site observe strong correlation between measured environmental effects (such as temperature and water level) and frequency vibrations.

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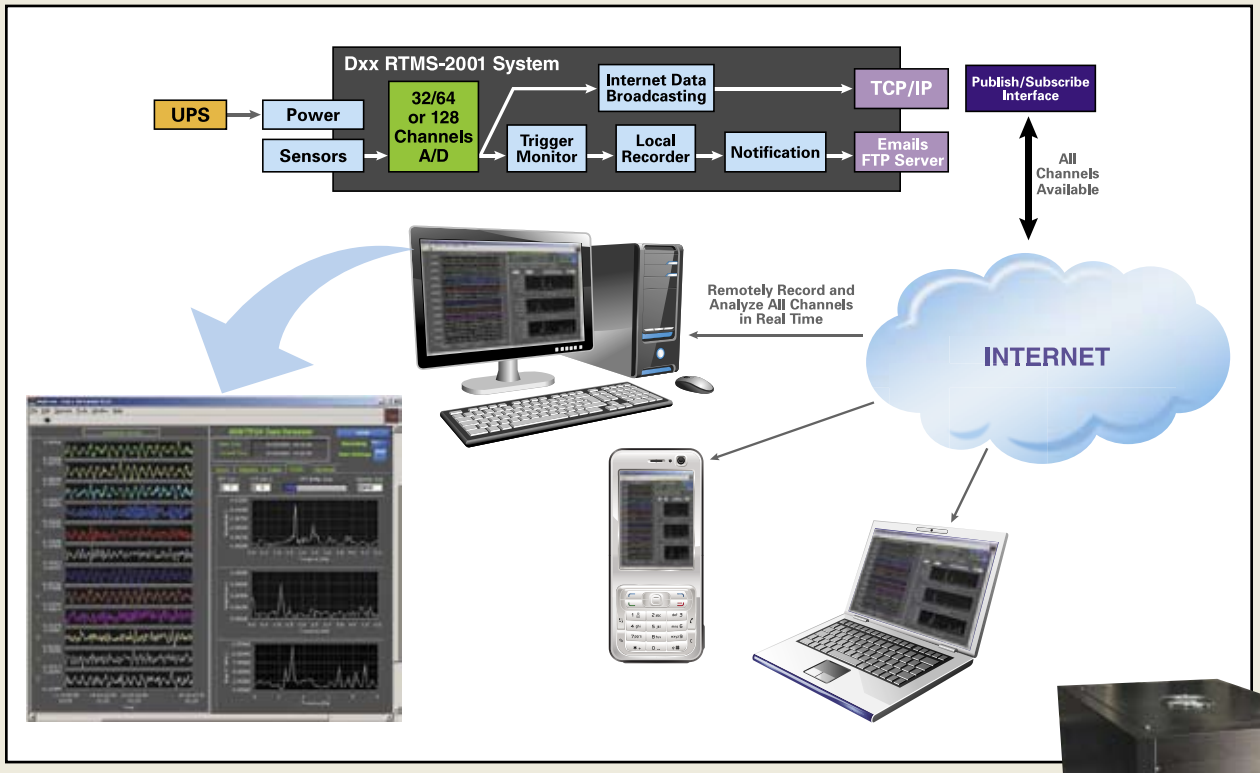
Real Time Monitoring System Architecture

The Digitexx monitoring system is based on a highly efficient, multithreaded software design that allows the system to acquire data from a large number of channels, monitor and condition this data, and distribute it, in real time, over the Internet to multiple remote locations.

Sensors on the test structure continuously send out data to the system. When a vibration test of other event occurs, pre-assigned thresholds of drift trigger the recording and analyzing of data (including pre-event memory). Once an event is recorded, the system notifies a list of users (via e-mail) and uploads the event via FTP to another site.

The various trigger thresholds are based on performance limits for the type and size of the building. For example, limits for a building made with welded beam-column connections would be based on FEMA-352, which matches probabilities of connection fractures with the computed drift ratios.[1]

[1] Celibi, Eeri, Sanli, Sinclair, Gallant, Radulescu. Real-Time Seismic Monitoring Needs of a Building Owner—and the Solution: A Cooperative Effort. *Earthquake Spectra*, May 2004. pg 341



About Digitexx

Founded in 2000, Digitexx was the first company in the industry to develop real time structural health monitoring systems for a variety of industries and applications including: bridges, tall buildings, campuses, windmills, oil rigs and more. Digitexx's innovative earthquake damage detection and locational algorithm system for tall buildings is jointly patented with Caltech. When properly configured, the Digitexx system is capable of measuring and responding to both natural and man-made events such as: earthquakes, wind, explosions and accidental heavy impacts.

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