Real Time Structural Health Monitoring (SHM)

Digitexx's state-of-the-art SHM system for tall buildings facilitates rapid assessment of building integrity.

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**

In the past, the decision whether to re-occupy a building after a significant event such as an earthquake was made based on visual inspection of damage to the structure. Even the most experienced of inspectors have difficulty determining the state of a building's internal structure, so most err on the side of caution. Usually, only about 20% of the buildings closed to occupants are really structurally damaged.[1]

There's now a better solution. Based on more than 60 years of experience in earthquake engineering and real time communications software, Digitexx pioneered real time structural health monitoring (SHM). Our patented system is the only real time solution that **monitors** multiple locations, **analyzes** and responds immediately, and **archives** and distributes centralized data. The monitoring system, when coupled with a post-event inspection process, greatly improves the likelihood that the inspecting engineers can correctly post the building as safe to occupy. The faster a building can return to operation, the less economic damage can be done to the owner, to the business, and to the economy.

[1] Building Instrumentation Facilitates Recovery after an Earthquake. Structure Magazine, January 2006, pg 52

Sensors: Digitexx's robust system can work with virtually all types and brands of new and existing sensors including ones for: acceleration, displacement, strain, wind and temperature.

Typical example: A 24 story steel frame building. 3 uniaxial accelerometers deployed at each of 9 floors and the roof (two going E–W, one N–S). Connection via a standard commercial DSL phone line.
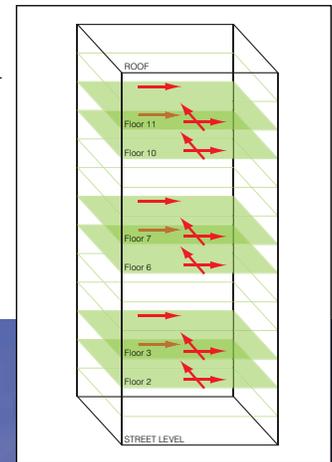
RTMS-2001R: This commercially-off-the-shelf system provides multi-channel, real-time data acquisition and analysis with manual and event-driven triggering. The system also offers an extensive set of remote tools for real time monitoring, broadcasting streaming data, data retrieval, remote tele-control, and event driven notification.

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 deployed throughout the building constantly send out analog data computing actual drift ratios at several pairs of consecutive floors, or average drift ratios over various combinations of non-adjacent floors to the system. If an event such as an earthquake occurs, pre-assigned thresholds of acceleration are exceeded in one or multiple locations, thus triggering 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 are 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
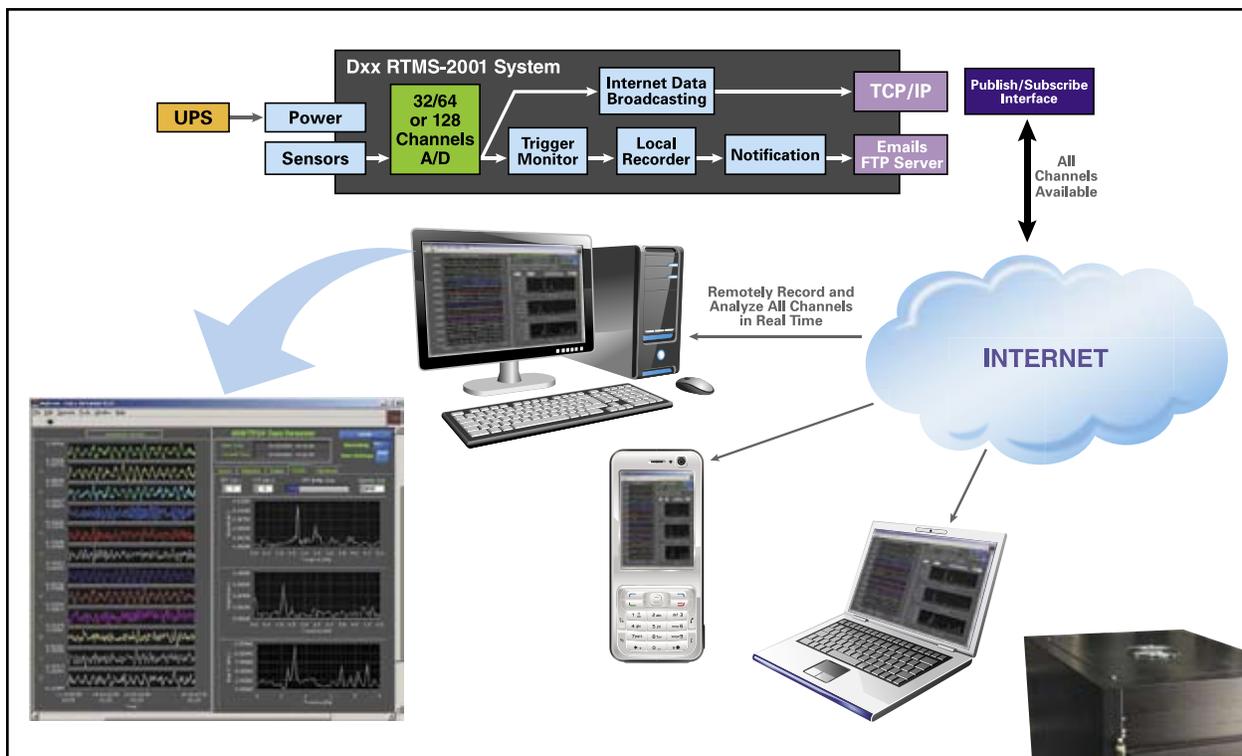
About Digitexx

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.