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

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

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. Usually, only about 20% of the buildings closed to occupants are really structurally damaged. Also, buildings at all times are subject to vibrations, ground movement, extreme weather conditions and construction activities and therefore needs to be monitored continually I order to ensure they have good structural health and viability. It is of utmost importance to detect and measure the response of the buildings to these local conditions in order to identify potential failure.

There's now a better solution. Digitex designed and developed real time structural health monitoring system (SHM). Our system is real time solution that monitors multiple locations, analyzes and responds immediately, and archives and distributes centralized data.

The monitoring system, when coupled with a quality inspection process, greatly improves the likelihood that the engineers can precisely assess the buildings health after a major event or during every day's exposure to the local conditions. The faster this process is done, the less economic damage can be done to the owner, to the business, and to the economy.

xPlorer

xWave

xStrain

xAlarm

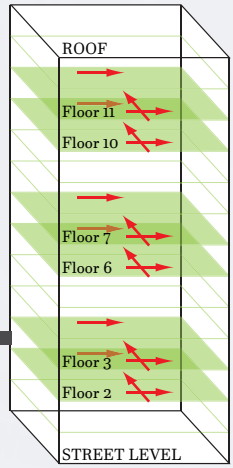
xGeo

xSense

xMet

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 internet connection.

Sensors: Digitex'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.



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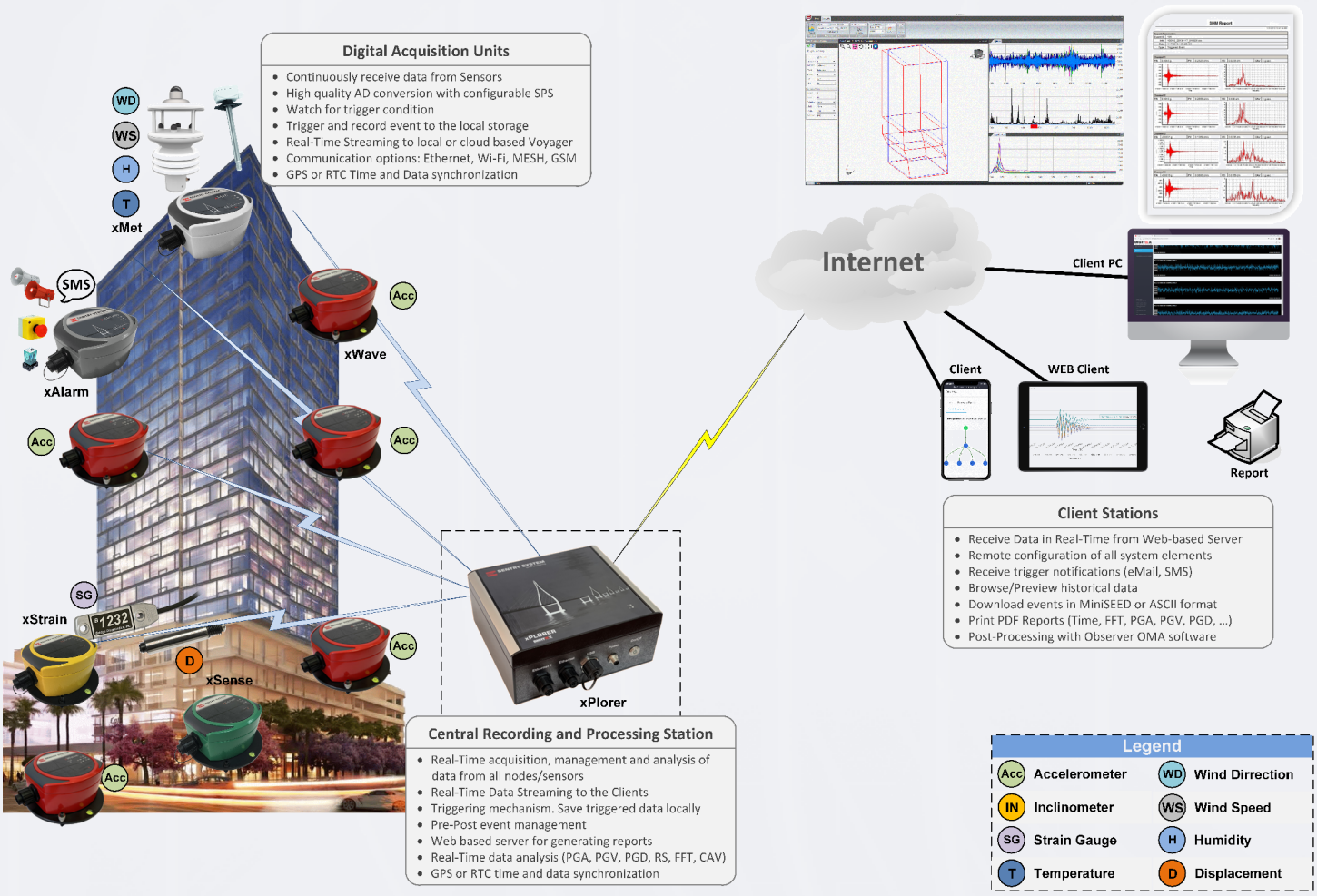
Real Time Monitoring System Architecture

The Digitex 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 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 analysing of data (including pre-event memory).

Once an event is recorded, the system notifies a list of users (via e-mail or SMS) and uploads the event to secure cloud location. Data are then stored to local database and appropriate PDF report is available for remote viewing via WEB site. Also, the user has the possibility to remotely (via WEB site) schedule On-Demand recording and check the health of the building.

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 standard, which matches probabilities of connection fractures with the computed drift ratios.



Sentry System Real-time Monitoring

About Digitex

Digitex is a company specialized in design and development of real time structural health monitoring systems for a variety of industries and applications including: bridges, tall buildings, campuses, windmills, oil rigs and more. Digitex's innovative solution for ambient vibration measurements and quick health assessment of structures is jointly developed and validated with our partners and advisors from the Universities. When properly configured, the Digitex 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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