Application Notes

Real-time monitoring systems
constructed with the use of R-sensors' instruments

R-sensors is offering digital products manufactured by the company namely data loggers NDAS-8226, digital seismometers & accelerometers combined with NDAS-RT multipurpose modules specially designed for real-time monitoring systems. Such systems provide a wide range of technological options to deliver information to an end-user.

Data Transfer Protocol

The SeedLink protocol is used to transfer data. It is designed to be used for networks supporting TCP/IP. The advantage of this protocol is that the data is not lost in case of break of connection and subsequent reconnection. The data transfer is automatically resumed if the data is still present in the SeedLink-server buffer. The buffer size of modern equipment being used as servers allows the data to be stored over a long period of time, and that virtually eliminates data loss.

The SeedLink protocol has 2 phases of communication by the server while data exchange. The first phase (negotiation phase) allows the user to acquire only the necessary data that is followed by transfer of data packages as such from the server. The SeedLink data packages consist of a header followed by a 512-byte mini-SEED entry (SEED data only).

SeedLink is originally designed as a transport layer for a SeisComP package. This link will provide more information about this protocol.

Hardware

We take a bridge as an example of some extended facility that needs installing a real-time monitoring system based on R-sensors' technical solutions.

Fig. 1 shows the appearance of instruments which can be used for the system. It is preferable to use the MTSS-1033ND or MTSS-1043ND digital accelerometers in combination with multipurpose modules for seismic monitoring systems.

Fig. 1. Digital accelerometer MTSS-1033ND and multipurpose module NDAS-RT

The layout at Fig. 2 shows a possible configuration of a system.
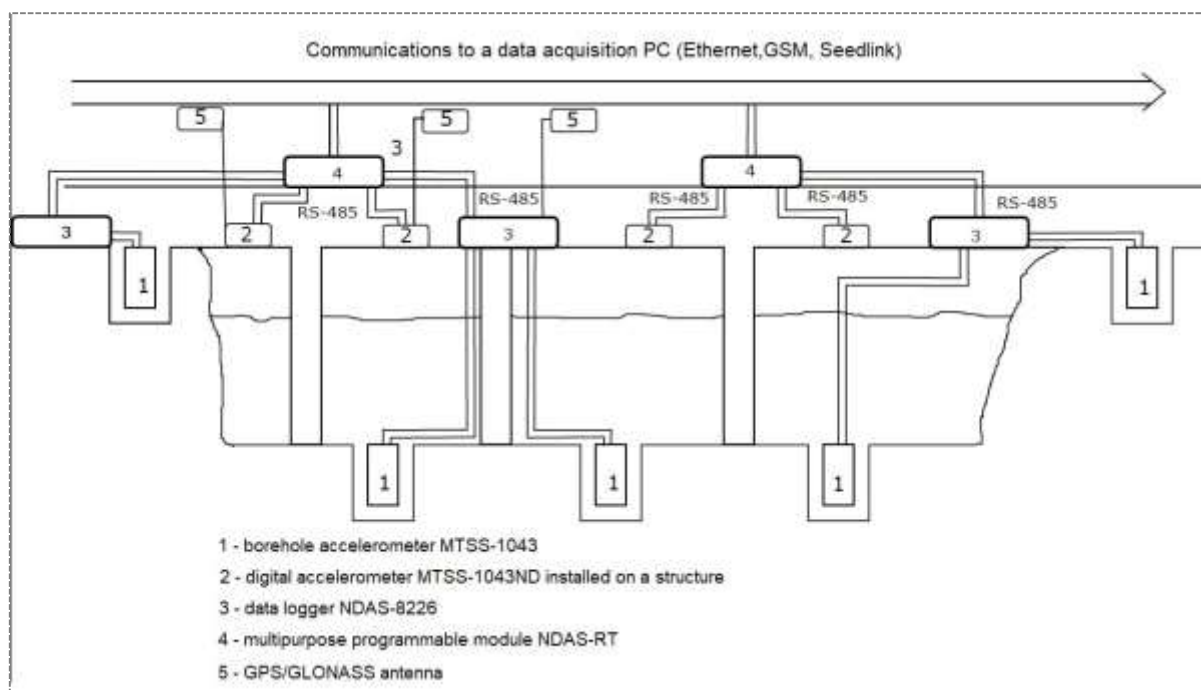
Fig. 2. An example of a real-time monitoring system

The accelerometers can be manufactured in a borehole version to be installed near piles of a structure including a bottom or can be manufactured for installing directly on a structure. The direct-installing version is shown at Fig.1. Accelerometers and multipurpose modules can be connected via **USB** cables (distances of up to 5 meters) or by means of the **RS-485** interface for distances of up to 500 meters (1200 meters at restrictions of a sampling frequency). Each multipurpose module NDAS-RT can support operation of up to 4 digital accelerometers.

More modules enable wireless networking based on **Wi-Fi, Bluetooth**.

Methods of data transfer to the end-user

The TCP protocol support is required for a system's operation within a network. At that, multifunctionality of NDAS-RT allows using different physical environments to construct networks. Depending on operating conditions and locations of the end-user, Ethernet over copper, mobile Ethernet, optical lines, etc. can be applied.

More opportunities

The NDAS-RT multipurpose module provides additional network options as follows:

- processing of incoming data and highlighting events by levels, STA/LTA triggers, logical combinations of triggers;
- control of external physical devices in alarm systems by means of closing dry contacts at an event detection;
- transfer of event detection information as a text message;
- data registration via 6 auxiliary ADC channels;
- fulfillment of user algorithms for data processing.