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Integrated Access to miniSEED Archives Using SEISAN Earthquake Analysis Software

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Earthquake analysis systems, such as SEISAN (Havskov and Ottemöller, 2000), have been considered fundamental tools for the operation of seismic surveillance networks. These packages generally implement a set of seismic analysis functions, combined with a database of seismic events. The latter may take the form of a simple file-based structure, as within SEISAN, or become an advanced relational database. In either case, events are generally stored as phase information and computation results (hypocenters, magnitudes, etc) combined with waveform data.
In addition, the advent of low cost disk storage and highly effective hardware redundancy allowed the widespread implementation of permanent continuous waveform archives. These have become paramount towards seismological research. Nevertheless, it seems clear that redundancies may exist by having continuous waveform archives as well as waveform data stored in event databases. As such, one may consider possible advantages of combining both.
Recently, efforts have been taken towards implementing the integrated usage of continuous miniSEED archives directly with the SEISAN earthquake analysis software. The two most commonly used archive formats: Buffer of Uniform Data (BUD) and SeisComP (SCP) have been considered. The developed software package accesses archived data, using the libmseed library by Chad Trabant (Incorporated Research Institutions for Seismology), and provides it to the SEISAN routines. In this way, the overall operation of SEISAN remains unaffected.
It now becomes possible to perform direct extraction of waveform data from a BUD or SCP archive to the conventional event database. Similarly to the existing continuous SEISAN databases. Perhaps more significant is that waveform data in the event database may be replaced with references to the continuous archive. Each reference consists merely on the channel name and a temporal reference to the event. As a consequence, interaction with real-time data processing systems, such as Earthworm, is strongly simplified. These systems now have only to send information on the detected events to SEISAN with references to the corresponding time interval and affected channels. The heavy transfer of waveform data is no longer required. Furthermore, SEISAN users gain tremendous flexibility by being able to access a continuous archive directly to manually scan for events. Finally, there is a massive reduction of the disk space required for the SEISAN event database, facilitating its portability and backup.
In addition to the SEISAN improvements, a JAVA application, SeisEventMgr, has been developed to assist manual scanning of a miniSeed archive. This tool plots waveform traces from a miniSEED archive superimposed with event data from a SEISAN database. This allows a rapid visualization of registered events as well as identification of unregistered events. It is particularly useful to assist routine operations in local seismic networks that rely on visual inspection of data for event detection.
The aforementioned software tools will be made freely available after testing is complete and may be downloaded from the SEISAN website: http://www.uib.no/rg/geodyn/artikler/2010/02/software

References

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