A new system for data acquisition and storage in Kazakhstan's National Data Centre (KNDC)

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Introduction

While creating a new data acquisition and storage system, several tasks were addressed, including:

- technological modernization, including the transition to a modern microservice architecture, the introduction of asynchronous and multi-threaded processing for real-time data, and the creation of a fault-tolerant storage system;
- the creation of technologies and tools for storing and flexible access to large volumes of incoming data in real time, as well as to its archive.
- Implementation and integration with the standard stack database of FDSN web services, ensuring compatibility with IRIS DMC, CTBTO, EIDA, and support for standard modern data formats (StationXML, QuakeML, miniSEED);
- ensuring the timeliness and accessibility of data for early warning systems, with minimal delays in receiving and preparing data for further processingcreation of an automatic data quality control system, etc.Translated with DeepL.com (free version)

Methods/Data

- The basis of the entire system is a PostgreSQL database with tables for storing data on waveforms (seismic traces), metadata, statistical information, and information about the data sources themselves. The system is designed so that, regardless of the data source and initial format, all data is converted to mseed format, and metadata is stored in station.xml format. All data entering the system is verified, its quality is assessed, then it is broken down into fragments by channel and recorded into the database. The metadata database can be created in several ways, either by manually filling in the available information or automatically, when metadata is downloaded from FDSN or using the IRIS DMC Library of Nominal Responses for Seismic Instruments.

Results

The KNCD has implemented a standardised FDSN-type web service that allows clients to obtain the necessary data (waveforms, metadata and event information) using standard tools and libraries that support this protocol, such as ObsPy.

Conclusions

The implementation of the new system at the KNC is a qualitative step forward in the development of the data acquisition and processing system. The created system allows collection data from various sources, such as the CTBTO international monitoring system, IRIS networks, regional networks in Central Asia, and others. For the first time, tools have been developed within the framework of the international FDSN standard that will open more opportunities for the international cooperation and data exchange with the global community.