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# The NDC-in-a-Box Waveform Data Processing Tools: Current Status, Recent Achievements, and Future Plans

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Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)

## INTRODUCTION AND MAIN RESULTS

The poster provides an overview of NDC-in-a-Box waveform components, emphasizing recent achievements, ongoing development efforts, and future plans. It is guided by the needs of NDCs for enhanced functionality, gap-filling, and addressing user-identified issues.

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## Introduction

To support National Data Centers (NDCs) in their ability to process IMS data, the Provisional Technical Secretariat provides the NDC-in-a-box software package. Many NDCs do real-time processing of continuous data from IMS waveform technology stations, with a particular focus on seismic monitoring data. This data can be used for verification purposes, as well as for civil and scientific applications.

Automated data acquisition, archiving, and processing are performed by SeisComP software, whose standard package is supplemented in the NDC-in-a-Box distribution by exclusive CTBTO components and modules. These include tools for data format transformation and event location based on IDC methodologies.

For follow-up manual review, including refining event associations and improving location solutions detected automatically, the NDC-in-a-Box offers the Geotool software. Additionally, detailed analysis of infrasound and hydroacoustic detections is performed using another interactive tool, DTK-GPMCC.

The development of these components is ongoing, driven by the needs of NDCs for additional functionality, gap-filling, and issue resolution. This poster highlights the current status, recent achievements, ongoing development activities, and future plans for these tools.

## NDC-in-a-Box Waveform Tools Overview

**SeisComP** is an open-source seismological software suite designed for real-time monitoring of earthquakes and seismic events.
Contracted developer: **Gempa GmbH** (Germany)

**Geotool** is a graphical software that allows a user to interactively display and process seismoacoustic data from International Monitoring System (IMS) and other seismic networks stations.
Contracted developer: **Naviog** (USA)

**DTK-GPMCC** software can work in interactive or automatic mode, that allows making measurements or visualizing and modifying existing measurements from the raw flow and the automatic detections. GPMCC is the graphical user interface of the PMCC algorithm.

**DTK-DIVA** is an interactive tool designed to assist NDC analysts in visualizing and exploring the extensive set of PMCC detections.
Contracted developer: **CEA** (France)

## Highlights of the NDC-in-a-Box v7.2 Release

In response to requests from NDCs and suggestions for software enhancements, the SHI NIAB software version 7.2 was released in February 2025.

This update include:

✓ An upgrade of SeisComP to version 6.6.3, featuring significant improvements to CTBTO modules such as proc2css and inv2css.

✓ Updates to IMS station and IDC processing configurations have been released monthly to ensure that NDC processing systems remain current and aligned with IDC operations and IMS network configuration.

✓ Starting with the v7.2 release, the updates also include IMS station configurations in XML format.

✓ An update of Geotool to version 3.2.4 which includes several bug fixes and performance enhancements.

✓ The release included version 2.5.15 of NET-VISA which is now fully adapted for the NIAB environment and includes improvements to the training script.

✓ DTK-(G)PMCC was updated to version 7.4.1 which provides a re-designed and modernized GUI and enhanced PMCC processing performance.
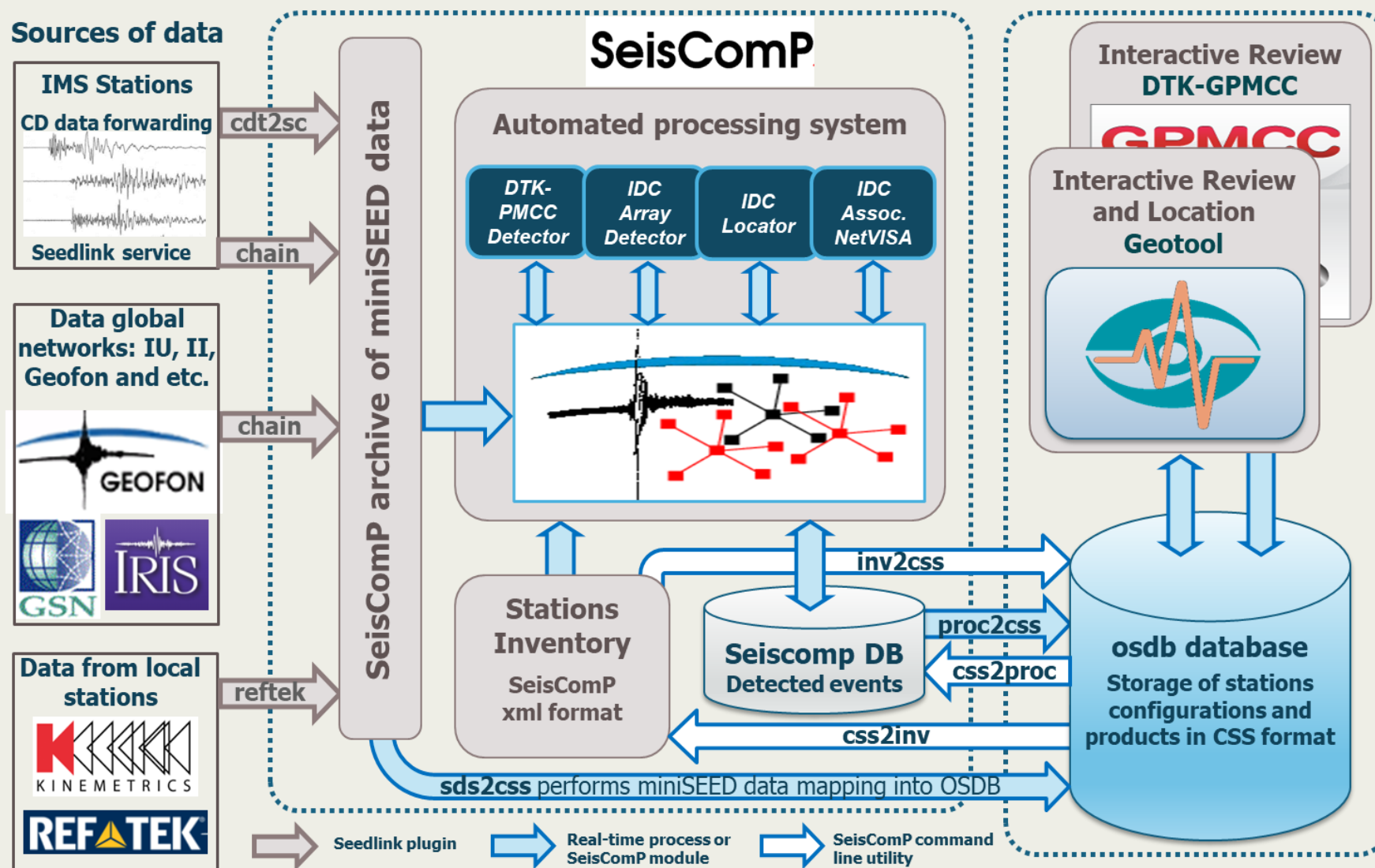
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*NDC-in-a-Box real-time waveform data processing pipeline*

## Future Developments

✓ **SeisComP**: Development continues in ensuring that amplitude measurements performed by the scdfx and scamp modules align with the IDC processing pipeline. Further improvements are planned to respond to user feedback from the recent releases of SHI NIAB. This includes improving the reliability when using various input data formats, and supporting the use and testing of NET-VISA by improving its interface to SeisComP.

✓ **Geotool**: The primary development objectives remain focused on exploring further performance enhancements, ensuring system stability, and expanding data retrieval capabilities from both VDMS and FDSN services, addressing known bugs, closing functionality gaps, such as the Real-Time Display.

✓ **DTK Software**: Improvements to the processing of infrasound data are being tested within the IDC in version 7.4.2. DTK-DIVA will be upgraded to 4.8.2 in the next v7.3 update of NIAB.