SnT2017 Poster No. T5.4-P19

Disclaimer
The views expressed on this poster are those of the authors and do not necessarily reflect the view of the CTBTO

NDC Training 2.0: From Training Analysts to Training NDCs

Abdelouaheb Agrebi, Russol Al-Dulaimi, Waseem Allan, Nikita Perfilyev, Alexander Poplavskiy, Johanna Fessl, Kevin Murray, Mario Villagran-Herrera
(Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, Vienna International Centre, P.O. Box 1200, 1400 Vienna , Austria)
Abdelouaheb.Agrebi@CTBTO.ORG

CTBTO PREPARATORY COMMISSION

Overview

With the objective to provide NDC representatives with a forum to share experience in fulfilling their verification responsibilities, the PTS introduced several "NDC sessions" on the margins of the CTBT SnT2015. One of these sessions was devoted to discuss challenges faced by emerging NDCs concerning infrastructure, software and training. Two sets of challenges were identified, some requiring national efforts for resolution and some the support of the PTS:

Emerging NDCs Challenges
- Computer Infrastructure (national, PTS)
- Internet problems (national)
- Lack of personnel (national)
- Power problem (national)
- Spares equipment for CBSs (national, PTS)
- Infrasound and Hydroacoustic data processing tools and training (PTS)
- Cooperation between NDCs (national, PTS)
- Training on the verification through NPEs (national, PTS)

Recommendations were collected in a survey during the proceedings of the 2016 NDC workshop, some of them directly associated with the challenges identified at the NDC Sessions during SnT2015 (similar recommendations have been collected in surveys during NDC training courses and CTBTO workshops):

Improvements to NDC Training:
- WebGrape capabilities
- NDC Preparedness Exercise NPE trials [stimulate participation of the NDCs in actual NPEs]
- Infrasound and Hydroacoustic data analysis
- Realtime data analysis (SeisComp3)
- Update presentation materials

PTS to Expand Participation, Information and Outreach:
- Develop experiments that enhance/require NDC participation and reporting
- Major involvement of NDCs in the IDC Validation and Acceptance Test Plan
- Provide CTBTO resources (e-learning) for students in universities
- Add feedback section to CTBTO SWP
- Create a CTBTO App
- Too many acronyms in the briefings – a problem for newcomers

Workshops and Training Materials
- Systematically collect and share workshop presentations in an easy way
- Make training materials available online

Tools in the extended NDC-in-a-Box
- Not all NDCs were present in the decision for new tools and testing
- Dedicated NPE next year to test the new tools?

Four areas of work required to address the challenges and recommendations

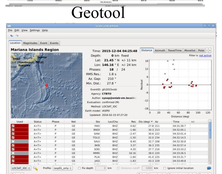
1. **Tools** to analyze IMS data for all technologies, including realtime
2. **Training Programme** based on the newly developed extended NDC-in-a-Box (eNIAB) Package
3. Continue providing **infrastructure support** to NDCs to increase their capacity to participate actively in the verification regime
4. Encourage sharing of expertise between **NDCs** and provide an electronic **forum** for interaction

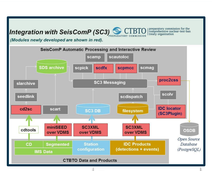
1. Tools

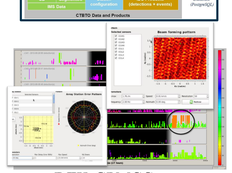
Extended NDC-in-a-Box (eNIAB) +
- Infrasound Processing (DTK-PMCC and DTK-GPMCC: automatically process and interactively review waveform array data based on PMCC algorithm)
- DTK-DIVA: to help analyse station detection background over long periods of time
- DTK-JADE: monitoring tool allowing to scrutinize seismo-acoustic signals and detections produced by different detectors, while scrolling through large amounts of wav-data Significantly expands NDCs processing capabilities
- Integration components between SeisComp3 (SC3), IDC Processing, Geotool and DTK tools
- aVDMS: automating requests for data and products from the Verification Data Messaging System
- msm: produces meta-data information (in the form of wfdisc headers) for miniSEED files
- Radionuclide Software: Improved *Autosaint, openSpectra, DB schema,* configuration, as well as ARR/RRR template
- iNSPIRE: new tool for interactive analysis review, covering particulate, SPALAX noble-gas and beta-gamma coincidence data (to replace *norfy*). To be operational in 2017
- WebGrape enhancements: PSR calculation methods and Internet Based Service (IBS)

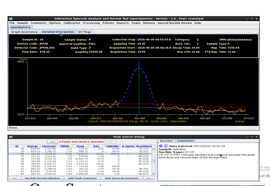
Benefits
- ✓ *Realtime automatic processing pipeline*
- ✓ *Capable of **Infrasound and RN** data processing*
- ✓ *Enables NDCs to more easily combine IMS data and IDC processing results with data from local and national stations and from other networks*
- ✓ *Converting station configuration, arrival and event information between the IDC schema (CSS) and the SC3 data model (SC3XML) as well as CD format data to miniSEED.*
- ✓ *Allows use of ATM tools using online system without software installation and large amount of data download*

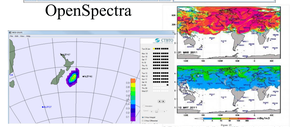

Geotool


SeisComp3




DTK-GPMCC


OpenSpectra

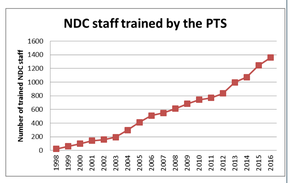

WebGrape-IBS

Abstract:

The CTBTO runs a Capacity Building and Training (CBT) Programme focused on providing technical assistance to States Signatories to enable their effective participation in the CTBT verification regime. One of the major Programme components is training NDC analysts to access and use IMS Data and IDC Products. The ultimate goal is to prepare NDCs to act as technical advisors to their respective national authorities. Over the years, the volume of requests for IMS Data, IDC Products, training courses and tools from NDCs has increased. The PTS continuously responds by *i) improving effectiveness of the training programme and ii) improving existing and developing new software tools for the NDC-in-a-Box Package.*

The improved CBT Programme aims to use available time and resources efficiently while promoting interactions among NDC analysts. In addition to focusing on individual analyst's skills, it will provide opportunities for the trainees to cooperate as an NDC in analysing events of interest using the IMS technologies and the different tools provided by the IDC (i.e. using scenarios of NDC Preparedness Exercises). To achieve this, a training programme incorporating progression from introductory to intermediate and to advanced level courses with an opportunity for trainees to move through the levels has been introduced. The evolution of the programme has counted since 2008, with the joint financial support of the PTS and the European Union (**EU**).

2. Training Programme: Introducing NDC Training 2.0



As of 31 December 2016, the PTS has conducted 91 Training courses for NDC staff. 1360 participants attended the courses from 89 states parties. The number of trained staff has steadily increased over the years and the course contents and quality of the trainings has also progressively been addressed. The continued development and enhancement of E-Learning, the inclusion of training on an extended NDC-in-a-Box (eNIAB) software package and adding NDC Preparedness Exercises NPE-trials to the courses has uplifted the NDC training programme to assist in preparing for the Entry into Force (EiF) of the CTBT.

2.1 Prerequisite E-learning Modules for 2-Week Waveform NDC Training (remote distance education via internet)

The Knowledge and Training Portal (KTP) is a concentrator of services created by the PTS to provide resources to the global CTBT verification community. The education and training spaces of the KTP include E-Learning (45 modules, 29 already available in all **6 UN languages**). There are 24 NDC-Modules.

NDC E-Learning Training Course :
- **About CTBT** (04 modules)
- **IMS Monitoring** (07 modules)
- **NDC Software, IMS Data and IDC Products** (12 Modules)
- **CTBT On-site Inspection** (01 module)

*In total 24 **NDC** modules with 22 translated in all UN languages.*

New!!! Now available offline

2.2 Two-Week Training *Highly based on hands-on training*

Access to IMS Data and IDC Products, basic-to-advance data processing

IMS Waveform Data
- Introduction and overview;
- Methods to Access IMS Data and IDC products;
- NDC Support/Performance Reports;
- IMS Data, Acquisition, Processing and Storage: Standard Software Packages;
- Necessary NDC's Resources to Process IMS Data and Analyse IDC Products;
- Practical sessions on Data and Products Access, and use of Standard Software Packages, etc.

IMS Radionuclide Data
- Introduction and overview;
- Methods to Access IMS Data and IDC products;
- NDC Support/Performance Reports;
- IMS Data, Acquisition, Processing and Storage
- Necessary NDC's Resources to Process IMS Data and IDC Products;
- Practical sessions on Data and Products Access, and use of Standard Software Packages, for processing and analysis of particulate and noble gas radionuclide data as well as post processing of atmospheric transport modelling output.

2.3 Regional NDC Training

Understanding the roles of National Data Centres in the verification regime;
Building and/or improving the National Data Centre capabilities;
Providing participants with sufficient knowledge for accessing and using IMS data and IDC products; and
Providing practical experience in analyzing IMS data.

2.4 Other NDC Trainings

SeisComP3 Training

To strengthen the capacity of the States Signatories' participation in the verification regime and to enhance their use of PTS data and products for civil and scientific applications using SeisComP3 for Realtime data analysis

Infrasound Training

To enhance the use of Infrasound PTS data and products in the NDCs using the extended NDC in a Box package in order to improve their participation in the verification regime and for civil and scientific applications.

2.5 One-Month NDC Training *Advanced…*

- Integration of IMS and NDC data
- Additional Linux, SQL focused on IDC/NDC needs
- More hands-on hours added to the Geotool, WebGrape, SeisComp3 and Hydroacoustic sessions
- New Sessions for the Infrasound data analysis theory and hands-on (using the last release of the NDC-in-a-Box Package)
- Data Fusion/NDC Preparedness Exercise (NPE) trials
- Horizontal training: Prepare NDC Staff on to how to build NDCs processes and train own staff

2.6 Follow-Up Visit: Expert visit to the NDCs to complete the NDC training cycle

To fulfill its functions, an NDC requires, computer infrastructure, properly configured software based tools and trained personnel. As part of the CTBT Capacity Building and Training Programme, the PTS organizes NDC Workshops and IDC expert visits. Upon request from NDCs or as a subsequent activity to infrastructure support (provision of Capacity Building System, CBS) a follow-up visit may be conducted based on the needs, focusing on the completion of these requirements. The technical follow-up visits are one strategic component utilized to provide technical assistance to States Signatories.

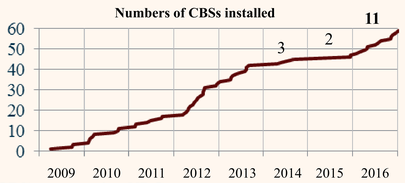
2.7 NDC Preparedness Exercises (NPE) and NDC Workshops :

NPEs are organized every 2 years to check the ability of National Data Centres (NDCs) to carry out their verification activities using IMS data from 4 technologies and also their National technical means. The results of the NPEs are presented during NDC workshops which is also organized every 2 years to provide a forum for NDC experts to share experience in fulfilling their verification responsibilities and to provide NDC feedback to the PTS on all aspects of the data, products, services and support NDCs in their work.

3. Infrastructure Support to NDCs

CTBTO PREPARATORY COMMISSION

Interest among developing countries in establishing their NDCs has grown significantly in the last decade; however, financial and technical limitations have caused delays. The joint cooperation of the PTS and the **EU** has made possible to support these emerging NDCs, not only with training and technology (software) but also with Infrastructure Support.



3.1 Provision of Capacity Building Systems (CBS) to emerging NDCs

In 2009 the PTS developed the concept of a basic set of equipment -**CBS**- capable of allowing an NDC to interface with the IDC (receive, archive and process IMS Data and Products). A total of **58 CBSs** have been installed all over the world. In 2016 the PTS increased the number of CBS installations in more than 500% comparing to 2015. Three different models have been distributed (using newer components as per purchase)

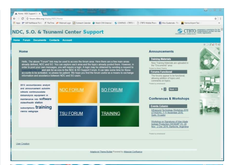
3.2 CBS Maintenance Plan

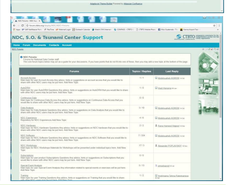
As of 2016 the PTS has implemented a (limited) technical support programme for CBSs that are effectively being utilized at the country level but had failed due to minor technical obstacles (including securing appropriate internet accessibility). The main causes of failure are: UPS Batteries, Hard-disks (Raid), Poor conditions of facility hosting the CBS (leading to broken cooling fans, etc.), Components end-of-life. The approach to spare the CBSs include two ways of assistance for the delivery and installation of the spares, as follows:
- ➢ *Using local contracted services (whenever available)*
- ➢ *Using existing contracts of the PTS (particular for States hosting IMS Stations)*

4. NDC Forum

To foster interaction between the various working groups enrolled in functions associated to IMS Data and IDC Products, the PTS offers an online resource known as the "NDC, S.O. & Tsunami Center Support Forum" (http://forum.ctbto.org). The forum currently includes three groups:
- ➢ *NDC: Personnel from National Data Centres*
- ➢ *S.O.: Station Operators of the International Monitoring System IMS*
- ➢ *Tsunami Center: Personnel from Tsunami Warning Centers (receiving IMS Data, as per agreement between the PTS and the Intergovernmental Oceanographic Commission IOC – UNESCO)*

The online service, in a similar way than any internet blog, offers the possibility of participating and initiating discussions. As of February 2017, a total of 48 topics have been added with 490 replies (3 years). In order to join the forum, participants require a login and must be registered in CTBTO as a member of any of the existing groups to be granted an account.





Conclusions

The CTBTO Provisional Technical Secretariat PTS is providing State Signatories the support required for the establishment and development of NDCs. The PTS provides tools (software), training, equipment and assistance (services). These provisions are constantly being improved both in quality and quantity by addressing feedback and recommendations provided by participants to NDC workshops and training courses. The NDC Training2.0 has been a challenging project undertaken by the Secretariat, its implementation has started in 2017. Measures are being taken to assess the level of success; the commitment of the States is expected.

By establishing an NDC, the States develop the capacity to fulfil their role in the CTBT verification regime; in addition, the use of IMS Data and IDC Products provide benefit for civil and scientific applications. Training courses are held at the Commission headquarters in Vienna and at other locations, often with the assistance of hosting States, at the national or regional level. The capacity building, training and outreach programme is funded through the Regular Budget of the Commission and through voluntary contributions. The contribution of the European Union has been fundamental to the success of the implementation of the NDC Training 2.0.