SERA
Seismology and Earthquake Engineering Research Infrastructure Alliance for Europe

DELIVERABLE

D4.1 Outcome of regional technical EIDA meetings

Work package	WP4 Expanding access to the European seismic monitoring infrastructure
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Summary

This report summarizes the outcome of various networking activities in SERA WP4 to engage and encourage seismic networks in target regions (e.g. Iberia, Balkans, Scandinavia) to initiate national plans and efforts to harmonize the strategy of various national networks for aiming at joining the existing European infrastructure EIDA for seismological waveform data and share data through new or existing EIDA nodes. In total WP4 conducted 3 workshops, 1 technical visit and 2 consult and advise meetings in target regions to discuss and support network operators and organizations in these efforts. Conclusions of these activities can be summarized as:

- EIDA is recognized as *the* infrastructure for seismological waveform data in Europe.
- EIDA enables fostering of national and regional discussions for collaboration between seismic networks and to contribute commonly to EIDA.
- Joining EIDA, or building a new EIDA node, requires strong (national) cooperation on both management and technical levels. For the latter, an EIDA expert's visit for in-depth investigation of the technical impact and the required resources to fully operate a sustainable node are of proven benefit.
- Common challenges in the realization of long term commitment for a (national) EIDA node are identified: allocation of national budget, coordination on an overarching level, sustainability, IT expertise, data licensing. Solution directions strongly depend on national politics and resources.
- Target regions need stronger involvement in European projects to improve collaboration and to standardize acquisition, infrastructure and data exchange that could help the leverage of national funding to establish a solid national framework for sustainable network operations.

1 Introduction

The ORFEUS infrastructure is one of the largest infrastructures in the world that provides seismological data and derived products to the scientific research community in strong collaboration with European seismological observatories. The infrastructure is organized as a networked system of observatory infrastructures, waveform data archives and services. A key component is the federated, distributed European Integrated waveform Data Archive (EIDA) that transparently connects a number of large data centers in Europe, including the ORFEUS Data Center. This unique, federated archive serves seismological waveform data from permanent and temporary networks of broad-band sensors and strong motion sensors deployed in Europe and beyond through dedicated services. Currently, EIDA holds around 400 TB of data of about 100 permanent networks and 100 temporary networks, with a total of more than 8000 seismic stations.

Within EPOS, in which ORFEUS is the infrastructure for seismic waveform data and related metadata, EIDA will be technically prepared to serve data from other European seismological networks as well as other data types (OBS, NFO) to a broader user community (e.g. earthquake engineering). This, however, requires activities to engage and involve network operators to join the existing infrastructure of EIDA and to demonstrate the benefits from joining the federated structure in which technical expertise and data management are shared in an efficient manner.

Task 4.1 within WP4 (Expanding open access to seismic data) conducts workshops and other events in target regions, specifically to engage and encourage additional seismic networks to join the existing European infrastructure EIDA and share/provide data through new, or existing, EIDA nodes. Particular focus areas are the Balkans and Scandinavia, with the goal to integrate seismic and accelerometric data

from the Balkans (e.g. Serbia, Montenegro and Bosnia) and networks in Eastern Europe (Moldova, Ukraine, Belarus, Crimea) to be included in EIDA.

In this reporting period (01 April 2018 – 01 October 2019) the SERA NA2 WP4 task group conducted the following events to engage seismic network organizations to contribute to EIDA:

- EIDA Workshop Madrid (8 March 2018): "Towards an Iberian EIDA Node".
- EIDA technical experts visiting BGS (potential UK EIDA node; 28-29 Jan 2019)
- EMB Chair visiting Bergen in January 2017, 2018 and 2019 for the EIDA node Norway in preparation (Univ. Bergen, NORSAR) .
- EMB member participation in dedicated event "Thirty years after the Spitak Earthquake: Experience and Perspectives, Yerevan, Armenia 3-7 Dec, 2018.
- Greece-North Macedonia coordination workshop, Athens, 2 April 2019
- EIDA workshop Belgrade, 6-7 June 2019.

2 EIDA Workshop Madrid (8 March 2018): "Towards an Iberian EIDA Node".

This workshop was organized to initiate a national/regional discussion in Spain and Portugal to start a long term plan for sustainable participation in EIDA, preferably through one Iberian node or alternatively by two separate nodes. 18 participants from SERA beneficiaries CNRS, NOA and KNMI and representatives of various organizations in Spain (CSIC, ICGC, IGN, Un. Grenada) and Portugal (Un. Evora, IPMA, IST) met in Madrid to discuss the establishment of an Iberian EIDA node.

The federated structure of EIDA strongly prefers extension of EIDA nodes by one or two large nodes rather than by a larger number of small nodes. The EIDA preferred scenario is the construction of one or two EIDA nodes, one overarching all Iberian networks, or one for Spain and one for Portugal. To reach this strategic goal a national discussion is required, and the experience in both France (RESIF) and Greece (NOA) in the process towards a united, national framework to exchange and share data within the European research infrastructure through one (national) EIDA node was presented. Common challenges in the realization of long term commitment for an EIDA node are identified in these processes and discussed (e.g. allocation of national budget, coordination on an overarching level).

Clearly these processes are difficult and heterogeneous throughout the various European countries and take their own dynamics and pace. The advantages of participating in EIDA were well received and recognized: coherent national strategy for funding, relatively small

institutional investments, improvement of data quality and availability, efficient usage of human resources and technical expertise, shared participation in EIDA and FDSN.

3 EIDA technical experts visiting BGS (potential UK EIDA node; 28-29 Jan 2019)

The British Geological Survey (BGS) expressed their interest to become an EIDA node several times in the past. Initial exchange of information took place already during the 2017 ORFEUS Annual Workshop (Lisbon) during which technical aspects and the formal procedure were discussed. The SERA NA2WG4 task group identified the interest of BGS becoming an EIDA node because of the large amount of data that could be added to EIDA, from the national seismic network deployed by BGS and their temporary deployments, the Blacknest array data operated by AWE (Atomic Weapons Establishment) and the rich data-set collected by SEIS-UK, the NERC funded Geophysical Equipment Facility (GEF), based in the School of Geography, Geology & the Environment at the University of Leicester.

Prior to any formal application to join EIDA, BGS preferred an in-depth investigation of the technical impact and the required resources to fully operate a sustainable EIDA node. A technical visit by two technical experts to BGS was done in January 2019 with the goal to install and set up the framework for running an EIDA node. A technical description of the installation of the software and the required configuration was provided (appendix B) and will help next potential interest institutes to explore the implications between joining EIDA or contribute data to an existing node.

4 EMB Chair visiting Bergen (EIDA node Norway in preparation: Univ. Bergen, NORSAR)

The EIDA Management Board Chair has been invited to be a member of EPOS-Norway Advisory Board, with meetings organised by EPOS-N in January 2017, 2018 and 2019. In connection with these meetings, dedicated side meetings were organised to discuss the necessary evolutions in the upcoming EPOS-N EIDA node (Uni Bergen, NORSAR). The EPOS-N EIDA node includes setting up a data distribution for the permanent Norwegian networks operated by the University of Bergen. This dataset is already largely distributed by ORFEUS Data Center.

To ensure high scientific value of creating a new EIDA node, options of increasing the amount of distributed data to include temporary deployments and to include the full archive of NORSAR array data. The EPOS-N data center is now fully operational from a technical point of view, and the integration of new datasets is now largely under way. The formal report from the candidate Norway EIDA node has been received on Sept 19, 2019, and it is expected to be accepted as EIDA node by the ORFEUS Board of Directors before the end of 2019.

5 EMB member participation in dedicated event "Thirty years after the Spitak Earthquake: Experience and Perspectives, Yerevan, Armenia 3-7 Dec, 2018.

An EMB member participated to this international/regional conference in Yerevan, Armenia on 4 December 2019. During this meeting, ORFEUS and EIDA were presented to initiate a national/regional discussion in Armenia and Lesser Caucasus for a long term plan of sustainable participation in EIDA and ORFEUS.

6 Greece-North Macedonia coordination workshop, Athens (2 April 2019)

NOA organized a coordination workshop to promote the exchange of seismological data between national and regional networks in Greece and North Macedonia within EIDA and ORFEUS. A special objective of this meeting was seismological and strong motion data exchange in real-time that will improve the seismic monitoring in the cross border regions and the Balkans. NOA agreed to make available seismic waveform data and metadata from seismological and strong motion stations in Northern Macedonia through its dedicated EIDA data center and to secure visibility and accreditation for the North Macedonian parties from the European scientific community and civil protection agencies.

7 EIDA workshop Belgrade, 6-7 June 2019.

INFP and NOA, together with ORFEUS, organized a regional workshop in the Balkans to promote the exchange of seismological data between national and regional networks and EIDA within ORFEUS. The workshop took place in Belgrade, Serbia, on June 6-7, 2019. Current EIDA nodes in the region are operated by the National Institute for Earth Physics (NIEP) in Romania and National Observatory of Athens (NOA) in Greece.

This workshop aimed at facilitating the integration of national/regional data in current or new EIDA nodes by discussing technical and operational aspects. The workshop was intended for participants from: Serbia, Croatia, Bosnia-Herzegovina, Montenegro, Albania, Kosovo, Bulgaria and North Macedonia. In total 16 representatives of the Seismic and Accelerometer Networks in North Macedonia, Croatia, Serbia, Bulgaria, Romania and Greece participated in the workshop, accompanied

by 3 staff members of other EIDA nodes (ODC, ETH) and ORFEUS. There were no representatives from Montenegro, Bosnia and Albania.

The meeting started with an introduction to EIDA: concept, technical requirements, management, current status, services and operations. At present 10 archives are distributing data through standardized services in standard formats. EIDA currently has 8000+ stations, 100 permanent networks 100+ temporary deployments, representing over 400 TB of data that is federated by the 10 nodes. The status of existing nodes from the Balkans region NIEP and NOA where presented by their national representative. Both nodes deploy all standardized services and have strong technical expertise in the operations within EIDA. The integration of new data in the existing nodes is encouraged. Also the current broader European infrastructure for solid Earth Sciences was presented and the relation with SERA (EPOS, ORFEUS, EIDA).

ORFEUS representatives presented the EIDA services: the web interface, access to data through webservices and the EIDA federator. The federator provides a single access point to the services fdsnws-station, fdsnws-dataselect and eidaws-wfcatalog across all EIDA nodes and allows users to issue a (complex) data request without knowing where the data is hosted. This service allows also queries across different web service domains. Another important service is the authentication service - the central authentication system providing tokens for all EIDA services, based on B2ACCESS and EUDAT2020 – that allows transparent access to embargoed data.

During the meeting different questions and challenges were raised related to the participating organizations (network operators), as well as to the kind of interaction between the networks and the way of cooperation with other international organizations. These issues are listed below for each country:

- North Macedonia was represented by two institutions: Seismological Observatory at the Faculty of Natural Sciences and Mathematics, University "St. Cyril and Methodius" which is responsible with seismic monitoring and Institute of Earthquake Engineering and Engineering Seismology (IZIIS). Although the Seismological Observatory has developed a real time seismic network during the last years they have problems due to the lack of personnel. Another concerning issue is that the available personnel is not fully trained to maintain and operate the full potential of seismological software Seiscomp3. IZIIS, the other representative of North Macedonia, has developed a strong motion network designed to monitor the effects of strong earthquakes, and data is available once the technical aspects for international data exchange is established. It was suggested during the discussions that to include data streams from these accelerometers in the real-time acquisition in Seiscomp3 so the data will be used by all interested institutions in the country. It has been suggested also that these stations should be included in the European seismic network as a national contribution.

- Serbia unfortunately was not represented by the National Institute which is in charge of the seismic survey of Serbia. The representative of Serbia, S. Radovanovic, was the former director of this institution and presented the current situation regarding the seismic infrastructure: hardware status and data exchange with other countries. Currently seismic data exchange is with NIEP (Romania), MEDNET (Italy) and GFZ (Germany). The Serbian seismic network is integrated with the GFZ network which is a system existing before EIDA. Also the lack of personnel at the Seismological Survey of Serbia was underlined.

- Bulgaria – the representative presented the current status of the seismic network. Data from the Bulgarian Seismic Network are transmitted in real time to the NIEP EIDA Node. The Institute representative is willing to continue the collaboration with EIDA by providing real time seismic data.

All the Institutions were encouraged to exchange data with one of the regional existing EIDA nodes. By providing data the contributing Institutions can benefit from shared knowledge and technical expertise to:

- Safe and persistent archival of data for European Institutions
- Improve attribution and in the near future ensure full identification, traceability and reproducibility of data
- Get ready for a number of derived products within ORFEUS (RRSM, ESM, Station Book)
- Logging service to quantify data usage
- Quality assurance
- Increase visibility of data and improve data discovery
- A competence center (ETC) for IT developments in Seismology
- Help defining seismological center best practice for ORFEUS community

The workshop led to a better understanding of the status of the Balkans seismic networks and information exchange between institutions. During the workshop the status of the seismological networks in the Balkans region was presented, so in this way several technical and/or political issues were identified. An important statement was made by several countries / network operators on the need to be stronger involved in European projects to improve collaboration and promote best practices for acquisition, infrastructure and data exchange that could help the leverage of national funding to establish a solid national framework for sustainable network operations. The workshop was also an opportunity to present the emerging AdriaArray project, that has a strong potential to promote collaboration and data sharing among seismological observatories in the Adria-Balkans-Dinarides region and EIDA.

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5 References

Presentations of the Balkan workshop can be found here: http://infp.infp.ro/~neagoe/SERA/

6 Appendices

Appendix A: Agenda EIDA Workshop Madrid (8 March 2018): "Towards an Iberian EIDA Node".

- 11:00 - Status of all seismic BB and SM stations in Iberia, data storage and distribution, including temporary experiments (All)
- 13:00 – Lunch break
- 14:00 - Input from EIDA Board Members:
    - History of EIDA, present status and goals.
    - Requirements to become an EIDA node.
    - Two case studies - France and Greece (EIDA Board members)
- 15:30 - Presentations from organizations presently candidates to become an EIDA node
- 16:30 – Coffee break
- 17:00 - Discussion: how to achieve the long term goal of distribution of high quality data, from all BB and SM stations in Iberia.
- 19:00 - Closure
- 20:00 - Dinner

Appendix B: EIDA technical experts visiting BGS (potential UK EIDA node; 28-29 Jan 2019)

A living document is maintained at ORFEUS:

https://orfeus.atlassian.net/wiki/spaces/OIT/pages/502628357/SEISCOMP3+installation+guidelines

and provides full documentation on the required steps:

1. Install SeisComP3 (SC3)
    a. Configure SC3
        i. Enable modules
        ii. Import station metadata
        iii. Create bindings
            1. SEEDLINK
            2. ARCLINK
            3. SLARCHIVE

   b. Configure SC3 modules
      i. FDSNWS module
      ii. ARCLINK module
      iii. SLARCHIVE module
      iv. GLOBAL module
   c. Install and configure WebDC3 web interface
2. Install EIDA tools
   a. WFCatalog
      i. Enable WFCatalog GUI web interface
   b. Routing service

Appendix C: Greece-North Macedonia coordination workshop, Athens, 2 April 2019

10:00 | 10:05	Welcome by NOA president and NOA-IG deputy director
10:05 | 10:10	Short introduction of the participants
10:10 | 10:30	IZIIS presentetion *by Vlatko Sheshov*
10:30 | 10:45	IZIIS Strong motion network *by **Dragi Dojcinovski***
10:45 | 11:00	Skopje seismic observatory presentation *by Dragana Cernih*
11:00 | 11:30	Coffee break
11:30 | 11:45	NOA Strong motion network *by Ioannis Kalogeras*
11:45 | 12:00	NOA broadband network and EIDA@NOA *by Christos Evangelidis*
12:00 | 13:30	Round table discussion
13:30 | 15:00	Lunch break
15:00 | 16:00	NOA museum tour
16:00 | 17:20	Round table discussion and NOA seismic facilities presentation
17:20 | 17:30	Next visits, Closure of the Meeting
20:00	Dinner

Appendix D: Participation in dedicated event "Thirty years after the Spitak Earthquake: Experience and Perspectives, Yerevan, Armenia 3-7 Dec, 2018

5 December, DVIN Hall (Ani Plaza Hotel)

Section i. 1988 Spitak earthquake: Field observations in the epicentral area; present-day seismicity of the region; new studies and results after 30 years.

Session 1: Chairman Dr. R. Gök, Co-Chairman Dr. L. Sargsyan

10:50–11:10 C. Evangelidis and G. Drakatos. European federated EIDA infrastructure for seismic waveform data archives. The regional NOA data implementation.

Appendix E: Agenda EIDA workshop Belgrade, 6-7 June 2019

06 – June 2019

Registration + Lunch 12:00 - 13:30

- 13:30 - 14:00 Opening - Reinoud Sleeman and Constantin Ionescu
- 14:00 - 14:15 ORFEUS Presentation (ORFEUS & SED@ETHZ) - Carlo Cauzzi
- 14:15 - 14:30 EIDA Node Presentation (KNMI and ORFEUS) - Reinoud Sleeman
- 14:30 - 14:45 EIDA Node Presentation (NIEP) - Cristian Neagoe
- 14:45 - 15:00 EIDA Node Presentation (NOA) - Christos Evangelidis

Coffee break 15:00 - 15:30

- 15:30 - 15:45 EWS (NIEP) – Alexandru Marmureanu
- 15:45 - 16:00 Dragana Chernih-Anastasovska (University of Skopje)
- 16:00 - 16:15 Vesna Šipka (Republic Hydrometeorological Service of Republic of Srpska)
- 16:15 - 16:30 Radmila Salic/Marta Stojmanovska (UKIM, Skopje)
- 16:45 - 17:00 Zeljko Zugic (Pazinska 5/7)

07 – June 2019

- 9.00 - 9:30 NIEP Presentation – Constantin Ionescu
- 09:30 – 09:45 Seismic Instrumentation & Network Advancements - Edelvays Spassov
- 9:45 - 10:00 Liliya Dimitrova (BAS, Bulgaria)
- 10:00 - 10:15 Jovana Borozan (Public Investment Management Office of the Republic of Serbia)
- 10:15 - 10:30 Oscar Diaz, Stepa Petrović Čačić, Dejan Naumov -Deep Borehole Installation Of STS-5A And Q330HRS As Part of Einstein Telescope FP7 Project

Coffee break 10:30 - 11:00

- 11.00 - 11:15 ODC developments – Jarek Bienkowski
- 11:30 - 11:45 Thomas Meier - The AdriaArray initiative: An open challenge for scientific cooperation in the Balkans
- 11:45 - 12:00 Costas Papazachos – Local Observatories
- 12:00 - 12:30 Open Discussions & closing

12:30 - 14:00 Lunch break / adjourn

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