

**TEPID –
TOWARDS EASTERN PARTNERSHIP COUNTRIES
E-INFRASTRUCTURES DEVELOPMENT**

ACTION FICHE

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I. Current state of affairs in the relevant sector

Following Department for Business Innovation and Skills of Research Councils UK, the e-Infrastructure refers to a combination and interworking of digitally-based technology (hardware and software), resources (data, services, digital libraries), communications (protocols, access rights and networks), and the people and organisational structures needed to support modern, internationally leading collaborative research be it in the arts and humanities or the sciences (<http://www.rcuk.ac.uk/documents/research/esci/e-Infrastructurereviewreport.pdf>).

This viewpoint allows to join and fit together all interrelated infrastructures and to start considering them as a single system. It will make possible to optimise not just each individual part, but the system as a whole. The prime goal of the e-Infrastructure is to support e-Science, e-Health and e-Culture and, at the same time, create opportunities for many other application domains which are important to society such as e-Commerce, e-Government, e-Training and e-Education. A competitive e-Infrastructure is indispensable to the numerically oriented branches of sciences, like climate and earth system research, water management, fluid dynamics, biophysics, theoretical chemistry, astrophysics, quantum chromo dynamics, nanostructure physics and high-energy physics. Both the increasing progress in mathematical models and the complexity of simulations create greater demand for these subject areas and for computing power to be almost unlimited. But there is also a strong tendency towards mass deployment of ICT to manage the large variety of decentralised data sources and find novel approaches to acknowledged problems from traditionally less computer oriented areas such as social sciences, humanities and biodiversity.

The research networking infrastructure delivers the physical connections for the e-Infrastructure. These will primarily be delivered through the hybrid GÉANTx6 pan-European backbone network and the fine-grained National Educational and Research Networks. These networks together form the solid basis for the general purpose scientific communication, supporting collaboration and special uses (of which the grid and distributed supercomputing applications are a part, but not a big one).

The West European countries should recognise the diversity of organisation and funding of the e-Infrastructures in the East European countries, derived from their historical arrangement of science and education.

Most of the EaP countries are still undergoing reforms of the ICT system or have just implemented them, there is a strong need for capacity and institution building at national (or sub-regional) level to stabilize/advance the ICT systems. Generally, there is a positive trend manifested through new laws on creating favourable conditions for ICT development and through the designation of state bodies to be in charge of ICT policy development and implementation. In recent years all EaP countries have defined their policies on ICT R&D through the development of relevant legislation. There are several laws and amendments to the national strategies for the development of ICT, but very few have concrete quantitative targets or follow a comprehensive systematic approach.

Development of e-Infrastructures requires ongoing support for research and education networking. The National Research and Education Networks play a key role in developing and integrating e-Infrastructures in the Eastern Partnership countries. As well as in connectivity and traditional network services they also have a role in providing services such as identity federations, grids and clouds to support the end institutions and their users. GÉANT plays a key role in linking the e-Infrastructures of the Eastern Partnership countries and providing connectivity to the rest of Europe and other regions of the world.

Currently all the EaP countries have their NRENs. The level of services, provided by these NRENs to their respective educational and scientific communities differs greatly and the e-Infrastructures they operate are rather diverse. A very important issue for all NRENs of EaP countries is the cross-border infrastructure and their connectivity to the EU countries.

II. Objectives

The overall goal of the project is to provide the integration of research communities of the EaP countries with their EU counterparts by means of development of high-speed connectivity, introduction of new informational and computational services (including GEANT-based ones), provision of opportunities for scientists from EaP countries to publish their results and to freely access scientific publications.

Nationally, EaP countries have to reach the level of EU countries in the area of e-infrastructure and usage of informational and computational services by the educational and academic communities. In particular:

GRID and Cloud Computing: EaP countries are actively developing their own Grid infrastructures for close collaboration and interaction with the European Grid Infrastructure. It is reasonable therefore to envisage developing interoperable solutions and standards as well as pilot actions for cooperation around the topic of advanced programming techniques for supercomputing. Some countries are members of EGI, most EaP countries are connected to the Pan-European GEANT network and are willing to develop further this cooperation with EU.

ICT for e-learning and digital information services: Universities, research institutes, libraries and cultural centres could be involved in activities on information digitizing as well as new technologies for digital information access development. The development of such sub-priorities as digital libraries, e-services for access to cultural heritage and technology enhanced learning, such as E-learning resources are amongst the most important priorities.

Nanoelectronics, Microelectronics: the EaP countries possess a high level expertise in this topic and a critical mass of high-level researchers. Common scientific programmes are being implemented within the EECA countries cooperation activities, and some shared infrastructure has been developed. The new generation of components and systems development is also of great importance nowadays.

Electronic governance (e-governance), including intelligent information management: EaP countries are planning to create new services for home and international citizens (as well as for business, simplifying regulatory procedures) with the help of new ICT solutions. The joint development of agreed solutions is an important task.

ICT for Health is one of the most significant societal challenges in EaP countries, as well as in the EU. It is important to develop interoperable solutions and standards within this field as well as to foster technical solutions implementation in EaP countries that would be in line with the best European practices.

Within implementation of the envisaged work it is planned to:

- Provide broadband (100 – 40 – 10 Gbps) international connections to all or some of the neighboring with Ukraine EU countries which are already integrated into the European high speed backbone/GEANT – Hungary, Romania, Poland, and Slovakia. Existing cross border connections are also kept in place and, where possible, upgraded.
- Provide broadband (as fast as would be feasible in the framework of the project) connections to the EaP countries - Moldova, Belarus, Georgia, Armenia, Azerbaijan
- Expand the coverage to all educational and academic institutions in the EaP countries and provide services to governmental institutions when necessary.
- Attract and involve young researchers (including students of universities) by connecting educational establishments and providing broadband access to their campuses.
- Provide access to scientific materials published by leading scientific press and form a country-wide service for publishing scientific periodicals.
- Ensure dissemination of knowledge in the field of networking and services, training and support to educational and academic institutions, as well as to staff of NRENs of connected EaP countries.

III. Expected outcomes and results

1. High-speed fiber optic connectivity:
 - 1.1. Establishment of cross-border fiber optic connections with NRENs in EU and EaP countries.
 - 1.2. Further deployment of the national-wide DWDM high-speed network for research and education.
 - 1.3. Further development of metropolitan area networks and connection of research and educational organizations to the high-speed backbone. Connecting distributed resources or resources which are owned and maintained by different parties
2. Data processing facilities:
 - 2.1. Development of the 1000 TFlops high-tech cluster for EU and EaP Grid communities and projects.
 - 2.2. Installation of Distributed clouds computing data center (DCCDC) providing contemporary information services to the educational and scientific community of EaP countries.
3. Scientific and research information exchange:
 - 3.1. Provision of easy and widely available access to the digital versions of scientific publications (books, journals, databases etc.) by leading scientific publishing houses. Establishing the economy of scale approach collaborating with research and education institutions in EaP countries.
 - 3.2. Creation of the Ukrainian National DOI (Digital Object Identifier) Registration Agency and achievement of publishing systems interoperability of EaP countries with global Reference Databases of scientific information.

IV. Geographical area to be covered:

- EaP countries (cross-border connectivity): Moldova, Belarus and, based on results of a feasibility study – Georgia, Armenia, Azerbaijan. Connectivity to be provided by the NRENs of the EaP countries; high-speed fiber optic links will connect educational and scientific organizations, innovation incubators, technology-transfer centers, etc. of all big cities where there are research and education centers and together with existing NREN channels will join the whole territory.
- EU countries, bordering with Ukraine: Poland (cross-border connection already in place, may be upgraded), Romania – cross-border connectivity has been discussed, prerequisites established, can be implemented fairly quickly, Slovakia and Hungary – both connections need to be negotiated and researched.



V. Sustainability

Sustainability of the resources created as a result of the project implementation is provided by the connected NRENs. It is anticipated that the governments of the EaP states may also provide financial or in-kind support.

1. High-speed fiber optic connectivity:

Will be provided by using the URAN and UARNET resources:

- stable maintenance and supervision of the built fiber optic;
- scheduled and unscheduled maintenance of the DWDM systems;
- network monitoring and configuration of the monitoring system;
- payment for electricity and indirect operating expenses.

Operating expenses will be covered:

- during the pilot operation – from the project budget;
- during sustainable operation – by NREN's users.
- a part of facilities not-currently-used may be rented out to telecom operators.

2. Data processing facilities:

Operating expenses will be covered:

- during the pilot operation – from the project budget;
- later – by institutions holding and operating data processing facilities.

3. Scientific and research information exchange:

Operation of access points to digital versions of scientific publications will be provided totally by concerned universities.

Payments for access licences to digital publications will be covered by

- during the 5-year period of the project – from the project budget;
- Prolongation of the licences after the completion of the 5 year period - by the State authorities of EaP countries or concerned universities.

Operating expenses of DOI RA and othe facilities for publishing of scientific periodicals will be covered:

- during the pilot operation – from the project budget;
- during sustainable operation – by scientific publishing houses in EaP countries.