The 3rd Eastern Partnership E-Infrastructures Conference EaPEC 2018,
October 17-18, 2018,
Chisinau, Republic of Moldova

RENAM infrastructure and services for supporting research and education in Moldova

Ion Tighineanu, Grigore Secrieru, Petru Bogatencov
RENAM, Republic of Moldova

Outline

- Evolution and current trends in the development of electronic infrastructure and services in the RENAM network.
- The prospects of creating new optical CBF (Cross Border Fibers) links and other components of the electronic platform RENAM-GEANT on the basis of the EU-funded EaPConnect project.
- Development of modern regional e-Infrastructure resources and the provision of services that are focused on support of scientific and educational communities in the European Eastern Partnership Programme countries.

E-Education, E-Science

- The application of ICT tools in education and science leads to their transformation into e-Education and e-Science.

- E-Education, E-Science means the transfer of information within an information system in a specific manner, capable of producing excellence in educational and research activities.

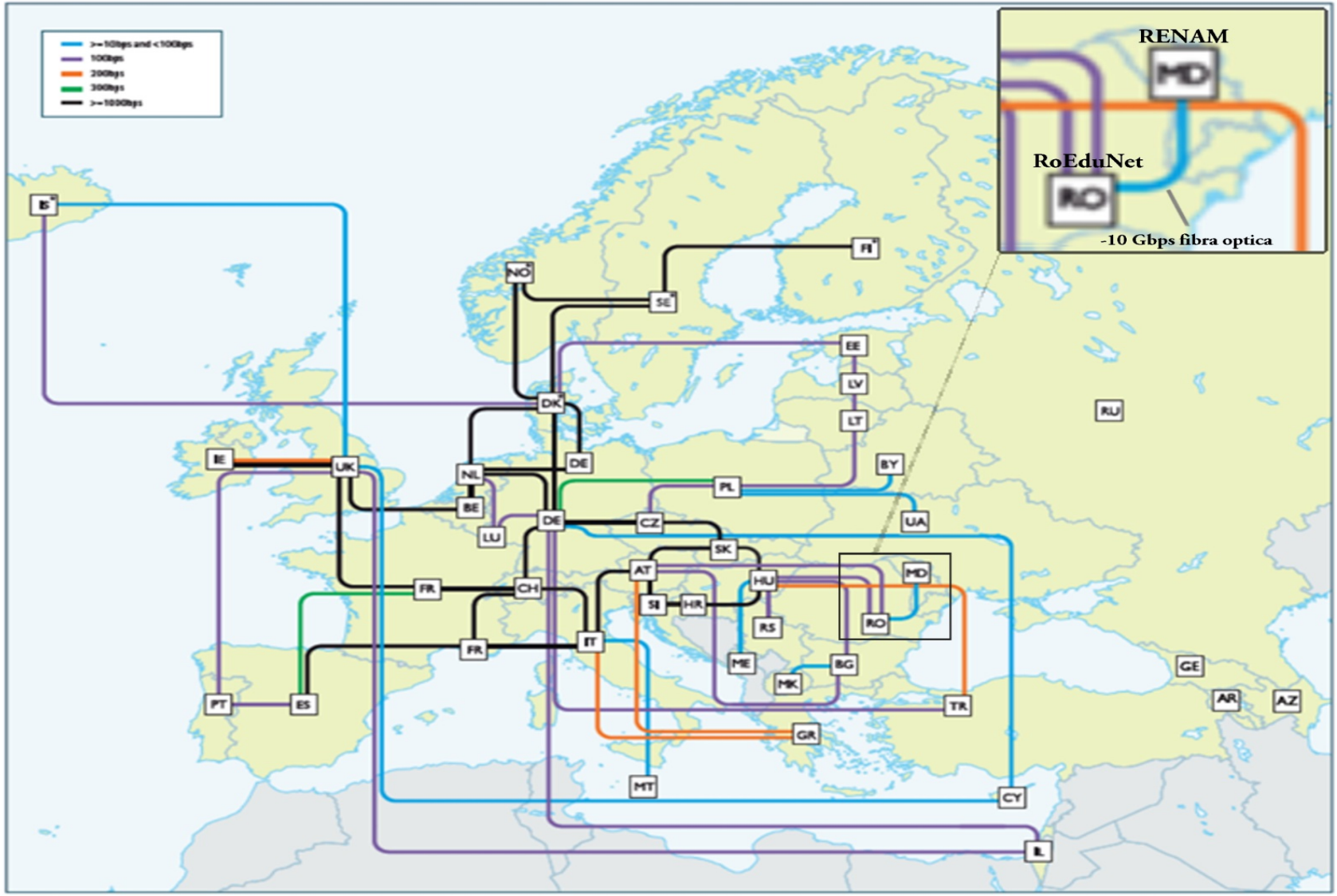
- It is based on the existence and use of a joint electronic infrastructure NREN (National Research and Education Network).

E-Infrastructure for research and education

The e-Infrastructure layers consist of:

- Communication Networks (the European Research & Education Network GÉANT, National Research & Education Networks - NRENs),
- High Performance Computing, Cloud computing, etc.,
- Specialized applications and software systems,
- Scientific data (Open science support, data management systems, data repositories, e-Libraries, etc.).

GEANT network architecture in Europe and RENAM connectivity



GÉANT connectivity as at January 2014. GÉANT is operated by DANTE on behalf of Europe's NRENs.

Evolution of R&E electronic space in the Republic of Moldova

- In Moldova, first computer networks for R&E have been created in 1994-96 (Academy of Sciences of Moldova, Universities) with the support of the Soros Foundation (1996-1998), NATO Scientific Council (1998-2003), and EU (from 2003).
- The common electronic space in the Moldovan R&E sector has been generated after the creation of the RENAM network, managed by the RENAM Association.

- **RENAM's goal:** to integrate the networks of education and research institutions into a common electronic space and to develop specific ICT services.

RENAM network concept

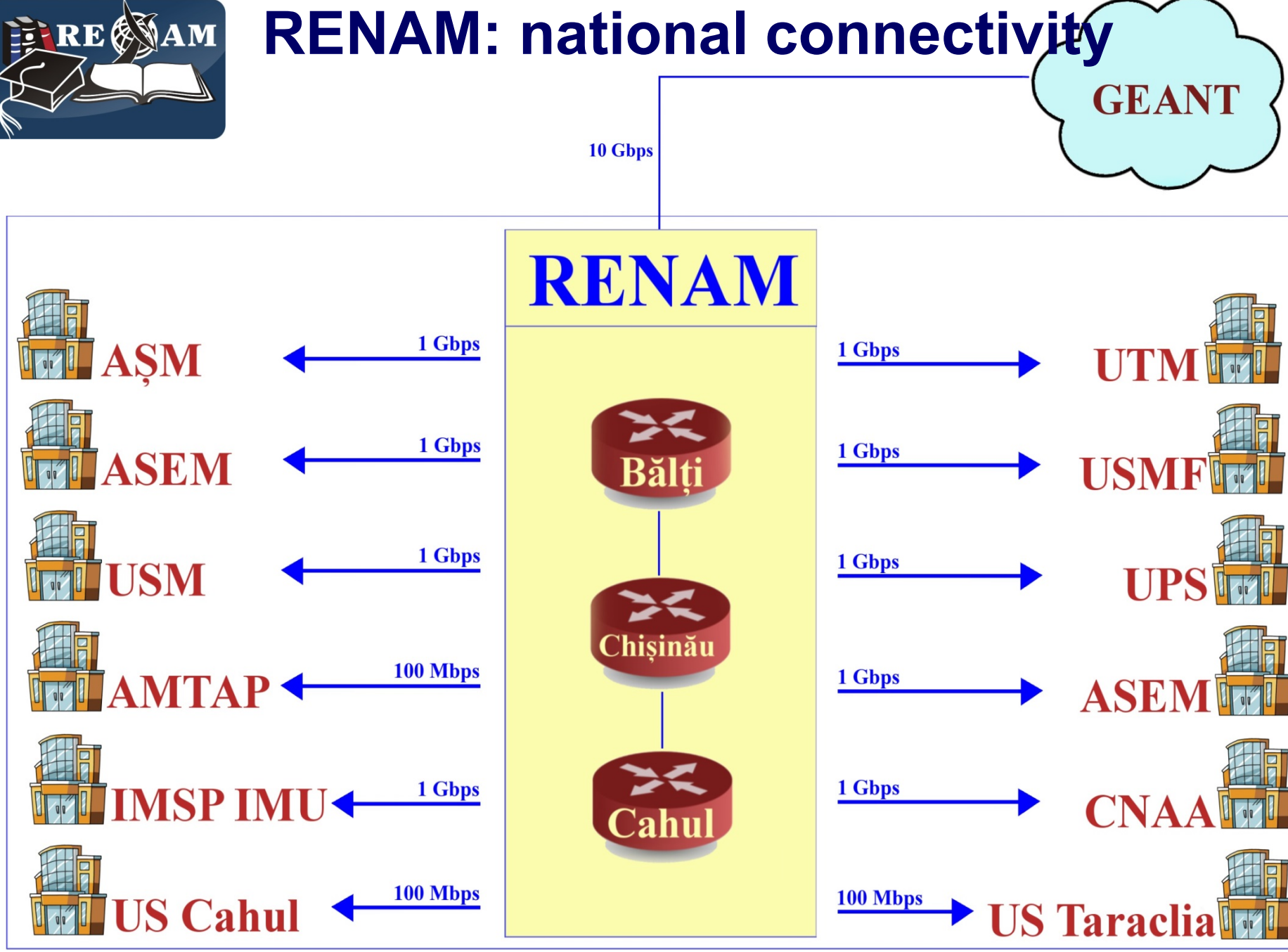
The topology of the RENAM network is based on a three-level architecture:

- The first level includes the central communication node and external optical channels like RENAM (Moldova) - RoEduNet (Romania) and broadband connection to GEANT.
- The second level is the national backbone of the RENAM network to which universities and research institutions are connected.
- The third level includes local networks in campuses and buildings of universities and research institutions.

An important role for extending external connectivity of RENAM was played by the creation of the optical channel to Romania providing access to GEANT in the framework of joint SEE-GRID-SCI (**EC-funded**) and NIG 982702 (**NATO-funded**) projects.


Wim JANSEN
Cris De WISPELAERE
André ANDRIES
Gheorghe BUCA
Fiber Link Moldova-Romania Inauguration
Chisinau, 20-21 May 2010
GÉANT
NATO
OTAN
European Commission
Information Society
and Media
eGI
European Grid Initiative
TERENA
DANTE
BOSCH

RENAM: national connectivity



RENAM development status in relation to other NRENs

- This evaluation is necessary to assess the level of the development of RENAM e-infrastructure in relation to other NRENs in Europe.
- The actual operational speed of the RENAM external channels is higher than 10 Gbps. However, the RENAM internal operating speed for majority of end-users is 1 Gbps.
- Requests from universities to increase connection capacities at 10 Gbps speeds clearly demonstrate the need to upgrade RENAM communication infrastructure up to 40/100 Gbps.

RENAM development perspectives

Main directions:

- Upgrading the central communication node and RENAM external connection channels to GEANT.
- Developing National Backbone to increase institution connectivity capabilities (10 Gbps as typical access speed).
- Elaboration, adaptation and implementation of modern ICT services.

Current opportunities and perspectives for national e-Infrastructure development are based on EC-funded international projects in which RENAM participates.

RENAM in international projects

n/o	Title of the project
1	EC, **EaP Connect**, External Actions EU: Grant Nr. 2015/356-353/11.06.2015, **2015-2020. Particip. 12**
2	EC, **VI-SEEM** H2020-EINFRA: VRE for regional Interdisciplinary Communities in Southeast Europe and the Eastern Mediterranean (VI-SEEM), nr. 675121, **2015-2018. Particip. 13**
3	EC, **GN4-2**, H2020-IBA-SGA-INFRA-GEANT: Research and Education Networking, stage 2, GEANT (GN4-2), nr. 731122, **2016-2018. Particip.39**

EaPConnect project (2015-2020)

The main goal of the EaPConnect project is the development of cross-border infrastructure and modern e-Infrastructure in the Eastern European Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine).

The expected result for RENAM is the development of broadband networking infrastructure (over 10 Gbps). It envisages creation of new internal optical channels and external optical channels, oriented to Romania and Ukraine.

EaPConnect project: solutions

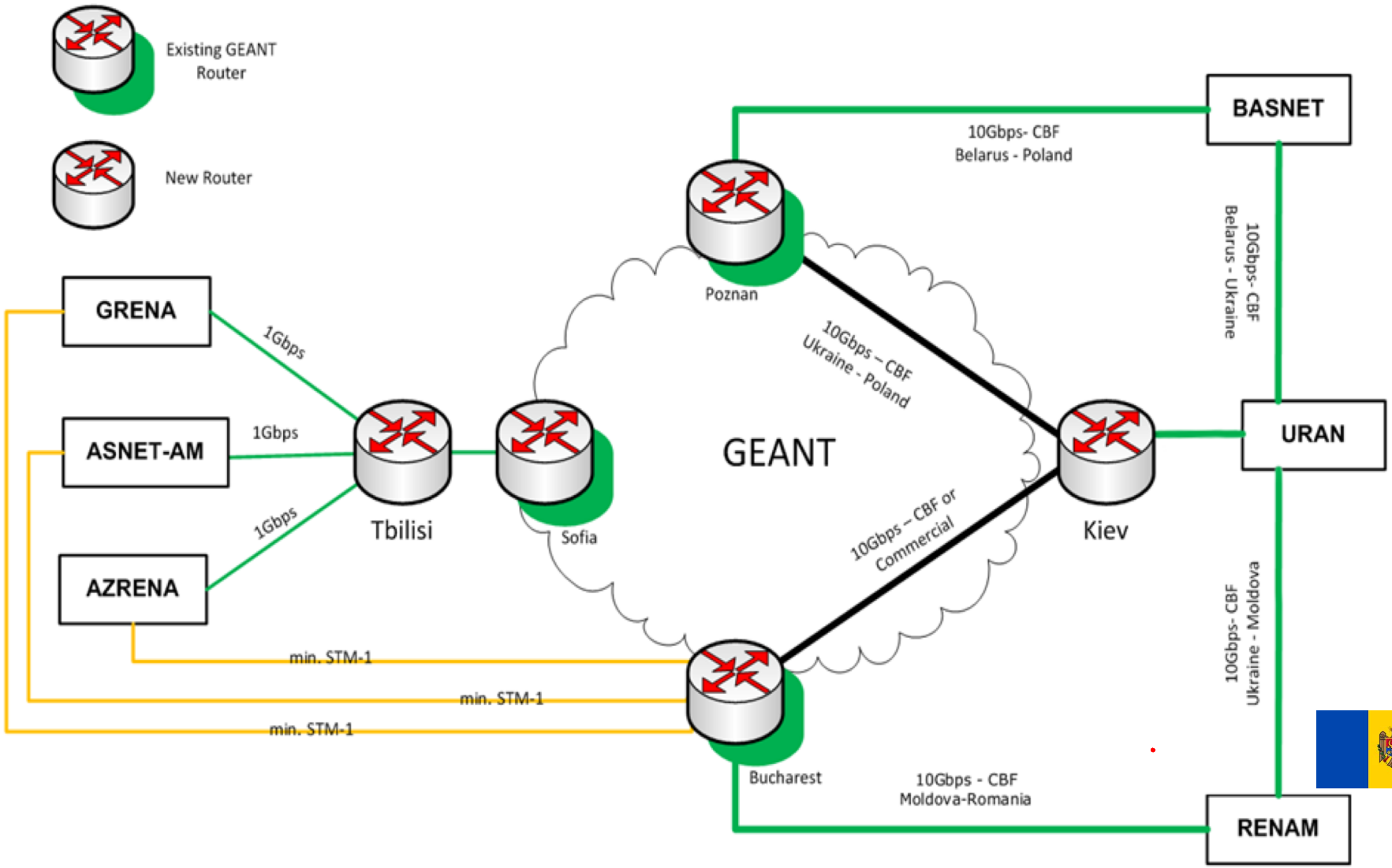
Special attention paid to identifying solutions of effective integration of EaP networking infrastructure to GÉANT.

Various approaches of the EaP regional network infrastructure development and its integration to GÉANT have been discussed.

Experts from GEANT, CEENet and Eastern Partnership NRENs elaborated the architecture of the whole regional network.

The elaborated general scheme, proposed network topology and approaches of realization have many advantages.

Developing regional connectivity to GEANT (EaPConnect project)



Geographical scheme of EaPConnect CBF connections

Development of regional connections for Moldova (EaPConnect project)

E-Infrastructure for research and education

E-Infrastructures for research and education are oriented to support distributed medium based on:

- high-bandwidth networks,
- HPC and scientific Cloud resources and others,
- corresponding data repositories.

All these facilities form a new research environment, enabling shared access to unique or distributed scientific facilities (including data, research instruments, computing resources and networks).

RENAM services at the national level

- Access to European and worldwide academic networks and global Internet through the GEANT network;
- Provision of broadband (high-speed) connections for national R&E institutions;

Interconnection of national E&R institutions:

- Academy of Sciences of Moldova,
- Research Institutes,
- Technical University of Moldova,
- Academy of Economic Studies of Moldova,
- Moldova State University,
- Ion Creangă Pedagogical State University,
- Nicolae Testemiţanu State University of Medicine and Pharmacy, University of European Studies of Moldova,
- Taraclia State University,
- Bogdan Petriceicu Haşdeu State University (Cahul),
- Academy of Music, Theatre and Fine Arts (Chisinau)

Access to GEANT and internationally available services

- eduGAIN - Federated Identity Management Service, using the global inter-federation mechanism;
- eduroam (WiFi network mobility service) - Secure Wi-Fi network access worldwide;
- Access to HPC resources of European computing infrastructures available via regional or/and specific calls, organized by EaPConnect project for porting and running applications for institutions, connected to RENAM;
- Access to world-class cloud infrastructure resources (Amazon, Microsoft, CloudSigma, etc.) through the GEANT Framework Agreement to get different cloud resources using Federated Access.
- Integration of computational and data resources of Moldova in the European Open Science Cloud (EOSC).

Conclusions (1)

- As a result of implementation of the EaPConnect project a fast development of the electronic communication infrastructure in Moldova is achieved, which reduces the existing gap (in comparison with the developed countries of Europe).
- Approaches for creating new connections are focused on cross-border fiber optic links that enable increased e-Infrastructure operational capabilities.
- The development of e-Infrastructure in the region is important for the integration of the scientific potential of Moldova and other countries into the European Research Area.

Conclusions (2)

- Development of RENAM digital space marks a new generation of integrated resources and services, thus forming a new environment for research and education in Moldova.

- This space provides users with accessible online resources and services as well as with unified tools for supporting national and international collaboration.

Mulțumesc!

Thank you!

RENAM Association
Chisinau, Republic of Moldova

www.renam.md