2021 RoEduNet Conference: Networking in Education and Research

New developments of the RENAM-GEANT communication platform for support science and education in Moldova

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EaPConnect
eapconnect.eu

General objectives

- Evolution and current trends in the development of networking infrastructure and services of RENAM network.
- Creating of new optical CBF (Cross Border Fibers) links and other components of the electronic platform RENAM-GEANT on the basis of the EU funded projects.
- Development of modern regional and national e-Infrastructures and the provision of services that are focused on support of scientific and educational communities in Moldova, enable instruments and provide facilities, resources, and services that are used by the research communities to conduct modern research, including implementation of Open Science principles.

RENAM NREN establishment & infrastructure development

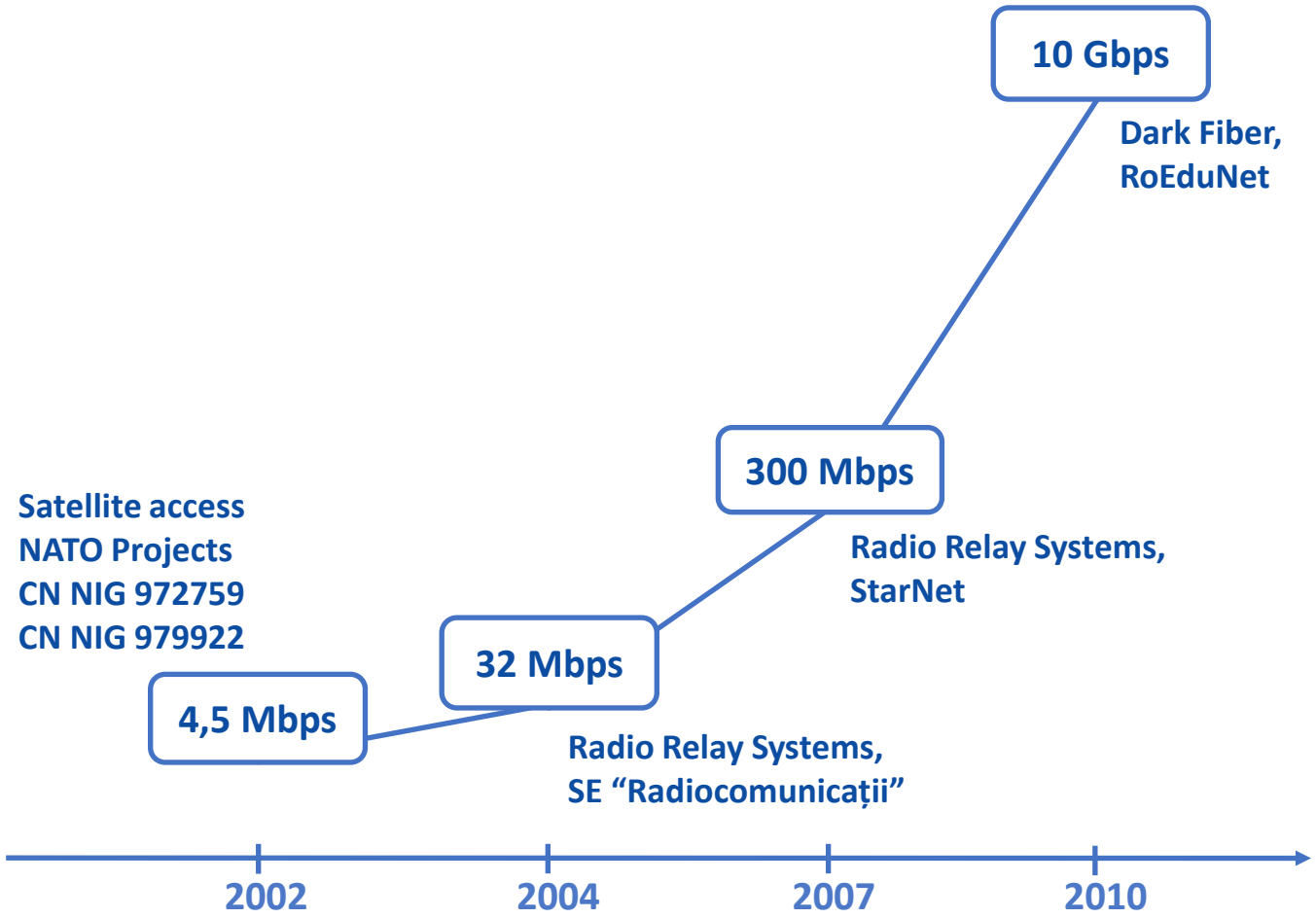
- **August 1999** – creation of the **RENAM networking infrastructure** that was initiated by joint initiative of the Academy of Sciences of Moldova and main universities (Technical University of Moldova, Moldova State University, Academy of Economic Studies of Moldova, State University of Medicine and Pharmacy of Moldova), with support of the Ministry of Education and NATO projects
- **2003 – connection to GÈANT** through the RoEduNet network based on microwaves radio relay systems
- **May 20, 2010 – 1st optical connection** launched between RENAM, RoEduNet and GEANT that using the route Chisinau (Moldova) – Iasi (Romania), created with support of two international projects (SEE-GRID-SCI funded by EU and NIG 982702 funded by NATO) and in partnership with local Company StarNet.

E-Infrastructures for research and education

- e-Infrastructures for research and education are oriented to support distributed medium based on
  - high-bandwidth networks;
  - Distributed computing, HPC and scientific Cloud resources;
  - respective data repositories.

- All these facilities are forming new research environment enabling shared access to unique or distributed scientific facilities (including data, software platforms, research instruments, computing resources and communication infrastructure).

Evolution of RENAM network external connections

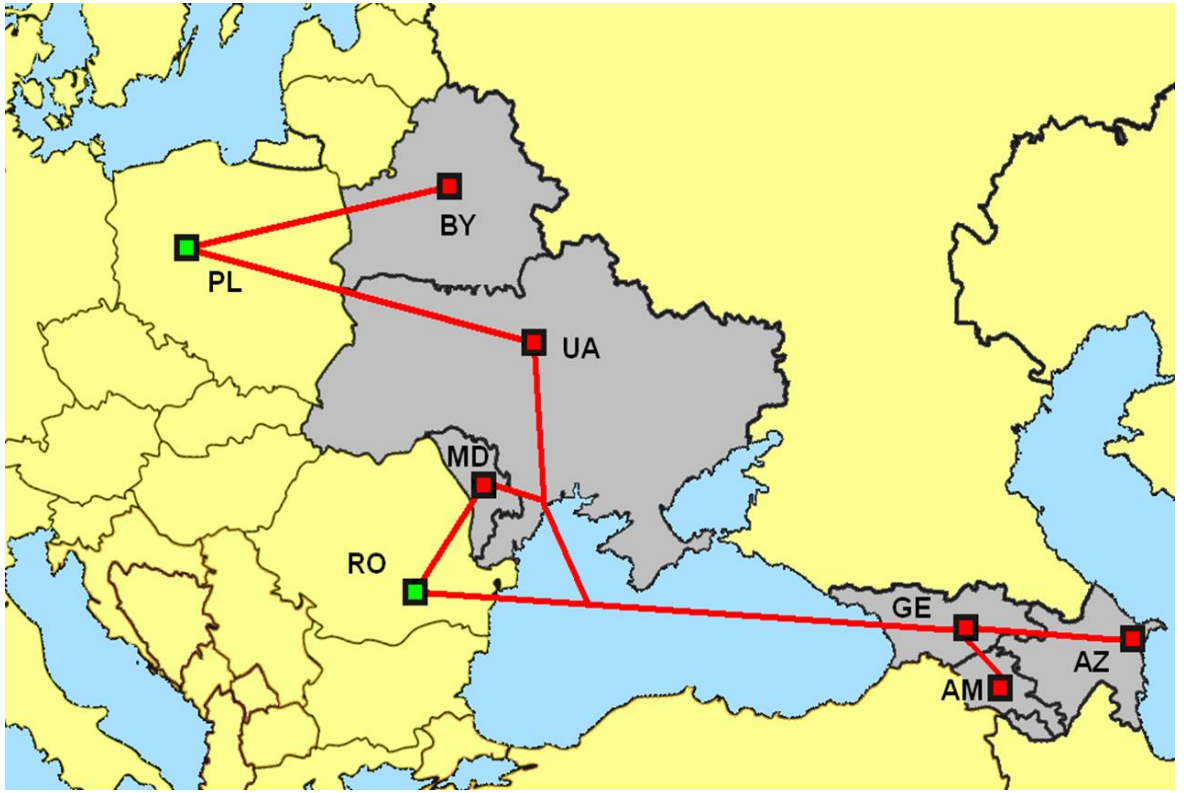


EU Initiatives for development of RENAM and EaP NRENs connectivity to GÉANT

In 2006-2007 – RENAM was involved in the EU funded project “Distributed Optical Gateway from Eastern Europe to GÉANT (Porta Optica Study - POS)”.

In 2012-2013 of the feasibility study of R&E e-Infrastructures’ development in the Eastern Europe continued in the framework of EU CEENGINE project. The project elaborated recommendations how to build a number of cross border connections and organize connection of the regional infrastructure to GÉANT network.

Further development of the RENAM connectivity to GEANT was supported by EaPConnect project.



Optical channel RENAM-RoEduNet

The first RENAM - RoEduNet Optical Channel that allowed to provide effective access to GEANT network was created in 2008-2009 in partnership with RoEduNet and support of StarNet company from Moldova. The channel was officially launched in May 2010.

This achievement marked the shift to over 1 Gbps speeds and, as a result, a significant improvement in the connectivity for universities and research institutions of Moldova.

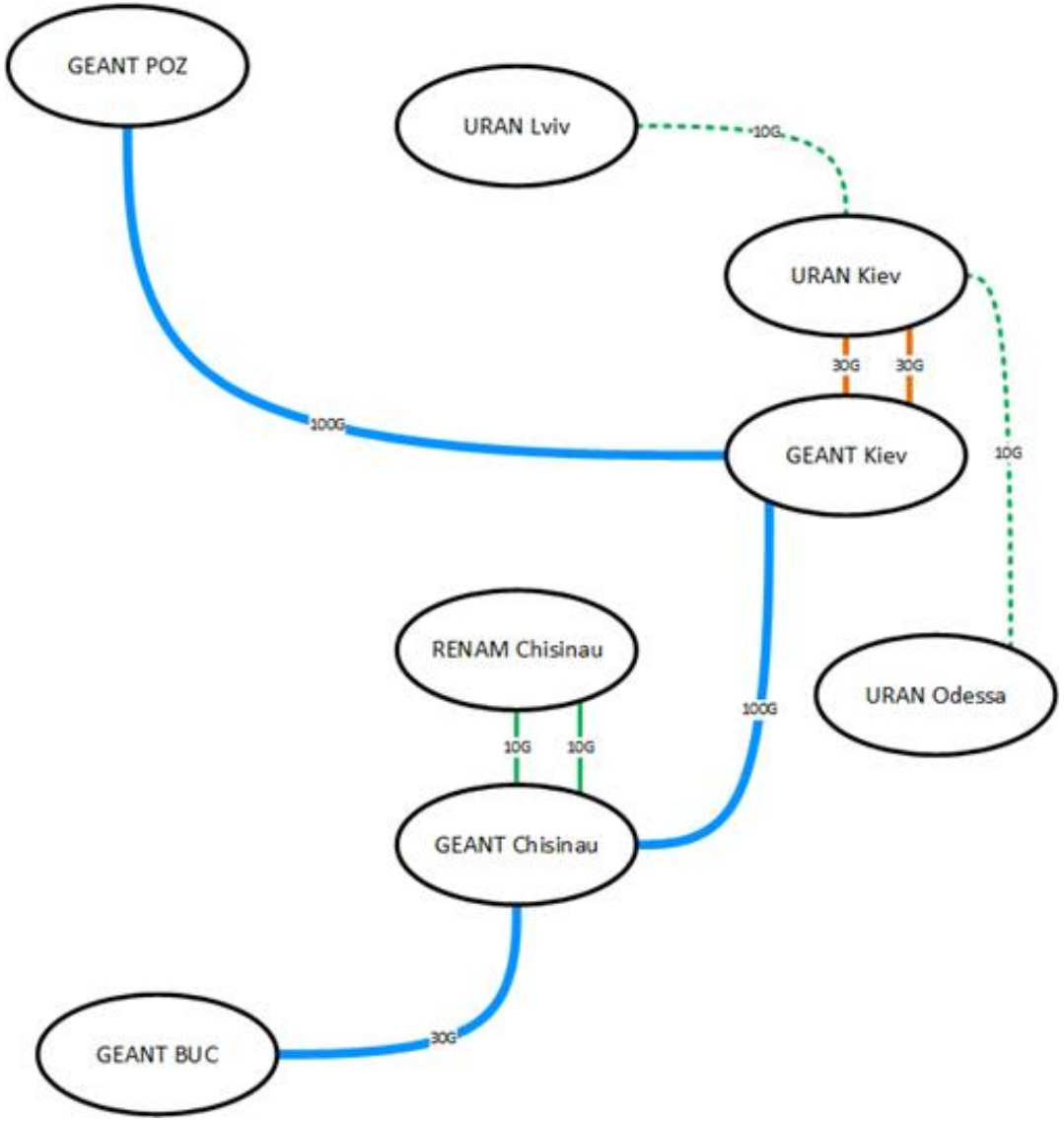
The creation and implementation of this optical channel has been carried out within two international projects: SEE-GRID-SCI (EC-funded) and NIG 982702 - (NATO-funded).

EaPConnect project supporting RENAM connectivity to GEANT

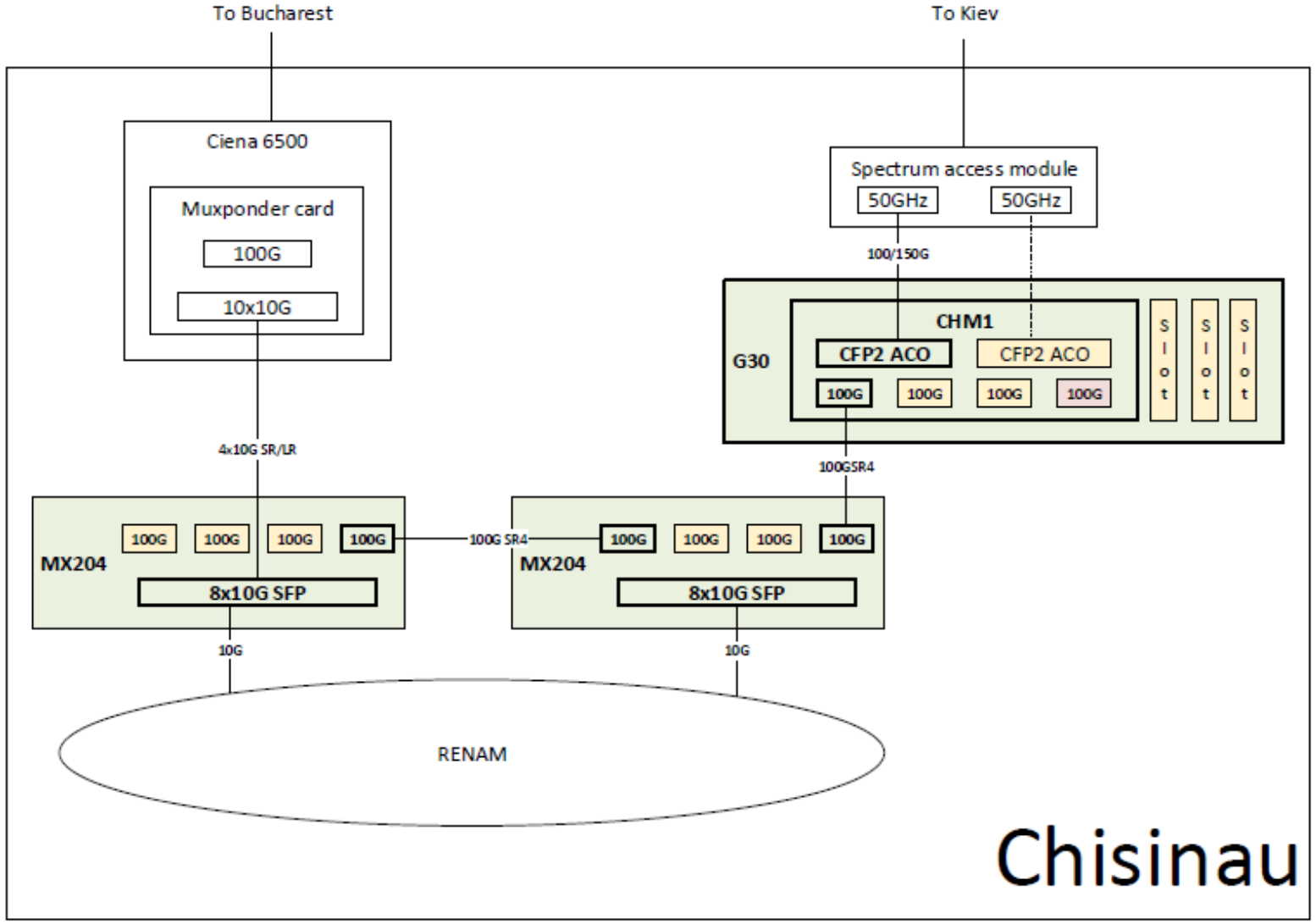
2017-2018 – optical link Chisinau (Moldova) – Iasi (Romania) **upgraded** and 100G optical lambda between Chisinau and Bucharest deployed

Creation of CBF connection between Moldova and Ukraine and construction of the communication semi-ring Bucharest (Romania) – Chisinau (Moldova) – Kiev (Ukraine) – Poznan (Poland)

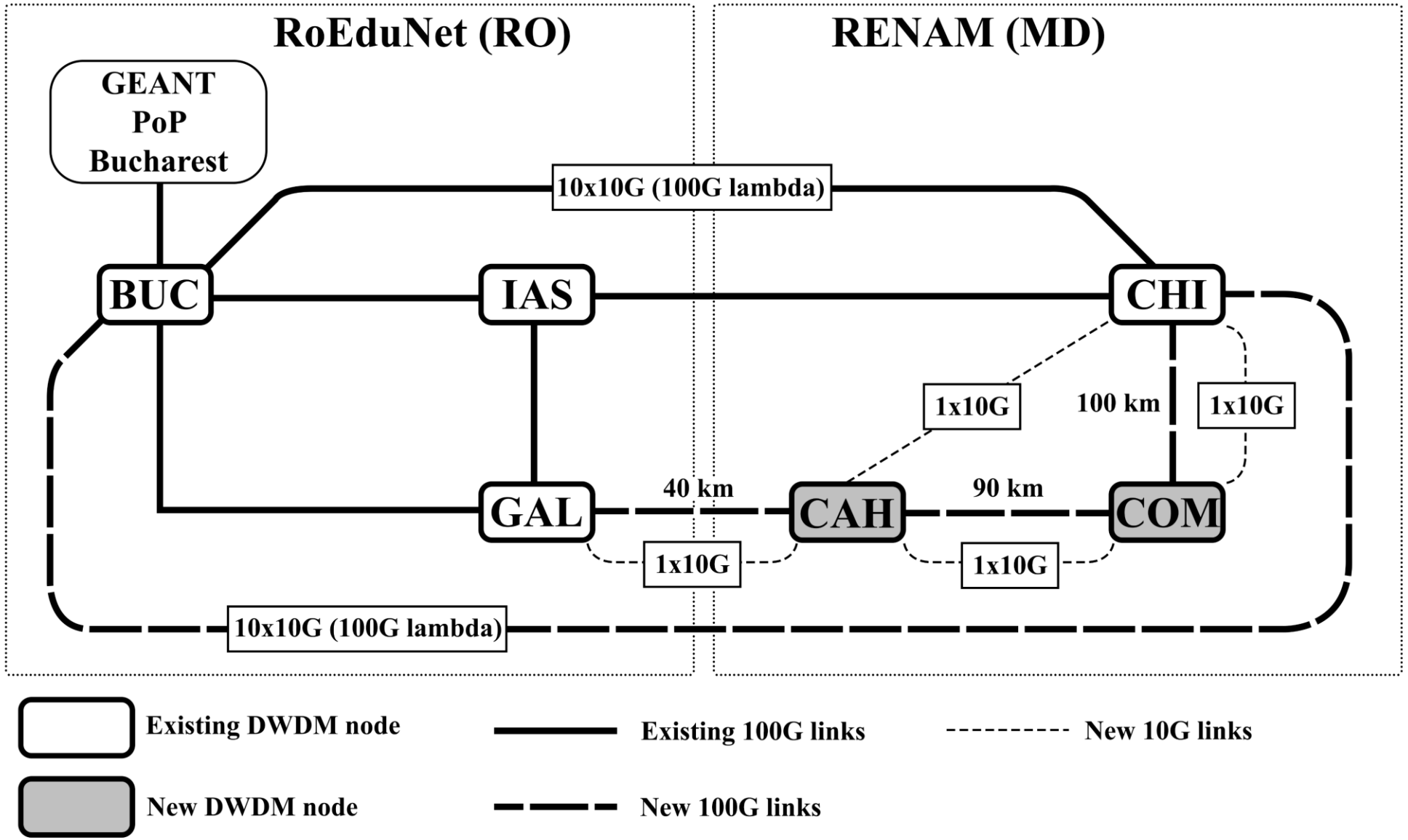
Logical scheme of the implemented connections



Deployment of GEANT PoP in Chisinau



Technical solution for Chisinau – Bucharest connectivity development



RENAM National Backbone development

- **Since 2006** – construction of the National optical Backbone started
- **2016-2020** – deployment of new capacity optical backbone
- **2020-2021** – technical project – re-engineering of the existing optical connections and creation of several new optical connections in Chisinau
- **2022-2023** – elaboration of technical project and implantation of new optical connections to connect universities campuses in the peripheral cities on the territory of Moldova
- **29 connected R&E institutions** – at present integrated all main universities and principal research institutes of Moldova

Current state of the RENAM National Backbone and Optical Backbone in Chisinau

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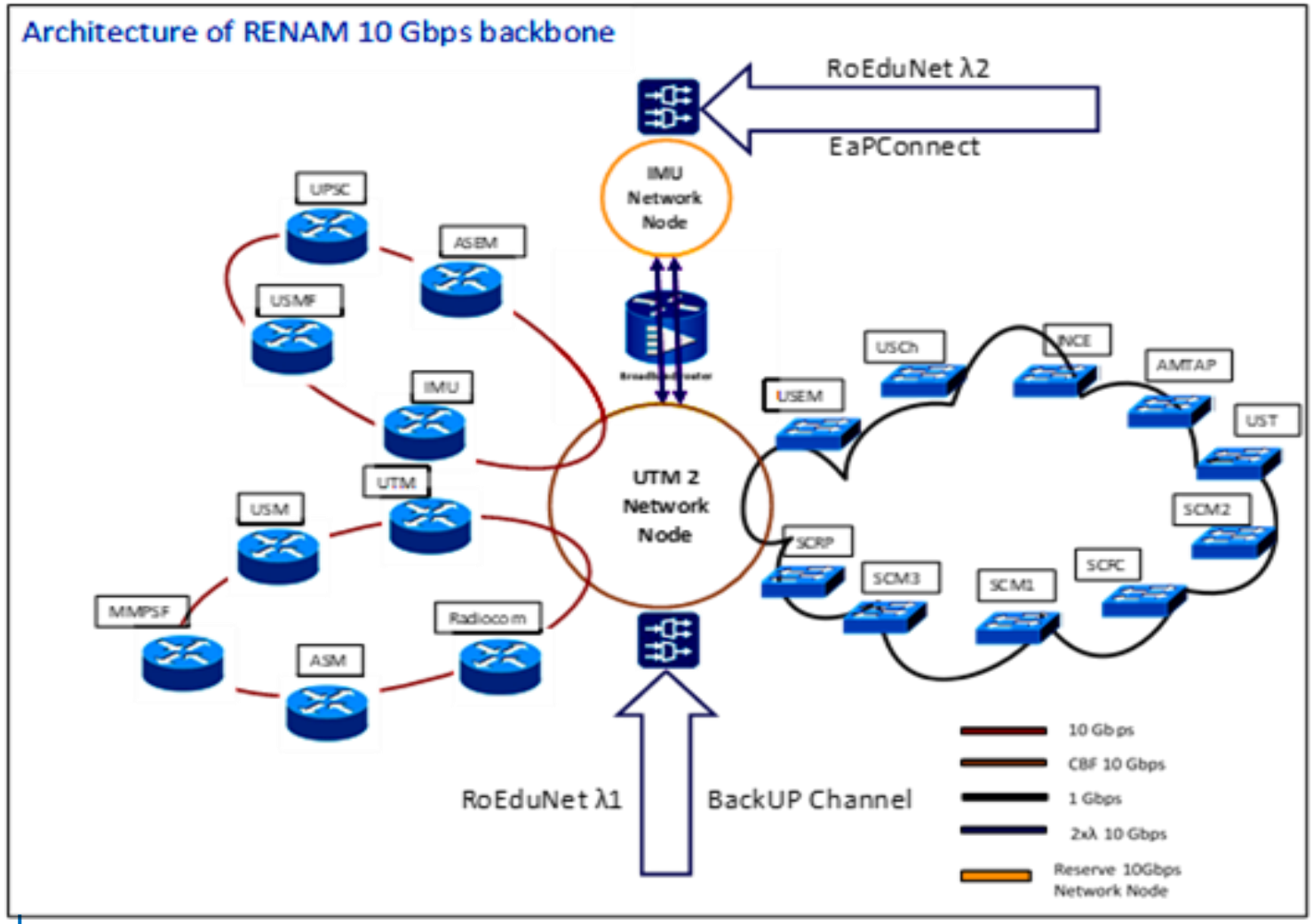


RENAM services for R&E institutions in Moldova

February 2021 – Users' Needs Assessment Survey, distributed with support of the Ministry of Education, Culture and Research (170 responders).

Identified priorities:

- Need to increase **external and internal connectivity** (53% of responders);
- **eduroam** wi-fi rouming (70% of responders);
- **eduGAIN** and **identity management** services (72% of responders);
- **Video conferencing** facilities (70% of responders);
- **Virtual learning environment** service, such as Moodle (60% of responders);
- **Research data virtual archiving** service (61% of responders);
- **Cloud computing** resources (52% of responders).

RENAM e-infrastructure and services supporting international collaboration

- data exchange for AERONET (AErosol RObotic NETwork) program (a federation of ground-based remote sensing aerosol networks);
- scientists of the Institute of Applied Physics are participating in international collaboration of nuclear physics experiments data processing: ATLAS, CMS (CERN), JINR (Dubna, Russia), DESY (Hamburg, Germany);
- data collection and exchange support for the H2020-TWINN-2015 project, boosting the scientific excellence and innovation capacity in digital holographic microscopy;
- providing data storage and regional computational resources for crystals structural study and modelling;
- data collection and storing for cross-border cooperation projects in the area of Cross-Border Preservation of the Aquatic Biodiversity;
- providing e-Infrastructure resources for climate data collection and modelling, ecological education.
- **National Distributed Computing Infrastructure** provides high throughput connections for the existing computing nodes that allows to operate flexible national HPC and Cloud infrastructures and its integration in the European EGI computing infrastructures.
- More than 60 **Horizon 2020 projects** directly or indirectly use connectivity and e-Infrastructure resources.

National computing infrastructure deployment

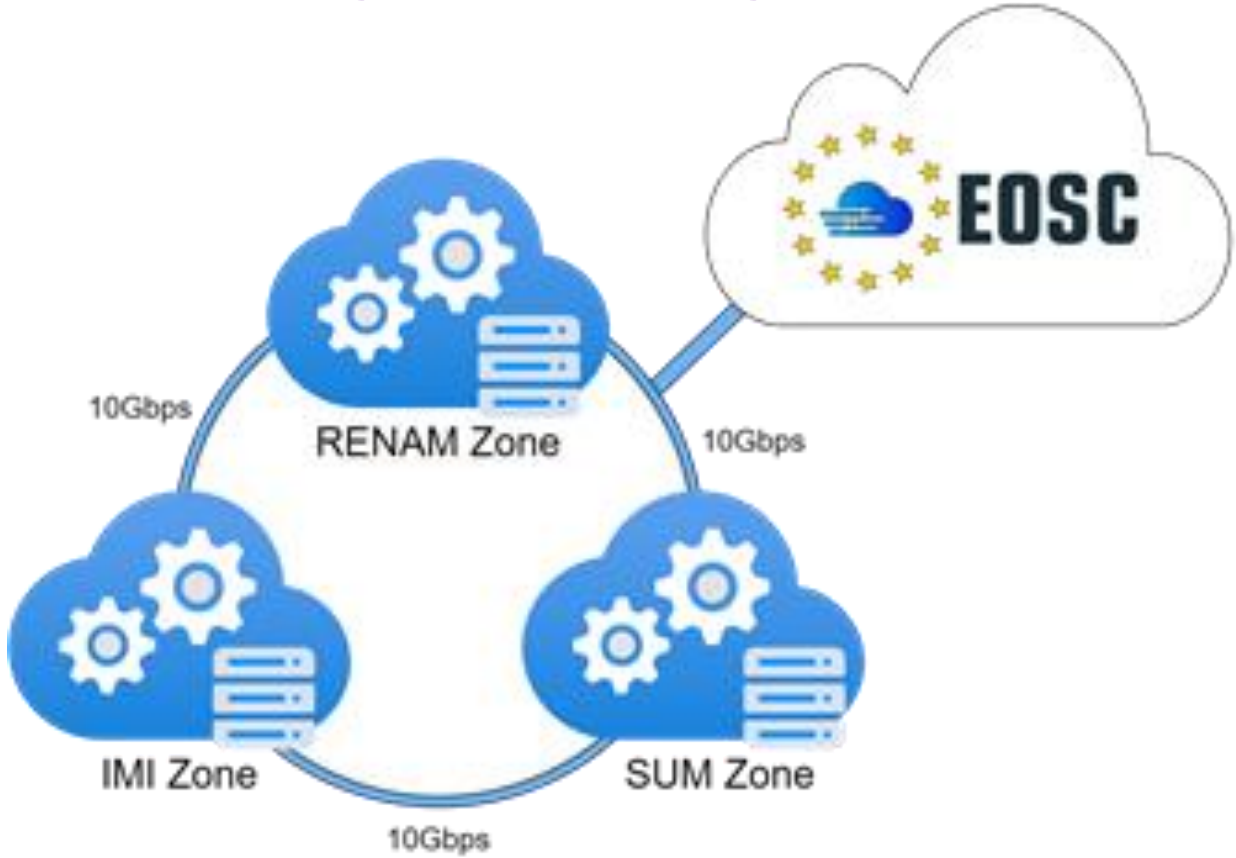
- RENAM together with SUM, VA IMCS are developing and providing federated Cloud environment with the efficient use of hard and soft resources, available for operation of platforms and tools for support of Open Science, development of digital technologies in research and education and solving problems that require high-performance computing and generating large volumes of data.
- The key points for the creation and development of a distributed infrastructure to support Open Science were facilitated by the participation of RENAM, SUM, and VA IMCS in international and national projects that allowed developing and modernizing the computing hardware and networking equipment.
- For the interconnection of main sites where computing resources are located, the RENAM-GEANT networking platform is used at speeds up to 10 Gbps and more based on the national fiber optic backbone of NREN RENAM. The created communication infrastructure is providing the necessary conditions for integration of the national academic and research community to EOSC and use the performance of the EOSC ecosystem.

Multi-zone IaaS Cloud infrastructure

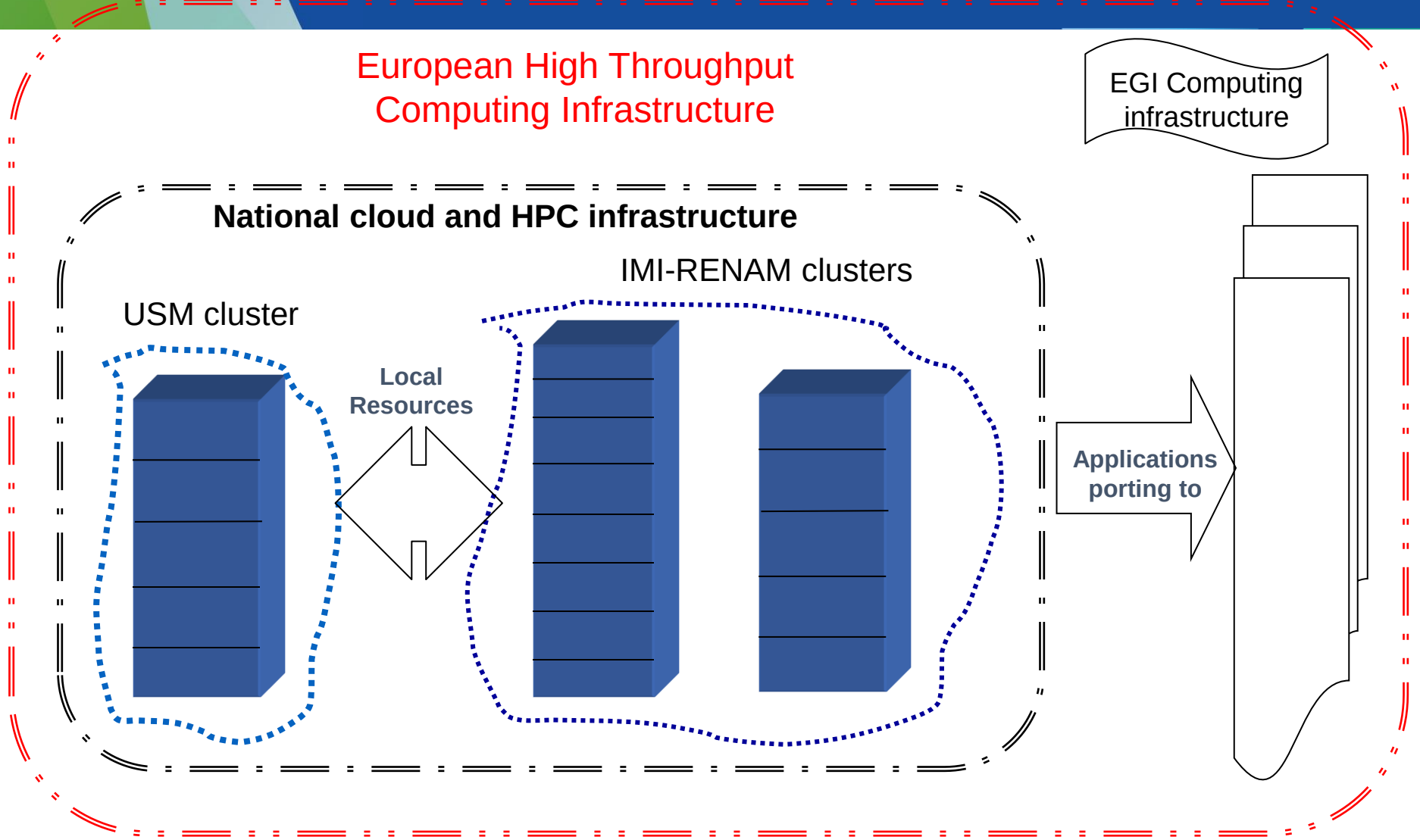
- At the first stage, is creating a multi-zone IaaS Cloud infrastructure that unites the resources of RENAM, VA IMCS and SUM into one distributed computing network for performing scientific calculations, as well as storing and archiving research data.

Parameters of the newly created distributed computing infrastructure:

- IMCS Compute servers: Dell R540 servers with total of 32 CPU cores, 128GB RAM, Dell R740 server with 12 TB of RAID of storage;
- RENAM Compute servers: Dell R730 servers with total of 40 CPU cores, 256 GB RAM, Dell R740 server with 12 TB of RAID storage;
- SUM Compute servers: HP ProLiant DL140 G3 with total of 28 CPU cores, 82 GB RAM, 2TB of RAID Storage.



Integration of the National Distributed Computing Infrastructure



Thank you!

Any questions?

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Use case: Supporting medical examinations in Moldova

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DICOM Network – solution for medical data collection, processing and visualization

- 300 patients / day
- 400 images / day
- 500 doctors
- 6 DICOM servers & 2 DICOM portals

bit.ly/MD-medical